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Risk Management Practices and Performance of Road Construction Projects in TransNzoia County, Kenya

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Abstract: **The world is rapidly developing economically that has led to an increased demand for construction of infrastructure and facilities around the globe. The construction industry is the pillar of success of modern countries thus providing the basic living conditions for the sustainability and development of human life on the earth. Due to an ever-increasing population, pressure on land, and growing economic activity, construction projects are in increasing demand and activities are booming in many countries. This goal can be achieved by starting the risk management process at the very beginning of a project's life cycle to take into account the process of participation of all stakeholders in this process (Kotlarsky et al., 2020). The construction industry is often considered as complex and defragmented due to working in a project based format; with a unique product and a process where there are times when decisions need to be made with insufficient information. Therefore, proper risk management processes can be vital to minimizing risks, maximizing opportunities and securing a successful project process. Risks in construction projects cannot be eliminated, however through proper risk management practices, the risks facing the construction projects can be minimized. Government funded projects are proclaimed to lag behind in their construction and tend to consume high costs of building and maintenance due to various factors. The study sought to analyse the effect of risk management practices on performance of projects by the TransNzoia County Government, Kenya. The specific objectives was to determine the effect of design risk management practices on performance of road construction projects in TransNzoia county Kenya. The study used agency theory and uncertainty theory. The study adopted a descriptive survey design. The target population was 65 professionals in road construction projects in TransNzoia County. Due to the small size of the study populace, the study adopted a census. The respondents were the Resident Engineer, Highway Engineer, Materials Engineer, Project Surveyor, Project Manager and Site Agent for Road Construction projects and the Architect, Structural Engineer, Project Manager, Site Agent and Clerk of works for Building projects. The data collection instrument was a structured questionnaire. Piloting was done to test the validity and reliability of the data collection instrument. Data analysis was done. A regression analysis was conducted to establish the correlation between the variables. The findings revealed that design risk management practices, legal risk management practices, construction risk management practices and contract risk management practices had a significance effect on performance of projects. The study recommends that the management should monitor all designs for avoiding design risk which has the potential for a design to fail to satisfy the requirements for a project including fundamentally flawed, infeasible, inefficient, and unstable or below client standards that manifest itself as functional defects or hurdles to development that impede project progress. Provision effective communication, a well-organized and cohesive facility team; a series of contracts allowing to encourage the various specialists to behave as a team without conflicts and to allocate risk and reward correctly; and timely, valuable optimization information from related parties in the planning and design phases and that design risk management enhances performance of construction projects. The contractors should avoid encountering legal claims by having adequate information to fully understand the signed contract or when the contract lacks some information be able complete construction project.**

Keywords: **Design risks, performance of road constructions projects.**

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1. INTRODUCTION

Construction project management is described as an operational management that supervises the whole activities of a project, according to modern management standards (Marcelino-Sádaba et al., 2015). It also appropriately organizes its tasks and takes the necessary steps to expedite the completion of those activities in order to meet the project's deadline. The manager of a construction project oversees and monitors the completion of the projects agreed- upon tasks (Al-Mukahal et al., 2020). Because the requirements for sustainable projects are becoming more complex, the project manager's function, which includes general supervision of a building's many construction phases, is evolving and becoming increasingly important for achieving pre-determined sustainability targets (Ruth et al., 2020). In today's constructions, sustainability of works has become critical, necessitating a shift in how project management performance is measured away from the previous traditional methods to recognized levels in terms of time, delivery, budget, and quality (Radujkovic & Sjekavica, 2017). Large and complex construction projects contain a variety of risk variables, and the successful completion of such projects is contingent on competent risk management (Sharma & Gupta, 2021). The risk management process has many benefits, including identifying and assessing hazards, as well as enhancing construction project management processes and resource usage (Nerija & Audrius, 2021). Despite the fact that it is one of the most expensive goods, many construction companies have never addressed the cost of risk (Cavignac, 2012). Traditionally, construction project success has been connected to three factors: timeliness, cost, and quality (Nerija & Audrius, 2021). The goal of time monitoring is to evaluate a project's performance in relation to the intended timetable within a specific period (Mahmoud, 2020).

In the current dynamic competitive world, program have been compelled to constantly adjust to changing business conditions. Project Management contributes to competitive organizational strategy. It is seen as a key competency for associations that connects the outcomes of projects to their goals (Project Management Institute, 2015). Management of the project is a strategic capability that results in the connection to outcomes of projects to project goals (Project Management Institute, 2015). Petrovic (2017) in his paper “Risk Management in Construction Projects–A Knowledge Management Perspective from Swedish Contractors” found out that Swedish construction industry was fairly unknown about the process of risk management. Sharaf & Abaelwahab (2015) as cited in Gain and Mishra, (2021) found that based on fuzzy logic model analysis, the overall risk in highway construction project in Egypt is considered at a medium level and needs to deploy the use of proper risk management.

