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INFLUENCE OF PROJECT RISK MANAGEMENT PRACTICES ON PERFORMANCE OF TELECOMMUNICATION NETWORK MODERNISATION PROJECTS IN KENYA

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Abstract

Purpose: Telecommunication operators around the world continue to upgrade their network technologies to improve performance and increase capacity. Many of these firms are confronted with the challenge of ensuring successful implementation of these projects. The general objective of this study was to establish the influence of project risk management practices on performance of Telecommunication Network Modernization projects in Kenya.

Methodology: This study adopted a case study research design. The target population for the study was Network Modernization projects undertaken by Safaricom Plc in the past three years. The unit of observation were the Project Managers and Technical Team leaders who are responsible for the management of the selected Network modernization projects. A total of sixty Network modernization projects were selected. Total number of 60 respondents was reached, representing the entire population. Census was used in the study. Primary data was collected using semi-structured questionnaire based on the objectives of the study. The data was edited, coded for processing using the Statistical Package for Social Sciences (SPSS v.24) and presented in tabular and graphical format. A master codebook designed to ensure that all the questionnaires are coded uniformly was used. Consequently, data was edited for completeness and consistency before analysis. The study used multiple regression analysis and Analysis of Variance (ANOVA) to analyze the degree of relationship between the variables in the study at 5% level of significance.

Results: The study found that all the four aspects of risk management were practiced to a high extent. Regression analysis yielded relationships between performance of network modernization projects against project risk identification, project risk monitoring and project risk response. Though these relationships were weak, they were found to be statistically significant at the 5% significance level. Project risk analysis was found to have no relationship with performance of network modernization projects.

Unique contribution to Theory, Practice and Policy: The study recommended that telecommunication firms should pay great emphasis on the three aspects of risk management, namely project risk identification, project risk monitoring and project risk response. Further it was recommended that future studies should be done to establish other factors that influence performance of Telecomm Network Modernization projects.

Key Words: *Project Risk Management Practices, Performance and Telecommunication Network Modernization Projects*

1.0 INTRODUCTION

Telecommunication industry is a very important sector in the economy of any country as it is an enabler of economic and social transformation, improves access to basic services, and enhances connectivity and creation of employment opportunities (World Economic Forum, 2015). The sector has been identified as one of the industries that is exposed to rapid technological change (Nelson & Winter, 2008). Therefore, telecomm companies have to continuously implement various projects in order to generate constant stream of product innovation thereby sustaining their competitive advantage. Mobile communication has experienced tremendous growth over the past decade due mainly to the availability, affordability, advanced computing and communication capability of smart mobile computing devices (Thapar & Karmakar, 2016). According to the International Telecommunications Union, ITU (2015) more than 6 billion people, over 87% of the world, hold subscriptions for mobile services. Furthermore, subscriptions for advanced services such as 3G mobile data are growing at 37% annually, accelerating the construction of new wireless networks and high speed wire line networks that carry wireless traffic to its ultimate destination.

Successful project management is the desirable outcome of Telecomm operators in carrying out various modernization projects. Information Communication Technology (ICT) project success or failure has long been of interest to researchers over the past 2 decades. High failure rates of ICT projects were attributed to completion beyond budget, behind schedule, and without meeting requirements. The McKinsey Global Institute (MGI) reported that in 2012, on average, large IT projects ran 45 per cent over budget and 7 per cent over time, while delivering 56 per cent less value than predicted. Standish group (2014) reported that only 12% of projects had finished on time and within the budget. According to Taylor & Artman (2012), 70% of software projects fail due to poor requirements with an associated rework spends above $45 billion annually. Jenner (2015) elaborated on depressing project failure rates between 50% and 70%. With these high failure rates, it is not surprising that several studies have been done to understand the factors related to ICT project success. Among several factors, risk management has been identified as one of the important factors that affected project success. Levinson (2010) mentioned that risk management was a key part of project management for any project size.

Indeed, the awareness of project risks and the need to manage them has become one of the areas of interest to researchers and practitioners in the recent past and is one of the main areas of the PMI project management body of knowledge (PMBOK) as well as the body of knowledge of the Association of project management (APM) of the UK (Shenhar & RAZ, 2002). Project risk management includes the processes of conducting risk management planning, identification, analysis, response planning, and controlling risk on a project, the objectives of which are to increase the likelihood and impact of positive events, and decrease the likelihood and impact of negative events in the project (PMI, 2013). According to Woods (2011), the process of risk management involves five main steps: (1) Identification, (2) Assessment, (3) Treatment or Response, (4) Reporting and (5) Controlling or Monitoring. Risk management provides a framework for organizations to deal with and to react to uncertainty. Whilst it is acknowledged that nothing in life is certain, the modern practice of risk management is a systematic and comprehensive approach, drawing on transferable tools and techniques (The Institute of Risk Management, 2010). Bakker *et al.* (2012) emphasize the importance of risk identification as the most influential process in terms of numbers as well as in the strength of communications effects, followed by risk reporting, risk registration and risk allocation, risk analysis, and finally risk control. At the same time, the definition of

project success is evolving. The traditional measures of scope, time, and cost are no longer sufficient in today's competitive environment (PMI, 2017). The ability of projects to deliver what they set out to do—the expected benefits—is just as important. Therefore, in determining project success, benefits realization maturity is considered as well as the traditional criteria.