Atta Agyeman and Adu Gyamfi (2017a) in their study found that the major causes of risk in construction are usage of substandard materials in construction industry, harmful work-related experience, and the dangers in construction. Ali and chike (2017) identify key construction risk in Italy and found that delays in payments, client variations, design variations, inaccurate cost estimates, and tight project schedules are key risk confronting construction project.

Parera et.al (2009) in their paper "Enhancing the effectiveness of risk management practices in Sri Lankan Road Construction Project" concluded that from the list of various identified risk factors during the project life cycle phases (conceptual, planning/design, construction and operational), one of the major risk was "design errors by consultant" that affected entire project life cycle (except conceptual phase).Based on its severity, it was second on list for the design and operation phase and fourth severe risk for the construction stage of project. "Delay in decision making by client" and "Error in estimation of duration and budget" were severe risk factor for conceptual phase as well as design phase. "Lack of funds for project" appeared prominent during design and construction phase of project and "Error committed during construction at site" was severe risk factor for the construction stage of project.

As per research findings, the construction stages in entire project life cycle were identified as most critical based on severity of risk factors. The risk factors identified during the construction stage ranked high based on its severity which was considered as the most important phase when exposed to externalities and human interaction. The research also stated that design phase was the second in the list in terms of vulnerability due to risk factors. So, additional care had to be taken during risk management strategy selection for both construction and design phases of project life cycle.

The construction industry is often described as defragmented and complex (Osipova, 2015) due to working in a project-based format. Within the construction industry, the organization is often small in the early stages and grows throughout the acquisition-, design- and production process. After the goal is achieved and the project is completed, the organization disbands. The traditional project success has viewed narrowly as achievement of intended outcomes in terms of specification (quality), time and budget, Atkinson (2009). Dvir (2006) say this tends to give the project manager an “operational mindset”.

The definitions of project management success have since become more inclusive and emphasize the importance of working with stakeholders to define needs, expectations, and project tasks. Turner (2004) suggests that project managers should be measured on a wider set of objectives and not just the achievement of time, cost and functionality goals. Project management success focuses upon project process and in particular the successful accomplishment of cost, time and quality objectives. It also considers the manner in which the management process was conducted. Project success deals with the effects of the final product. There is need for the power sector project stakeholders to understand what constitutes project success in view of the many capital-intensive projects they implement.

Effective project implementation or simply put, project success can be measured on the basis of time, cost and quality (performance), commonly known as the triple constraint. These three factors represent the Key Performance Indicators (KPIs). To establish whether a project has been effectively implemented, or better still, if the project has been successful, one has to go back to the initial project goals of time, cost and quality (performance) and be able to measure the extent of their individual achievement. The construction industry is vital to every country's economy. The role and the importance of the industry in the development of a country need not be over emphasized. The Kenyan construction industry contributes significantly in terms of scale and share in the development process of the country. According to the Kenya Bureau of Statistics, the construction industry contributed 4.2%, 4.1%, 4.2%, and 4.4% towards the Gross Domestic Product (GDP) for the years 2010, 2011, 2012 and 2013 respectively. This is apparent that the output from the construction industry is a major and integral part of the national output, accounting for a sizeable proportion in the Gross Domestic Product (GDP) of the country. In Kenya the industry employed 100,100 people in 2010, 106,000 people in 2011, and 116,100 people in 2012 and 130,300 people in year 2013 (Republic of Kenya, 2014).

Despite the importance of the sector to the economy, it is beset by a number of challenges that require introspection and understanding of the inherent risks management practices. In recent years, poor performance of construction projects has provoked an increased interest into the nature and mechanism of risk management and analysis (Smith et al., 2006). They have observed the industry as having a very poor reputation for coping with the adverse effects of change, with many projects failing to meet deadlines and cost and quality targets. There are many risk management practices factors that affect the construction industry. For instance, Miglie et al., (2021) in their studies have established that project time and cost are greatly affected. 70% of project initiated are found to have time overruns of over 50 % while 50 % of the project have cost escalation exceeding 20 percent. This is attributed to risk management factors influencing the project objectives. Other empirical studies have documented a legion of causes of delay in performance of projects, some related to risk management practices.

Sambasivan and Soon (2007) identified causes of delays in the completion of construction projects, including contractor's improper planning, poor site management, inadequate experience, inconsistent flow of payments for completed work, poor management of sub-contractors, inconsistent communication between parties, as well as shortage of materials, equipment, and labour. In South Africa, a government report linked infrastructural project delays with changes in project design, inconsistent flow of financial resources, and contractor's lack of capacity to deliver (Government of South Africa, 2009). In Ghana, delay in payments, poor contractor management, delays in material procurement, poor technical performances, and escalation of material prices were identified as key factors accounting for about 80% of delays in the completion of infrastructural projects (Frimpong, Olowoye, & Crawford, 2003). As evidenced from the critical review of the literature, projects are continuing to fail (Flyvbjerg et al., 2003; Kutsch& Hall, 2005; Kutsch et al., 2011; Mulcahy, 2003; Raz et al., 2002; Sharma et al., 2011; Standish Group, 2006, 2009) and complexity is increasing (Hillson& Simon, 2007; Philbin, 2008; Vidal et al., 2011). The literature questions the ability of general prescribed industry risk management standards to effectively deal with complexity and irrationality (Smith & Irwin, 2006). Furthermore, there is criticism in the literature of the ability of current general prescribed industry risk management standards to effectively manage uncertainty and risk (Atkinson et al., 2006; Chapman & Ward, 2002, 2003b; De Meyer et al., 2002; Stoelsness& Bea, 2005). Effectively managing uncertainty and risk in complex environment in particular appears to be an important element towards enabling project success (Hillson& Simon, 2007; Raz et al.,2002; Zwikael&Ahn, 2011).

Project management is a vital management element that controls all aspects of business operations (Derakhshan, Turner, & Mancini, 2019). Project management has been defined in the Project Management Body of Knowledge (PMBOK) as an "oversight function that is aligned with the organization's governance model and encompasses the project life cycle" (Project Management Institute, 2013). Through its activities then uncertainties evolve that should be monitored for any

success or completion of any given project. This uncertainty can be defined as a state for which there is no information (Hessellund, et al., 2020). Project management entails making and implementing decisions, maintaining proper leadership, streamlining organizational activities, securing resources and funding, establishing accountability, and measuring success (ul Musawir, Abd-Karim, & Mohd-Danuri, 2020). The project management literature has been shown to contain concepts suggested as important to improving the management of uncertainty and risk, particularly in complex project environments. These concepts are referred to in this research to be 'in advance' of mainstream standards. They include explicit opportunity management (Hillson, 2002, 2004a; Olsson, 2007;Zhang, 2011), the uncertainty management paradigm (Chapman & Ward, 2003a, 2003b; Ward & Chapman, 2003), a constructively simple approach to the evaluation and interpretation of estimates (Chapman et al., 2006), risk attitude (Hellier et al., 2001; Hillson & Murray-Webster, 2005, 2008; Slovic, 1987; Smallman& Smith, 2003) and complexity theory concepts (Cooke-Davies et al., 2007). Critical of probabilistic risk management approaches in particular; other researchers have taken these further and suggested wider approaches as more appropriate in the management of uncertainty. Pender (2001) is critical of PMBoKs (2001) traditional use of probability theory. Pender indicates that probability-based risk management theory does not explain the important aspects of observed project management practice.

Winch (2010) defines risk as an absence of information when a decision needs to be made at any time throughout a process. The correlation between risk and time is of great importance since risks can both occur at an instant, as a surprise, or can be identified in advance. The framework of time generates a basic understanding of how risk management can be applied. Regardless if a risk occurs instantly or it is identified in advance the risk stems from a source. The risks trigger an event that has a negative impact on the project itself. Lastly this event mandates a response. The response can be to the source; if the risk is identified in advance, or to the event; if the risk is not identified in advance. Construction risk management practices have been mostly found to exhibit dynamism and continuity across a project's life cycle (Chan et al., 2009; Nieto-Morote&Ruz-Vila, 2010). Mark, Cohen and Glen (2004) have defined a risk management practice as potential for complications and problems with respect to the completion of a project and the achievement of a project goal.

In addition, the impact or consequences of this future event must be unexpected or unplanned (Chia, 2006). Construction project risk management practices can be defined as an uncertain event or condition that, if it occurs, has a negative effect on at least one project objective, such as time, cost, or quality (Jomaah, Bafail, &Abdulaal, 2010). Unmanaged risks are therefore threats to project delivery. Failure to adequately deal with risks has been shown to cause cost and time overruns in construction projects (Andi, 2006). Trying to eliminate all risks in construction projects is impossible. However, it is well accepted that a risk can be effectively managed to mitigate its' adverse impacts on project objectives, even if it is inevitable in all project undertakings. Managing risks involves: planning, identifying, analyzing, developing risk handling strategies, monitoring and control. Project team members particularly clients, consultants and contractors should eliminate / mitigate delays when playing their respective roles. Risk management practices in construction projects are associated with contexts of the projects as well as personnel involved. According to Kishk and Ukaga (2008) the performance of any project is judged by the satisfaction of stakeholders' needs and is measured by the extent of meeting standards laid down at the start of the project. This is in regard to delivery of construction projects by contractors within budget, time, quality, environment, safety and performance.

Construction projects are considered successful when delivered within scheduled duration, allocated budget, and specified quality (Majid, 2006; Owolabi et al., 2014). Delay in the completion of construction facilities is a critical challenge with a global dimension, often leading to increased costs due to time extension or acceleration as well as loss of productivity, disruption of work, loss of revenue through lawsuits between contractual parties, and project abandonment (Sambasivan& Soon,2007; Owolabi et al., 2014). Many SSA economies experience losses amounting to billions of dollars, as a result of delayed completion of infrastructural projects, which undermines the noble goal of poverty reduction (Gutman et al., 2015). Delay in the completion of infrastructural projects has significant cost implications, which in turn bears far-reaching consequences in the lives of citizens, especially in developing countries like Kenya. Studies conducted in various contexts have deduced that although delay in the completion of construction projects is a global phenomenon, it appears to be more common in developing than in developed countries (Sambasivan& Soon, 2007;Alaghbari et al., 2007; Aziz, 2013). Among the developed countries, delay in the completion of infrastructural projects has been reported in Canada, the United States, Australia, and Britain, among others.