Several research results indicate that poor risk management is a likely cause of project problems and failures. Jun, Qiuzhen & Qingguo (2010) investigated the effects of project risk planning on ICT project performance focusing on a case of China vendor firms. The study sought to test the hypothesis; Project risk planning and control makes a greater significant positive contribution to project performance at low levels of inherent uncertainty than at high levels. The study used questionnaire to collect data from a sample of 181 software project managers and other key informants from software houses in Hangzhou City, China, by mail and email. The respondents were requested to provide information with respect to one or more recently completed outsourced information system development projects. The study found that there exists a significant positive relationship between project risk planning and project performance. The results indicated that project risk planning and control led to improve project performance ensuring project completion within schedule and budget thereby improving vendor firm's profitability. Some studies indicate that project risk management approaches are not widely accepted in project management as a result of the time necessary to use them, the difficulty of obtaining input estimates and assessment of risk probabilities, human/organizational resistance to change, difficulty in understanding and interpreting outcomes of the risk management process and finding suitable risk management methods.

Africa is rapidly growing, which increases the demand for infrastructure projects. Information and Communication Technology (ICT) is one of the sectors that has witnessed tremendous growth in the last two decades and provides enormous benefits to economic development. However, cost and time overruns are a worldwide phenomenon and pose a serious threat to the development of telecommunication infrastructure, which is the platform for ICT. Better risk management can help to improve the project outcomes (Ika & Saint-Macary, 2012). De Wet & Visser (2013) investigated the success rate of software projects in South Africa and whether risk management might improve project success rates. The results indicate that the average success rate of software projects in South Africa is indeed very low, and that software projects in South Africa often experience the same risks as in the developed world. It was also found that, where risk management is applied, software projects produce better results than software projects with no risk management. The majority of South African software companies' use ad hoc internally developed risk management procedures rather than formalized procedures.

Telecommunication Network Modernization in Kenya

The Kenyan telecommunication industry has grown tremendously in the past two decades and this can be traced to the liberation and privatization of the sector that followed the restructuring of the defunct Kenya Posts and Telecommunications corporation (KPTC) and subsequent establishment of Communication Commission of Kenya (predecessor of Communication Authority of Kenya, CAK) as well as Telkom Kenya and Postal Corporation of Kenya followed by commencement of Mobile services by Kencell (Now Airtel) and Safaricom Plc. The types of mobile phone services available have also changed drastically to include Mobile money transfer service, SMS, e-mail and internet services as well as video conferencing on top of voice services offered by the operators. There are currently three main

players in this sector; Safaricom, Bharti Airtel and Telkom Kenya resulting in competitive operating environment that drives innovation of new products and services. Currently, there are over 41 million mobile subscribers in Kenya which is 90.42% mobile penetration level with Safaricom controlling 71.2% of the market, Airtel Networks has 14.9% of the subscriber base, with Orange Telkom having 7.2% (CAK, 2017).

Kenya has recognized the role played by mobile telecommunication technologies to provide mobile services to its populace, and the sector continue to roll-out a mix of 2G, 3G and 4G (Long Term Evolution, LTE) services. These services are supported by fiber optic infrastructure that have been built by the public and private sector as backbone links, and last mile solutions (ITU, 2017). The ultimate aim is to provide high-speed Internet services in addition to voice services for use by the citizens and to enhance public services delivery in all spheres of life in the country. Despite increased investment by the telecomm operators in the network modernization projects in an attempt to improve the quality of service, Communications Authority of Kenya (2015) quality of service report shows that the telecomm operators have consistently failed to meet some of the Key Performance Indicators (KPIs) used to gauge the extent to which their services conform to the required standard, achieving a score of 62.8% against a target of 80%.

With one player (Safaricom) controlling the bulk of Kenya's telecomm market share, the regulator has tried several strategies to spur competition. In 2011, Kenya launched the Mobile Number portability program allowing subscribers to retain their mobile subscriber numbers whenever they opt to change mobile service providers. Mobile Number portability was meant to deepen the level of competition in the mobile telecommunications market and enhance consumer choice. However, Mobile Number Portability failed to kick off and has continued to decline from 36,000 subscribers ported between the various networks when the service was started in 2011 to a paltry 295 in-ports carried out on first quarter of 2017 which is a negligible 0.0007% of total subscribers (CAK, 2017).

Safaricom and Network Modernization Projects

Safaricom is the market leader in the Kenyan telecommunication sector and has consistently invested in product innovation and rollout of new technologies making it one of the most profitable companies in the region with net income of Kshs.48.4 Billion (Safaricom annual report, 2017). Mobile money transfer and payment service (Mpesa) launched in 2007 is so far the most successful product innovation by the company which has revolutionized money transfer service and payments in the region. Major projects undertaken by Safaricom in the recent past include Rollout of 4G (LTE) service, Mpesa server relocation to Kenya, Government of Kenya Security project (CCTV) in Nairobi and Mombasa, rollout of Fiber to the Home (FTTH) and Fiber to the Building (FTTB), Radio Access Network modernization (2G & 3G) amongst others. Based on Safaricom annual Report (2017), Mobile data business remains the companies' fastest growing revenue stream and the focus in growing it further through accelerating smartphone penetration, growing 3G and 4G users informs its massive investment in network modernization projects. Safaricom annual report (2017), shows the company expenditure on network rollout and modernization was Kshs.38 billion in 2016/2017 financial year with most of it spend on 4G and 3G modernization projects.

Statement of the Problem

Many projects around the world keep failing, resulting in loss of millions of dollars for organizations. The McKinsey Global Institute (2012) reported that, on average, large IT projects ran 45% over budget and 7% over time, while delivering 56% less value than

predicted. Standish group (2014) reported that only 12% of projects had finished on time and within the budget. Kenya faces similar performance challenges, despite the remarkable growth of ICT sector witnessed in recent years.

A study carried by KPMG determined that 68% of organizations in ICT in Kenya experience project failure (Kinyua et al, 2015). According to the quality of service report released by the Communications Authority of Kenya (2015), the telecomm operators have consistently failed on a number of the Key Performance Indicators (KPIs) used to gauge the extent to which their services conform to the required standard, achieving a score of 62.8% against a target of 80%. This is despite increased investment by the telecomm operators in the network modernization projects in an attempt to improve the quality of service and customer satisfaction. This persistent challenge has led many researchers to attempt to identify the influencing factors that need to be tackled to produce a successful project management outcome (Mortensen, 2013).

Although project risk management has been identified as an important factor in the performance of ICT projects, the adoption of these risk management practices in projects is inconsistent (Taylor et al, 2012). On the PMI (2017) pulse of the profession survey, 40% of the project managers surveyed acknowledged that they rarely or never use project risk management practices on their projects. Previous studies in Kenya (Keraro, e tal 2015; Alfayo & Namusonge, 2016) however, mainly concentrated on factors affecting performance of ICT projects in general. This has left a knowledge gap in the key area of influence of risk management on performance of Telecommunication projects in particular. The study therefore sought to bridge this knowledge gap. Thus this study assessed the influence of project risk management practices on performance of Telecommunication Network Modernization projects in Kenya.

2.0 LITERATURE REVIEW

2.1 Theoretical Review

Project Risk Analysis and Management

Project Risk Analysis and Management (PRAM) model has been in use for many years. Project Risk Analysis and Management is a process that enables the analysis and management of the risks associated with a project. A variety of PRAM procedures have been developed to measure the impact of concealed technical, economic, political, managerial and even social risks and to adopt an appropriate risk strategy to minimize the loss due to those risks (Bannerman, 2008). PRAM has now been formally integrated into project management body of knowledge (PMBOK) and Association of project management (APM). PRAM uses a project framework to identify and mitigate risk by using the accepted framework of risk identification and project controls and focusing on risks as they occur during the project life cycle. It requires users to follow a rational series of procedures and to undertake this analysis at scheduled intervals during the life cycle of a project (IRM, 2010).

The PRAM approach represents a continuous process that can be started at almost any stage in the life cycle of a project and if properly undertaken will increase the likelihood of successful completion of a project to cost, time and performance objectives. Risks for which there is ample data can be assessed statistically, however, no two projects are the same and often things go wrong for reasons unique to a particular project, industry or working environment (IRM, 2010). Dealing with risks in projects is therefore different from situations

where there is sufficient data to adopt an actuarial approach. Because projects often involve a technical, engineering, innovative or strategic content, a systematic process is preferable to an intuitive approach. Project Risk Analysis and Management (PRAM) has been developed to meet this requirement. PRAM model is suitable for this study as it helps to analyze various risks that might be anticipated in the performance of Telecommunication network modernization projects in Kenya.

Network theory

Network theory is the study of complex interacting systems that can be represented as graphs equipped with extra structure. In the 1950's, Howard Odum introduced networks to model the flow of resources like energy through ecosystems. Since it is a generalized pattern, tools developed for analyzing, modelling and understanding networks can theoretically be implemented across disciplines. Network theory originality lies in the application of some network theory indicators to the project risk management field (Olsson, 2008). By applying network theory tools to risk assessment, computational limitations may be overcome and result to a broader coverage of events with a narrower range of uncertainties. Risk assessment is a very important tool to acquire a present and future risk status of the Telecommunication network project. The study is based on network theory to deal with risk analysis and interactions in Telecommunication projects. Indeed, such projects are exposed to numerous and interdependent risks of various nature, which makes their management more difficult. In this study network theory is presented with the aim of identifying key elements in the project structure of interrelated risks potentially affecting the performance of a telecommunication project. This analysis serves as a powerful complement to classical project risk analysis. The construction of the risk network requires the involvement of the project manager and other team members assigned to the risk management process.

Empirical Review

A study was conducted by Kinyua, Ogollah & Mburu (2015) to examine the effect of risk management strategies on project performance of small and medium information communication technology enterprises in Nairobi, Kenya. The study established that the level of project risk identification as carried out in the enterprise was high, as it was found that specific actions are identified to enhance the risk management activities on each significant risk. Risk registration influenced identification and management of project risk, use of checklist, risk controls and screening of project risks and taking measure enhance risk identification in small and medium technology firms to a very great extent. The study also established that there existed a significant positive relationship between project risk identification and project performance of ICT Small Medium Enterprises (SMEs) in Kenya where project risk identification through risk reporting, registration, allocation, control and checklist would impact positively on ICT project performance.

Roque & de Carvalho (2013) conducted a study on understanding the impact of project risk assessment on project performance in Brazilian companies. The objective of the study was to comprehend the impact of risk assessment on performance of various projects in different sectors and to investigate the degree of diffusion of project risk assessment in Brazilian Vendor companies (project risk analysis being one of the processes of risk assessment). The methodological approach involved a survey of 415 projects at different levels of complexity undertaken by various companies in different sectors in Brazil. The results demonstrate that adopting risk management techniques and keeping attention to uncertainties has a significant positive impact on project success as project staff were able to identify and take measures to

mitigate occurrence of risks to a greater extent. The results demonstrated that the impact of project risk analysis on project success was positive. However, results on a study by Pimchangthong & Boonjing (2017) on the effects of risk management practices on performance of IT projects in Thailand indicated that risk identification and risk response planning were shown to influence the process performance and the total aspects of IT project success while risk analysis negatively influences product performance.