In Canada for instance, De Souza (2009) attributed delays in the completion of infrastructural projects to various factors, including reduced funding by sponsors, communication breakdown, delayed disbursement of funds, poor site management by contractors, and tedious legislative procedures. In the United States, SNL Financial (2010) reported delay in the completion of a pipeline project connecting Florida State and Bahamas, particularly due to design changes. Construction work involves high levels of uncertainty. Management of construction projects involves a great deal of managing risks. Managing risks involves: planning, identifying, analysing, developing risk handling strategies, monitoring and control. Project team members particularly clients, consultants and contractors should eliminate /mitigate delays when playing their respective roles. Cohen and Palmer (2004) identify sources of construction risks to include changes in project scope and requirements; design errors and omissions; inadequately defined roles and responsibilities; insufficient skilled staff; force majeure; and new technology. Baloi and Price (2003) categorize construction risks as technical, social, construction, economic, legal, financial, natural, commercial, logistics, and political. A risk is a potential future harm that may arise from some present action; such as, a schedule slip or a cost overrun. The loss is often considered in terms of direct financial loss, but also can be a loss in terms of credibility, future business, and loss of property or life. (Wikipedia, 2004). Project risk is the potential to project failure. It is considered basic project management due diligent to identify risk and go through a process of reducing, mitigating, transferring, sharing or accepting each risk (John S.2017). Similarly, Mills (2001) lists three most important risks to include: weather, productivity of labour and plant and quality of material.

Sambasivan and Soon (2007) identify ten most important causes of risks in the construction industry to be contractor's improper planning, contractor's poor site management, inadequate contractor experience, inadequate client's finance and payments for completed work, problems with subcontractors, shortage in material, labour supply, equipment availability and failure, lack of communication between parties, and mistakes during the construction stage

Locally, construction companies have not been exceptional on risks. The delays in the completion of infrastructural facilities have been associated with factors, such as poor financial management by government agencies, inadequate designs, and poor management of the construction process by contractors (Talukhaba, 2009). Arguably, these factors are compounded by secondary factors, such as poor management of materials and equipment by contractors, inadequate recognition and response to risks emanating from the physical and socio-economic environments, as well as inadequate regard for stakeholders' needs (Talukhaba, 2009). Another study conducted by Ondari and Gekara (2013) reported significant correlation between project delays and factors, such as management support, design specifications, contractor's capacity, and supervision capacity. This study will assess if risks have a significant influence on the completion road projects by the Government of Kenya in TransNzoia County, Kenya.

Risk Management of the activities in a proposed baseline is evaluated to determine their potential for risk towards a construction project. This evaluation assesses all activities against a set of screening categories typically in the areas of construction, interface control, safety, regulatory and environmental, security, design, resources and space migration. There are diverse causes and manifestations of risks in projects.

Wanyona (2005) attributes risks related to project finance to the ineffective cost planning and control of building projects by the cost consultants. Because of the complex nature of construction projects, this approach has resulted to delays, litigation and even bankruptcy. Kishk and Ukaga (2008) note that the degree of risk management process undertaken during the project lifecycle impacts directly on the project success. Failure to manage construction risks in a systematic way makes the project suffer in cost overruns, delayed completion, non-completion or may fail to meet the quality specifications and the benefits they were intended for. Nasser Alsaadi and Norhayatizakua (2020) studied on the impact of risk management practices on the Performance of Construction Projects. The result revealed that practicing risk management improve the performance of construction project significantly. Based on this result it is essential to hire qualified project managers who has sufficient knowledge in risk management and its main activities. Construction risks have been mostly found to exhibit dynamism and continuity across a project's life cycle (Chan et al., 2009; Nieto-Morote & Ruz-Vila, 2010). Mark, Cohen and Glen (2004) have defined a risk as potential for complications and problems with respect to the completion of a project and the achievement of a project goal. In addition, the impact or consequences of this future event must be unexpected or unplanned (Chia, 22006). Construction project risks can be defined as an uncertain event or condition that, if it occurs, has a negative effect on at least one project objective, such as time, cost, or quality (Jomaah, Bafail, & Abdulaal, 2010). Risks are therefore threats to project delivery. Failure to adequately deal with risks has been shown to cause cost and time overruns in construction projects (Andi, 2006). Trying to eliminate all risks in construction projects is impossible.

However, it is well accepted that a risk can be effectively managed to mitigate its' adverse impacts on project objectives, even if it is inevitable in all project undertakings. Sources of risks includes inherent uncertainties and issues relative to company's fluctuating profit margin, competitive bidding process, weather change, job-site productivity, the political situations, inflation, contractual rights, and market competition (Karimi Azari et al., 2011). It is important for the construction companies to face these risks by assessing their effects on the project objectives. Risk management helps in deciding which of the project is riskier, planning for the potential sources of risk in each project, and managing each source during construction (Zayed, Amer, & Pan, 2008). It is important that risk is distinguished from uncertainty. Smith, Merna, and Jobling, (2006) defines uncertainty as a chance of occurrence of some event where the probability and distribution is not known. They distinguish uncertainty from risk as being where the outcome of an event or a set of outcomes can be predicted on the basis of statistical probability. This implies that there is some knowledge about a risk as opposed to an uncertainty about which there is no knowledge.

Performance of projects fails due to poor implementation of risk management practices in place. There are a number of well-established techniques and tools used for managing project risks in large organizations (White and Fortune, 2002); there has been little research publications on the tools and techniques used in managing project risks in small projects and performance (Bryde, 2003). It has been observed and decried by the public and other users of Government funded projects that they always lag behind in time, which conversely have a bearing on cost, due to various factors. Among such, as observed by Waihenya (2011), Seboru (2006), Kivaa (2000),Talukhaba (2009), Mbatha (2006) and Baradyana (2006) are variation in cost of building materials, changes in design of building, changes in finishes by client, contractor running out of money to run projects for some time, hiring extra tools during construction not anticipated, under-estimation of cost of construction by the project Quantity Surveyor, application of wrong time estimation model and increment weather patterns, among many others. Most of the existing studies based on risk management practices and performance of public projects point at the contractor as the sole contributor to delays and project failure and ignore the complexity of risks in the entire phase of project implementation such as Waihenya (2011), Seboru (2006), Kimani (2004), Kivaa (2000), Talukhaba (2009), Mbatha (2006) and Baradyana (2006). According to the TransNzoia County Government (2017), most construction projects delegated contractors are always facing challenges of delays, budget overruns, change of designs due to disputes over invasion of human settlements to the road reserves and illegal construction of buildings on public land, public utilities and along power lines. This has made construction of roads, government buildings, water and sewage systems and power lines expensive and taking more time than planned. Therefore, the study sought to influence of Design Risk on performance of road construction projects in TransNzoia County, Kenya.

2. DESIGN RISK AND PROJECT PERFORMANCE

Design risk is the potential for a design to fail to satisfy the requirements for a project. This includes designs that are fundamentally flawed, infeasible, inefficient, unstable or below client standards. A poor design may manifest itself as functional defects or hurdles to development that impede project progress (John S.2017). Ann et al. (2004) referred to simulation as being the process of replicating the real world on a setoff assumptions and conceived models of reality. Simulation can be applied to construction, and other industries (Banks et al, 2006). Simulation is one method to quantitatively assess project construction risks. It is normally used to prevent large complex project or systems because it is much less expensive to experiment with models than real systems. Its duration, cost and value can characterize the flow processes. The value is referred to the satisfaction of the requirements of the client. Only the activities that can be converted to form valuables for the client are the ones that add value to the product.

Huovila et al. (2017) suggested the model for the design process. A methodology to introduce continuous improvement of the design process was designed to give response to the problems identified. This methodology incorporates the elements suggested by the interviewees and some of the recommendations given by (Huovila etal., 2007). Several researches on factors affecting construction project completion have proposed either general factors (Sanvido et al., 1992) or specific factors (Chua et al., 1999). In building construction, Sanvido et al. (1992) found four CSFs: a well-organized and cohesive facility team; a series of contracts allowing to encourage the various specialists to behave as a team without conflicts and to allocate risk and reward correctly; experience in various aspects of similar facilities; and timely, valuable optimization information from related parties in the planning and design phases.

Ogunlana (2009) studied in critical success factors in large scale construction projects in Thailand. Their study emphasized that success factors vary across various projects. Their findings revealed project planning and control, project personnel and

involvement of client as critical factors influencing project success. Ann et al. (2006) in their study, investigated on CSFs in construction project briefing process as prerequisite to achieving success in project performance. This process involves the interpretation of clients 'actual views and requirements to project participants. Their study considered open and effective communication, clear and precise briefing documents, clear intention and objectives of client and clear project goal and objectives as critical success factors. Ugwu et al. (2007) identified nine top critical success factors that would act as enablers for successful implementation of ICT projects in construction as cost of development, top management support, availability of appropriate tools, development team knowledge and understanding of construction processes, ease applications, clear definition and understanding end user, clear communication, standardization issues and change management of organization level. Talukhaba (1999) while carrying out a study on high rise building projects in Nairobi finds out that there are specific variables that significantly cause project delays. These specific variables are to a large extent connected with project participants, the process, and both the physical and social economic environments of the project. These stakeholders inevitably interact to achieve a project. For example, the client, the design team, the contractors and subcontractors constitute the participants. Disputes, claims, approvals, and payments certificates are associated with the process whereas the building materials financial resources and construction equipment's constitute the socio-economic environment. Rock, underground water, and rain are attributes of the physical environment.