A study by Juliane & Alexander (2013) was done to determine how portfolio risk management (including monitoring as a process of management) influences ICT project portfolio success in ICT enterprises in UK. The objective of the study was to determine whether portfolio risk management influence ICT project performance. Project risk monitoring as a process of risk management was also studied. Data was collected using a questionnaire and cross industry sampling was adopted to select a sample of 176 firms. The results indicated that portfolio risk management (including risk monitoring) shows a significant positive relationship with project performance. The study concluded that ICT project portfolio risk monitoring has a positive impact on ICT project performance.

Shenhar & Raz (2002) conducted a study on the Impact of Project risk management practices such as risk identification, probabilistic risk analysis and trade-offs on project success. By means of an empirical study of 100 projects performed in Israel in a variety of industries, the study sought to examine the extent of usage of risk management practices, the difference in application across different types of projects and their impact on various project success dimensions. The findings suggest that risk management practices are still not widely used. However, when applied, risk management practices appear to contribute to project success. It was also found that risk management practices were mainly applied to higher risk projects and the impact of risk management is mainly on better meeting time and budget objectives and less on product and technical specification. Project risk identification and risk response were shown to be statistically related to project success.

Conceptual Framework

Independent Variables **Dependent Variable**

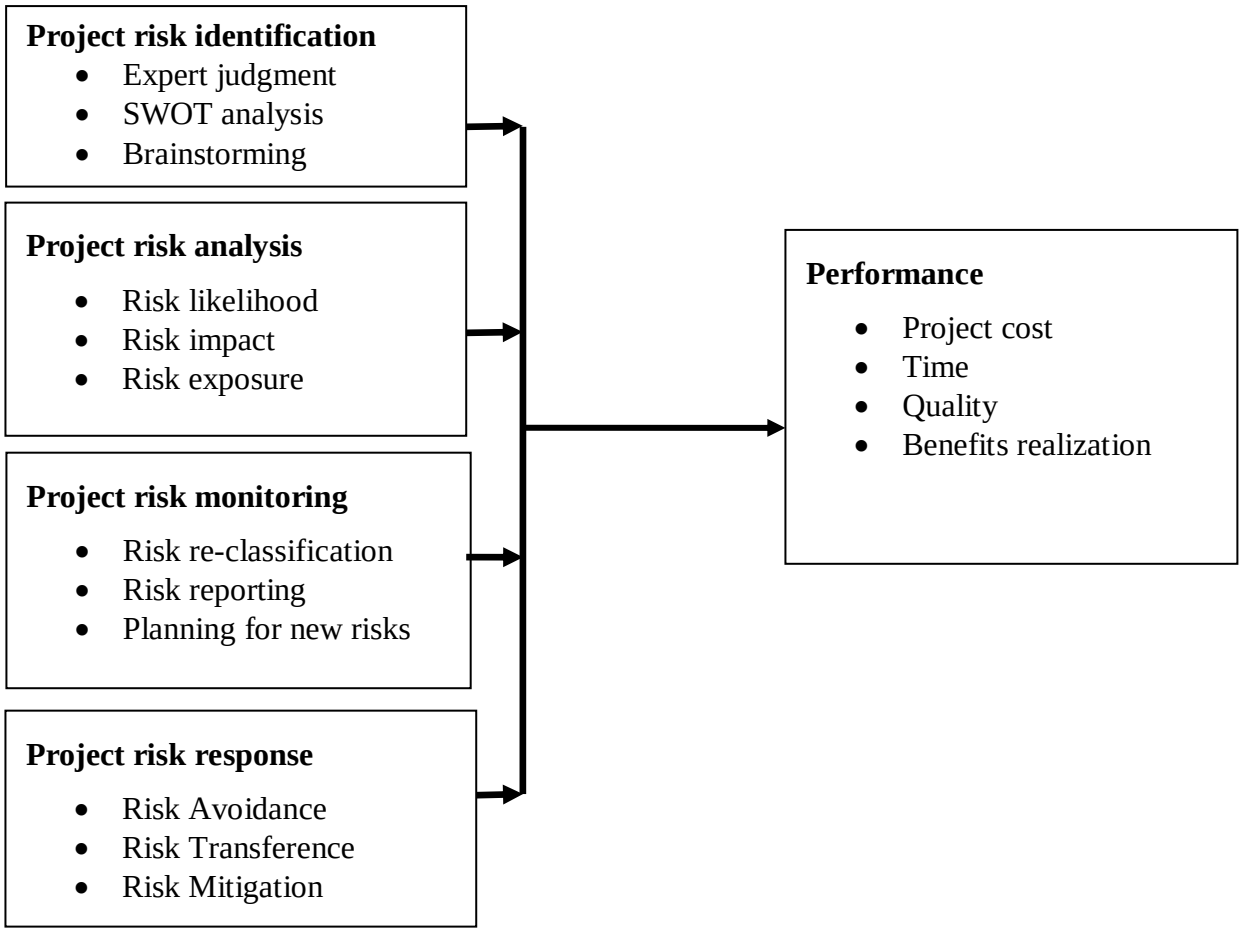

Figure 1: Conceptual Framework

3.0 RESEARCH METHODOLOGY

This study adopted a case study research design. The target population for the study was Network Modernization projects undertaken by Safaricom Plc in the past three years. The unit of observation were the Project Managers and Technical Team leaders who are responsible for the management of the selected Network modernization projects. A total of sixty Network modernization projects were selected. Total number of 60 respondents was reached, representing the entire population. Census was used in the study. Primary data was collected using semi-structured questionnaire based on the objectives of the study. The data was edited, coded for processing using the Statistical Package for Social Sciences (SPSS v.24) and presented in tabular and graphical format. A master codebook designed to ensure that all the questionnaires are coded uniformly was used. Consequently, data was edited for completeness and consistency before analysis. The study used multiple regression analysis and Analysis of Variance (ANOVA) to analyze the degree of relationship between the variables in the study at 5% level of significance.

4.0 FINDINGS

4.1 Background Information Results

4.1.1 Education Level

The respondents were asked to indicate their highest level of education. The table below shows the distribution of respondents by education level.

Table 1: Distribution of respondents by education level

	Frequency	Percent
Postgraduate degree	31	51.7
Undergraduate degree	29	48.3

From Table 1 above, majority of the respondents (51.7%) had undergraduate degree, followed by 48.3% who had Post graduate Degree. This result show that project management was being undertaken by people with high level of education.

4.1.2 Age distribution

The study sought to find out the distribution of respondents by age. The respondents were asked to indicate their age bracket. The following table shows the distribution of respondents by age.

Table 2: Distribution of respondents by age

	Frequency	Percent
Above 50	2	3.3
41 - 50 years	18	30.0
31 - 40 years	23	38.3
21 - 30 years	17	28.3

From table 2 above, most of the respondents (38.3%) were aged between 31 to 40 years, followed by 30% aged between 41 to 50 years, 28.3% aged between 21 and 30 years and 3.3% aged over 50 years. This result show that Safaricom plc has a high percentage of youthful employees as 66.6% of the respondents are below 40 years. They therefore have the energy to undertake the company projects and ability to adapt to change which is an important factor since projects generally involve change.

4.1.3 Length of service

The study sought to establish how long the respondents had served the organization. The table below shows the distribution of respondents by length of service.

Table 3: Distribution of respondents by length of service

	Frequency	**Percent**
16 - 20 years	3	5.0
11 - 15 years	17	28.3
6 - 10 years	25	41.7
Under 6 years	15	25.0

From table 3 above, majority of the respondents (41.7%) had worked for the organization for between 6 – 10 years followed by 28% who had worked for between 11 – 15 years, 25% who had worked for under 6 years and 5% who had worked for between 16 to 20 years. Therefore, majority of the respondents (75%) have worked with the company for more than 6 years hence have the relevant knowledge and experience to handle Network modernization projects and were in a position to provide the required information for the study.

4.2 Risk Identification and Performance of Network Modernization Projects

4.2.1Ratings of Risk Identification Indicators

The study used nine indicators of risk identification which were in the form of statements. The respondents were asked to rate the level of their agreement on a 5-point Likert scale where 1 was strongly disagree and 5 was strongly agree. For purposes of analysis, the top two and bottom two levels were aggregated. The table below shows the results.

Table 4: Levels of agreement with risk identification indicators

Item	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
There is a documented standardized risk identification process in place that is used by all projects.	0.0%	8.3%	11.7%	51.7%	28.3%
The risk identification process is fully integrated into other corporate processes and procedures.	0.0%	3.3%	11.7%	58.3%	26.7%
We have sought expert judgment from engineers and stakeholders.	0.0%	6.7%	25.0%	43.3%	25.0%
Delphi Technique is used in project risk identification	0.0%	1.7%	11.7%	56.7%	30.0%
The company has carried out a SWOT analysis on the project.	0.0%	1.7%	15.0%	56.7%	26.7%
The strength and opportunities are more than the weaknesses and threats	0.0%	5.0%	16.7%	38.3%	40.0%
The company uses information from past successful projects to identify potential project risks.	0.0%	10.0%	21.7%	35.0%	33.3%
Brainstorming, meetings and Interviewing of team members is used to identify potential project risks.	5.0%	5.0%	6.7%	31.7%	51.7%
The information gathered is helpful to the projects and helps in its modification.	0.0%	0.0%	3.3%	65.0%	31.7%

From table 4 above, majority of the respondents (80%) agreed that there is a documented standardized risk identification process in place that is used by all projects. Similarly, majority of the respondents (85%) agreed that the risk identification process is fully integrated into other corporate processes and procedures. Further, a majority of the respondents (68%) stated that they have sought expert judgment from engineers and stakeholders during project implementation. A great majority (86.7%) of the respondents indicated that the Delphi Technique is used in project risk identification. Majority of the respondents (83.3%) indicated that the company has carried out a SWOT analysis on the project with most of the respondents (78.3%) indicating that the strength and opportunities are more than the weaknesses and threats. Similarly, majority (68.3%) of the respondents stated that the company uses information from past successful projects to identify potential project risks. Also, majority of the respondents (83.3%) indicated that brainstorming, meetings and Interviewing of team members is used to identify potential project risks. Finally, majority of the respondents (96.7%) responded that the information gathered is

helpful to the projects and helps in its modification. These findings show that all the major risk identification measures are carried out by the company to a great extent.

4.2.2 Risk Identification and Performance of Network Modernization Projects

Linear regression analysis was used to estimate the relationship between risk identification and performance of network modernization projects. The following tables present a summary of the results.

Table 5: Summary of regression results between Risk Identification and Performance of Network Modernization Projects

	Measure	Value	t	P-Value
Model Summary	R	0.317		
	R Square	0.100		
Coefficients	Constant	2.413	3.522	.001
	β1	0.426	2.545	.014

From table 5 above, the correlation coefficient (R = .317) indicating that risk identification has a moderately strong positive correlation with performance of network modernization projects. The R-Square (.100) indicates that risk identification explains 10% of the variability in performance of network modernization projects. This means that the remaining 90% of the variability in performance of network modernization projects is accounted for by other factors.