Adeleke et al., (2018) have investigated the impact of risk management on project performance. The objective of their study is to measure the degree of diffusion of risk management practice in Brazilian companies. The results demonstrate that adopting risk management practices has a significant positive impact on project performance. They also show a positive impact from the presence of a risk manager on project success. The review of previous studies revealed a strong association between risk management and performance of construction projects. A statement that "a higher risk may lead to a higher gain" (AlAjmi & Makinde, 2018). Minimizing the risks in projects will improve the output of projects. Risks have a significant impact on a construction project's performance in terms of cost, time and quality (Chang et al., 2018). As the size and complexity of the projects have increased, an ability to manage risks throughout the construction process has become a central element preventing unwanted consequences. Moreover, risk management recognized as an important exercise in order to achieve better performance of construction projects. Success in construction project indicated by its performance in the achievement of project time, cost, quality, safety and environmental sustainability objectives. The research of Lawrence (2015) indicated that risk management practices at planning stage had an effect on project performance. It is recommended that more attention be placed on organizing risk management according to their effect and influence and more emphasis should be put on communication and project risk management by developing plans for effective communication and risk handling when carrying out projects (Cross, 2019). In the same context, Hartono et al., (2019) examined the impact of project risk management on CPP. The results of their study showed that adopting Project Risk Management Practices has a significant positive impact on project success. They also show a positive impact from The Impact of Risk Management Practices on the Performance of Construction Projects 7 the presence of a risk manager on project success. From the practical point of view, paying attention to uncertainties during the project, making use of the project risk management techniques and deeply understand the business environment are critical success factors, demanding attention of project managers and risk managers. While Abazid & Harb (2018) carried out in order to obtain a comprehensive conceptualization on risk and the consequences it has in the fields of construction and the required management operation.

Construction industry plays a major role in development and achievement the goals of society. Construction is one of the largest industries and contributes to about 10% of the gross national product (GNP) in industrialized countries (Navon, 2005). Construction industry has complexity in its nature because it contains large number of parties as clients, contractors, consultants, stakeholders, shareholders and regulators. The performance of the construction industry is affected by national economies (Navon, 2005). In Palestine, efficient construction projects can provide a solid platform for reviving the Palestinian economy and for building a more balance and independent economy during stable political conditions. In 1993, neglect of such systems, services, and institutions, however, has harmed the quality of life of Palestinians and their health and environment. However, project performance in Palestine has suffered since conflict erupted in September 2000 after the breakdown in Israel-Palestinian negotiation on permanent-status issues. This has led to closures and tight restrictions on movement of people and goods in West Bank and Gaza resulting in a dramatic decline in trade, investment, and employment. In addition, this has prevented the planned implementation and has caused problems in performance of projects (World Bank, 2004).

Project risk management is in collaboration with other project elements and an efficient risk management plan considerably increases the chance of gaining project scope (Sibiya, et al., 2015). A risk seen as the potential for complications and problems with respect to the completion of a project and the achievement of a project goal (Mark et al., 2004) and as an uncertain future event or condition with the occurrence rate of greater than 0% but less than 100% that has an effect on at least one of project objectives (that is scope, schedule, cost, or quality and others) affects performance of the construction projects (Gatzert, et.al. 2015). In addition, the impact or consequences of this future event must be unexpected or unplanned (Chia, 2006). It is well accepted that risk can be effectively managed to mitigate its' adverse impacts on project objectives, even if it is inevitable in all project undertakings. The source of risk includes inherent uncertainties and issues relative to company's fluctuating profit margin, competitive bidding process, weather change, job-site productivity, the political situations, inflation, contractual rights, and market competition, etc. (Karimiazari et al., 2011). It is important for the construction companies to face these uncertain risks by assessing their effects on the project objectives because a risk quantitative method allows deciding which of the project is riskier, planning for the potential sources of risk in each project, and managing each source during construction (Zayed et al., 2008). Mutua, et al., (2014) states that it is noteworthy that risk is distinguished from uncertainty. The one is measurable uncertainty; the other is immeasurable risk (Hillson, 2004; Olsson, 2007; Karimiazari et al., 2011). Therefore, managing risks is involved in identifying, assessing and prioritizing risks by monitoring, controlling, and applying managerial resources with a coordinated and economical effort so as to minimize the probability and/or impact of unfortunate events and so as to maximize the realization of project objectives (Douglas, 2009). Project risk management, which has been practiced since the mid-1980s, is one of the nine main knowledge areas of the project management institute's project management body of knowledge (Tuysz et al., 2006).

Effective risk management may lead the project manager to several benefits such as identification of favourable alternative course of action, increased confidence in achieving project objective, improved chances of success, reduced surprises, more precise estimates (through reduced uncertainty), reduced duplication of effort (through team awareness of risk control actions), etc. (Bannerman, 2008). Systemic project risk management has an effect on the project success. It is found that there is a strong relationship between the amount of risk management efforts undertaken in a project and the level of the project success (Elkington & Smallman, 2002; Reza et al., 2002). Several project risk management approaches are proposed as follows; i.e., PRAM (Chapman, 1997), RAMP (Institute of Civil Engineering, 2002), PMBOK (PMI, 2008), RMS (Institute of Risk Management, 2002), etc. (Nieto et al. 2011). Existing approaches may be summarized into a f our phase process for effective project risk management, i.e., identifying risks, assessing risks, responding risks, and monitoring and/or reviewing risks. Identifying risks is the first step which determines which risk components may adversely affect which project objectives and documents their characteristics (Karimiazari et al., 2011).