The resulting regression equation is of the form:

$$\mathbf{y = 2.413 + 0.426x}$$

$$(p<.05) \qquad (p<.05)$$

Where **y** = **performance of network modernization projects**; **x** = **Risk identification**

Thus, regression results yielded a positive relationship between risk identification and performance of network modernization projects. Though the relationship was weak, it was found to be statistically significant at the 5% level of significance (p<.05). These findings conform to those of Addison & Vallabh (2002) who carried out a study on impact of project risk identification performance of software projects in ICT enterprises in China. They found that the relationship between project risk identification and performance was statistically significant at 95% confidence level. Bakker *et al.* (2012) emphasized the importance of risk identification as the most influential process in terms of numbers as well as in the strength of communications effects.

Risk identification was shown to follow a standardized formal process where project meetings, Delphi Technique, historical project data, checklists as well as SWOT analysis and expert judgment were employed to identify potential project risks. This has positively influenced the performance of modernization projects in Safaricom plc. Project risk identification is usually done at the beginning of the project, therefore, it forms an important part of project planning process. Studies have shown that the earlier project risk management is adopted in a project, the greater chances of success the project, agreeing with the results of this study which showed risk identification as having greater influence on project performance of Telecommunication network modernization projects.

4.3 Risk Analysis and Performance of Network Modernization Projects

4.3.1 Respondents' rating of Risk analysis indicators

Five indicators were used to measure risk analysis. The respondents were asked to rate the level of their agreement on a 5-point Likert scale where 1 was strongly disagree and 5 was strongly agree. For purposes of analysis, the top two and bottom two levels were aggregated and findings extracted for aggregated ratings above 50%. The table below shows the results.

Table 6: Respondent's rating of risk analysis indicators

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
There is a documented standardized risk analysis process in place that is used by all projects.	1.7%	16.7%	15.0%	25.0%	41.7%
The risk likelihood for the projects is always assessed	0.0%	21.7%	13.3%	33.3%	31.7%
The risk impact for the project is always evaluated	1.7%	15.0%	8.3%	38.3%	36.7%
Probability and Impact Matrix is used to evaluate the priority and importance of identified project risks	0.0%	20.0%	11.7%	43.3%	25.0%
Risk exposure for projects is always estimated in advance	1.7%	11.7%	23.3%	35.0%	28.3%

From the table above, majority of the respondents (66.7%) said that there is a documented standardized risk analysis process in place that is used by all projects. Additionally, majority of the respondents (65%) stated that the risk likelihood for the projects is always assessed. Further, majority of the respondents (75%) indicated that the risk impact for the project is always evaluated. Moreover, majority of the respondents (68.3%) stated that probability and Impact Matrix is used to evaluate the priority and importance of identified project risks. Lastly, majority of the respondents (63.3%) said that risk exposure for projects is always estimated in advance. These results show that Safaricom has put in place robust risk assessment processes to aid in determining the potential likelihood and impact of project risk thereby adopt relevant risk treatment strategy.

4.3.2 Risk Analysis and Performance of Network Modernization Projects

The study sought to establish the influence of risk analysis on performance of network modernization projects. Linear regression analysis was used to estimate this relationship. The following table presents a summary of the results.

Table 7: Summary of regression results between Risk Analysis and Performance of Network Modernization Projects

	Measure	Value	T	P-Value
Model Summary	R	0.16		
	R Square	0.025		
Coefficients	Constant	3.854	15.606	.000
	B1	0.078	1.232	.985

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From table 7 above, the correlation coefficient (R = .016) indicating that Risk analysis has very weak positive correlation with performance of network modernization projects. The R-Square (.025) indicates that risk analysis explains 2.5% of the variability in performance of network modernization projects. This implies that there's almost no relationship between risk analysis and performance of network modernization projects.

The resulting regression equation is of the form:

$$\mathbf{y = 3.854 + 0.078x}$$

$$(p<.05) \qquad (p>.05)$$

Where **y** = **performance of network modernization projects**; **x** = **Risk Analysis**

Thus, regression results yielded no relationship between risk analysis and performance of network modernization projects. These results contradict with those of Roque & de Carvalho (2013) who conducted a study on the impact of project risk assessment on project performance in Brazilian companies. They found that risk analysis has a positive relationship with performance of projects. However, the findings are consistent with that of Pimchangthong & Boonjing (2017) who studied the effects of risk management practices on performance of IT projects. Their study showed that Project performance is positively influenced by risk identification and risk response planning but is negatively influenced by risk analysis. This means that the less risk analysis is performed, the more product performance is expected, or that over analyzing is counterproductive. Project risk analysis being quite a complicated process and since project managers are often unfamiliar with the relevant tools and techniques, usually use historical information or unwritten past experience to determine the chances of identified risks occurring. However, the likelihood of a risk occurring is often derived from an "educated guess". Most project managers also believe the tedious process of risk analysis is time wasting and may not yield useful information.

4.4 Risk Monitoring and Performance of Network Modernization Projects

4.4.1 Respondents' rating of Risk Monitoring indicators

The study utilized two indictors for risk monitoring. The respondents were asked to rate the level of their agreement on a 5-point Likert scale where 1 was strongly disagree and 5 was strongly agree. For purposes of analysis, the top two and bottom two levels were aggregated. The table below shows the results.

Table 8: Ratings of Risk Monitoring Indicators

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
The company has had to reclassify some risk after they turned out to be more disastrous.	0.0%	1.7%	21.7%	51.7%	25.0%
The project team always plans for new risks before they occur.	0.0%	1.7%	20.0%	58.3%	20.0%

From the table above, majority of the respondents (76.7%) indicated that the company has had to reclassify some risk after they turned out to be more disastrous. Additionally, majority of the respondents (78.3%) stated that the project team always plans for new risks before they occur.