Yang et al. (2011) also suggested using stakeholder satisfaction as a criterion for project success in addition to the traditional measurement of time, cost and quality. Stakeholders have differing views of success, and these might vary over different timescales (Turner, 2009). Project managers can use critical success factors (CSFs) to identify the necessary factors to meet customer requirements (Bond, 2015). Projects are used in all economic and non-economic fields as mean of organizing the activity, aiming the achievement of desired objectives. There is a direct relationship between projects, projects portfolio, programs and the organisational strategy. Projects, as the main way of creating and dealing with change (Cleland, Gareis, 2006), are used to implement strategies. Meskendahl (2010) refers to projects as the central building block used in implementing strategies, therefore business success is determined by the success of the projects.

According to PMI (2013), aligning projects with strategic objectives brings value to an organization. Implementing successful projects generates positives effects on the organisation, influencing not just short and medium, but also long-term development. The topic of business success is related to aspects of profitability and competitive advantage. Several studies have been made in this field due to the importance of finding what success is and how it is measured. In this paper we focus on projects' success, a topic of great interest in project management literature. Success approached in relationship with projects is even more important since the number of failing projects is extremely high, more than one third of projects failing to reach their objectives (PMI, 2013). Initially, project success was referred to as reaching the objectives and the planned results in compliance with predetermined conditions of time, cost and performance. Projects are unique, reason why project success criteria differ from one project to another (Müller, Turner,2007). To increase complexity even more, within the last decades the concept of project success is approached in relationship with stakeholders' perception (Davis, 2014), being accepted that success means different things to different people (Shenhar et al, 2001).

Success criteria are defined by Muller and Turner (2007) as variables that measure project success. Since project success might be perceived differently by stakeholders, there is a need for comprehensive criteria that reflect their interests and views (Dvir et al., 1998). Westerveld (2003) emphasises the importance of stakeholders' satisfaction as a main success criterion, complementary to the golden triangle of time, budget and quality, and adds that different time lags should be considered. Establishing a set of criteria applicable to any type of project is unrealistic (Mir, Pinnington, 2014). Although certain criteria might be relevant in measuring the success of most projects, they should be adapted to size, complexity, duration, type and stakeholders' requirements. This increased level of complexity when approaching aspects of projects 'success is normal and determined by the dynamic environment where projects are implemented. While in project management literature the list of success criteria is supplemented constantly with measurable or non-measurable items, in practice the situation becomes confusing, project managers having to deal with situations of implementing projects that don't have clearly defined success criteria. One of the success conditions mentioned by Davis (2004), based on a comprehensive literature study, is that "success criteria should be agreed on with stakeholders before the start of the project, and repeatedly at configuration review points throughout the project".

Davis (2014) studies project management success in literature from 1970s to present, classifying the evolution of success factors into decades. According to this study, approaches of success factors evolved from focusing on the operation level of a project in 1970s to embracing a stakeholder focused approached after 2000s (Davis, 2014). As a result of the numerous studies that approached the topic of project success, several lists of success factors exist. Pinto and Slevin's paper from 1987 represent a reference point by establishing a list of ten success factors, recognised by other authors as accurate (Turner, Müller, 2005): project mission, top management support, schedule and plans, client consultation, personnel, technical tasks, client acceptance, monitoring and feedback, communication, trouble-shooting (Pinto, Slevin, 1987). Davis (2014) adopted in her paper a set of nine themes in order to describe success factors of projects: cooperation and communication, timing, identifying/ agreeing objectives, stakeholder satisfaction, acceptance and use of final products, cost/ budget aspects, competencies of the project manager, strategic benefits of the project and top management support. Yu et al. (2005) discussed the timing of project evaluations which aim analysing the success, concluding that the process is useful at any time between the first milestones until the completion of the project. The results of these evaluations might indicate inconsistencies that can have negative influence on the final outcomes. Whenever these situations occur, project managers should act in order to increase success chances by influencing the previously identified success factors.

3. METHOD

The study adopted a descriptive survey design. The target population was 65 professionals in road construction projects in TransNzoia County. Due to the small size of the study populace, a census of the total population was used. The respondents was the Resident Engineer, Highway Engineer, Materials Engineer, Project Surveyor, Project Manager and Site Agent for Road Construction projects and the Architect, Structural Engineer, Project Manager, Site Agent and Clerk of works for Building projects. A questionnaire is a data collection tool used to determine a variety of aspects from respondents including beliefs, thoughts, knowledge, and motives (Krueger and Casey,2000). The data collection instrument was questionnaire. Piloting was done to test validity and reliability. Data cleaned, organized to attach meaning. After data is collected and all the completed questionnaires re- turned, preliminary analytical steps of editing, coding and tabulation will be done. These ensured that the data is accurate, reliable, compete and suitable for further detailed analysis (Sekaran and Bougie, 2010). This study used both descriptive and inferential statistics to analyse the data. Descriptive statistics described and summarize the data in a meaningful way. The coded data was entered into a computer and the SPSS computer package used. Here percentages to depict population characteristics such as the legality of the organisation was obtained. The correlation and regression analysis was carried out in order to establish the contribution of each independent variable to the dependent variable.