4.4.2 Risk Monitoring and Performance of Network Modernization Projects

Linear regression analysis was used to estimate the relationship between risk monitoring and performance of network modernization projects. The following tables present a summary of the results.

Table 9: Summary of regression results between Risk Monitoring and Performance of Network Modernization Projects

	Measure	Value	T	P-Value
Model Summary	R	0.493		
	R Square	0.243		
Coefficients	Constant	2.865	9.516	.000
	B1	.323	4.317	.000

From table 9 above, the correlation coefficient (R = .493) which indicates that Risk Monitoring has a moderately strong positive correlation with performance of network modernization projects. The R-Square (.243) indicates that risk monitoring accounts for 24.3% of the variability in performance of network modernization projects. This means that the remaining 75.7% of the variability in performance of network modernization projects is accounted for by other factors.

The resulting regression equation is of the form:

$$\mathbf{y = 2.865 + 0.323x}$$

$$(p<.05) \qquad (p<.05)$$

Where **y** = **performance of network modernization projects**; **x** = **Risk Monitoring**

From the above regression analysis results, it was deduced that risk monitoring and performance of network modernization projects have a moderately strong positive relationship. Though the relationship was moderately weak as indicated by the low R square (.243), it was found to be statistically significant at the 5% level of significance ($p<.05$). These findings are consistent with those of Juliane &Alexander (2013) who found a positive relationship between risk monitoring and performance of ICT project portfolio among ICT enterprises in the UK.

Based on this findings, it is evident Safaricom plc has put in place risk monitoring process that ensures project risks are continuously tracked as the project progresses and new risks are identified and treated as well as reclassification of old risk based on potential impact on the project. The effect of this is improved project performance due to increased project risk visibility and tracking of the performance of risk responses against the plan as well as managing any new risks that affect the project. This has been shown to have positive influence on project performance.

4.5 Risk Response and Performance of Network Modernization Projects

4.5.1 Respondents' rating of Risk Response indicators

The study used six indicators of risk response. For purposes of analysis, the top two and bottom two levels were aggregated. The table below shows the results.

Table 10: Ratings of risk response indicators

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
The project design is always changed to eliminate identified risks.	5.0%	3.3%	15.0%	33.3%	43.3%
In case licensing requirements for a project are not up to standard, the department tends to change the project scope to fit the requirements.	0.0%	1.7%	21.7%	28.3%	48.3%
Some specialized project scope is contracted to third parties and agreement on key performance targets executed.	1.7%	3.3%	16.7%	26.7%	51.7%
Performance bond or insurance is normally a requirement for all contractors	5.0%	1.7%	15.0%	28.3%	50.0%
Pilot site is always implemented before large scale project rollout to mitigate any risks.	1.7%	1.7%	15.0%	30.0%	51.7%
Fall back plan is usually put in place for projects that involve changes to live Network	5.0%	1.7%	13.3%	26.7%	53.3%

From table 10 above, majority of the respondents (76.7%) agreed that the project design is always changed to eliminate identified risks. Further, majority of the respondents (76.7%) indicated that in case licensing requirements for a project are not up to standard, the department tends to change the project scope to fit the requirements. Additionally, a majority of the respondents (78.3%) stated that some specialized project scope is contracted to third parties and agreement on key performance targets executed. Moreover, majority of the respondents (78.3%) said that performance bond or insurance is normally a requirement for all contractors. Similarly, majority of the respondents (81.7%) indicated that pilot site is always implemented before large scale project rollout to mitigate any risks. Finally, majority of the respondents (80%) stated that fall back plan is usually put in place for projects that involve changes to live Network. These results show that project risk response was carried out to a great extent by the company.

4.5.2 Risk Response and Performance of Network Modernization Projects

The study sought to establish the relationship between risk response and performance of network modernization projects. Linear regression analysis was used to estimate this relationship. The following table summarize the findings.

Table 11: Summary of regression results between Risk Response and Performance of Network Modernization Projects

	Measure	Value	t	P-Value
Model Summary	R	0.548		
	R Square	0.300		
Coefficients	Constant	2.369	6.587	.000
	B1	.430	4.990	.000

From table 11 above, the correlation coefficient (R = .548) Indicating that Risk response has a moderately strong positive correlation with performance of network modernization projects. The R-Square (.300) indicates that risk response explains 30% of the variability in performance of network modernization projects. This means that the remaining 70% of the variability in performance of network modernization projects is accounted for by other factors.

The resulting regression equation is of the form:

$$\mathbf{y = 2.369 + 0.43x}$$

(p<.05) (p<.05)

Where **y** = **performance of network modernization projects**; **x** = **Risk Response**

Thus, regression results yielded a positive relationship between risk response and performance of network modernization projects. Though the relationship was weak, it was found to be statistically significant at the 5% level of significance (p<.05). The findings conform to those of Shenhar and Raz (2002) who conducted a study on the Impact of Project risk management practices such as risk identification, probabilistic risk analysis and trade-offs on project success. By means of an empirical study of 100 projects performed in Israel in a variety of industries, the study sought to examine the extent of usage of risk management practices, the difference in application across different types of projects and their impact on various project success dimensions. They found a positive relationship between risk treatment and project performance.

These finding show that Safaricom plc utilizes various risk treatment strategies e.g. risk transference, avoidance and mitigation to minimize the effect of risk on project performance objectives e.g. project cost, schedule, quality and benefits realization. Risk transference tools such as performance bonds, insurance, contracts are majorly used and this has been shown to have positive influence on project performance. By contracting some of the highly technical works to major technology companies, Safaricom is able to utilize the best available expertise in execution of their projects while shifting the risk of project failure to their partners. Penalties, contacts and performance bonds are often used to minimize financial loss by the company in case of project failure due to operational or other project risks. These strategies have been shown to have positive influence on project performance of the telecomm firm.

4.6 Joint Influence of Risk management factors and performance of network Modernization projects

The study sought to establish the combined influence of all the risk management factors on the performance of network modernization projects. Multivariate regression analysis was used. The results obtained were as displayed in the two tables below.

Table 12: Regression Model Summary for the joint influence of risk management factors on performance of network modernization projects

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.651a	.423	.381	.28072

a. Predictors: (Constant), RISKRES, RISKID1, RISKANA, RISKMON

From this result, regression analysis yielded an R-square value of .423 indicating that the independent variables jointly explain 42.3% of the variability in the dependent variable. However, despite the low goodness of fit, ANOVA results indicate that the relationship is statistically significant at the 5% significance level. Thus, risk management factors have a weak, positive statistically significant relationship with performance of network modernization projects.

Table 13: Regression coefficients for the joint influence of risk management factors on performance of network modernization projects

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.844	.641		1.318	.193
RISKID1	.309	.140	.229	2.200	.032
RISKANA	.032	.051	.065	.625	.535
RISKMON	.192	.077	.294	2.494	.016
RISKRES	.280	.093	.357	3.008	.004

These results show that all but one of the predictors was found to be statistically significant at the 5% level of significance ($p<.05$). The predictors that were found to be statistically significant in the equation were Risk Identification ($p=.032<.05$), Risk Monitoring ($p=.016<05$) and Risk Response ($p=.004<.05$). Risk analysis did not make any statistically significant contribution to the equation ($p>.05$).

These findings agree with studies by various researchers. Zwikael & Ahn (2011) on a study in three countries, (New Zealand, Israel and Japan), in different sectors suggest that risk management even when moderate, has a relationship with levels of project success. A study by Kululanga and Kuotcha (2010) indicated that implementation of project risk management strategies in practice improves the projects performance such as meeting deadlines, cost targets and quality performance.

The findings indicate that project risk identification, monitoring and response led to improvement of project performance by ensuring project completion within schedule and budget while delivering expected project benefits thereby improving Safaricom plc profitability and customer satisfaction. Safaricom (2017) reported 30% reduction in Network deployment cost and this can be attributed to among other factors prudent project risk management. The company has continuously invested in various network modernization projects resulting in competitive advantage and enhanced market share hence the firm's

superior financial performance. Project risk management has therefore positively influenced the outcome of these projects.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Conclusion

The study concluded that there exist a positive and significant relationship between project risk identification and performance of Telecomm Network modernization projects. Though the level of influence was found to be low, it was statistically significant implying that project risk identification makes a significant contribution in explaining the variability of the performance of network modernization projects. More specific conclusions can be drawn on this findings regarding project risk management at Safaricom Plc. The company generally undertakes all accepted risk identification processes including brainstorming and project meetings, use of risk checklist, and historical data to identify possible project risks. This confirms that the company has instituted all the relevant risk identification measures and has prioritized it as an important process in project management. Although project risk analysis was found to be practiced to a high extent by the organization, correlation and regression analysis results indicated that there was no significant influence between project risk analysis and performance of network modernization projects. However, Project risk response strategy is often determined after project risk identification and analysis. Therefore, Project risk analysis remains an important process in project risk management since its outcome is used to determine the project risk response strategy which was shown to have a positive influence on performance of telecommunication projects.

The results of this study also show that project risk monitoring has a small but statistically significant influence on performance of network modernization projects. Thus, it was concluded that project risk monitoring has a small statistically significant influence on performance of network modernization projects. It was also found that project risk monitoring was done to a great extent by the organization. Safaricom PLC has incorporated measures that ensure optimal project risk monitoring including responding immediately to deviations between actual and planned situations as well as planning for new risks as they occur. This suggests that the organization has prioritized project risk monitoring as a crucial component of its overall project risk management strategy.

The study also sought to establish the influence of project risk response on the performance of network modernization projects. It was found that the organization applied project risk response factors to a great extent. Safaricom Plc. has put in place several project risk response strategies including risk avoidance, risk transfer and risk mitigation. The organization applies a number of risk treatment strategies such as changing the project design or scope to eliminate identified risks, contracting specialized project scope to third parties as well as use of performance bond and insurance. Further, the company usually implement pilot site before large scale project rollout to mitigate any risks and fall back plan is usually put in place for projects that involve changes to live Network to minimize service disruption in case of operation failure. However, it has not considered risk retention as a viable strategy. This reflects positively on the organization's overall project risk response effort. Project risk response was found have a moderately strong positive correlation but statistically significant positive relationship with performance of network modernization projects.

Overall, project risk management was shown to have a positive influence on performance of Telecomm network modernization projects. Project risk identification has greater influence

on project performance followed by risk monitoring and risk response. However, risk Analysis was shown to have no influence on the project performance. Therefore, all risk management practices including risk identification, risk analysis, risk response planning, and risk monitoring are necessary for success of telecomm projects. However, risk analysis practices should be limited to avoid a negative impact on schedule and cost performance. This study also show that integrating risk management into various corporate processes, developing a documented standardized risk identification process, and discussing risks with relevant team members and project stakeholders have positive influence on project performance.

Recommendations

The study recommended it's recommended that project managers should pay high attention to risk management factors especially on risk identification, risk monitoring and risk response. Project managers should continue improving their project risk management measures given the dynamic nature of risk especially in a technology driven industry.

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