4. DISCUSSION

Project design risk is the potential for a design to fail to satisfy the requirements for a project. This includes designs that are fundamentally flawed, infeasible, inefficient, unstable or below client standards. A poor design may manifest itself as functional defects or hurdles to development that impede project progress (John S.2017). The study sought to establish the influence of Design Risk on performance of road construction projects in TransNzoia County, Kenya. The findings are presented in a five-point Likert's scale where SA=strongly agree, A=agree, N=neutral, D=disagree, SD=strongly disagree and T=total. Table 4.1 below contains a summary of data relating to attitude of respondents towards influence of Design

Risk on performance of road construction projects in TransNzoia County, Kenya. For instance, when respondents were asked whether project design risk has the potential for a design to fail to satisfy the requirements for a project including fundamentally flawed, infeasible, inefficient, unstable or below client standards. The distribution of findings showed that 52.0 percent of the respondents strongly agreed to the statement that project design risk has the potential for a design to fail to satisfy the requirements for a project including fundamentally flawed, infeasible, inefficient, unstable or below client standards, 30.0 percent of them agreed, 14.0 percent of the respondents were neutral, 4.0 percent disagreed while none of them strongly disagreed. These findings implied that project design risk has the potential for a design to fail to satisfy the requirements for a project including fundamentally flawed, infeasible, inefficient, and unstable or below client standards.

The respondents were also asked whether a poor design may manifest itself as functional defects or hurdles to development that impede project progress. The distribution of the responses indicated that 43.0 percent strongly agreed to the statement, 48.0 percent of them agreed, 7.0 percent of them were neutral, 2.0 percent of them disagreed while none of them strongly disagreed to the statement. These findings implied that a poor design may manifest itself as functional defects or hurdles to development that impede project progress.

The respondents were also asked whether open and effective communication, clear and precise briefing documents, clear intention and objectives of client and clear project goal and objectives as critical success factors. The distribution of the responses indicated that 38.0 percent strongly agreed to the statement, 44.0 percent of them agreed, and 16.0 percent of them were neutral, 1.0 percent of them disagreed while 1.0 percent of them strongly disagreed to the statement. These findings implied that open and effective communication, clear and precise briefing documents, clear intention and objectives of client and clear project goal and objectives as critical success factors.

The respondents were further asked whether a well-organized and cohesive facility team; a series of contracts allowing to encourage the various specialists to behave as a team without conflicts and to allocate risk and reward correctly; experience in various aspects of similar facilities; and timely, valuable optimization information from related parties in the planning and design phases. The distribution of the responses indicated that 55.0 percent strongly agreed to the statement, 33.0 percent of them agreed, 9.0 percent of them were neutral, 2.0 percent of them disagreed while 1.0 percent of them strongly disagreed to the statement respectively. These findings implied that a well-organized and cohesive facility team; a series of contracts allowing to encourage the various specialists to behave as a team without conflicts and to allocate risk and reward correctly; experience in various aspects of similar facilities; and timely, valuable optimization information from related parties in the planning and design phases.

Finally, the respondents were asked whether design risk management enhances performance of construction projects. The distribution of the responses indicated that 50.0 percent strongly agreed to the statement, 38.0 percent of them agreed, 8.0 percent of them were neutral, 3.0 percent of them disagreed while 1.0 percent of them strongly disagreed to the statement respectively. These findings implied that design risk management enhances performance of construction projects.

Table 4.1: Influence of Design Risk on performance of road construction projects

Statements on Design Risk		SA	A	N	D	SD
Project design risk has the potential for a design to fail to satisfy the requirements for a project including fundamentally flawed, infeasible, inefficient, unstable or below client standards	%	52.0	30.0	14.0	4.0	0.0
A poor design may manifest itself as functional defects or hurdles to development that impede project progress	%	43.0	48.0	7.0	2.0	0.0
Open and effective communication, clear and precise briefing documents, clear intention and objectives of client and clear project goal and objectives as critical success factors	%	38.0	44.0	16.0	1.0	1.0
A well-organized and cohesive facility team; a series of contracts allowing to encourage the various specialists to behave as a team without conflicts and to allocate risk and reward correctly; experience in various aspects of similar facilities; and timely, valuable optimization information from related parties in the planning and design phases	%	55.0	33.0	9.0	2.0	1.0
Design risk management enhances performance of construction projects	%	50.0	38.0	8.0	3.0	1.0

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4.1. Inferential Statistics

4.1.1 Pearson Correlation

The study sought to establish the strength of the relationship between independent and dependent variables of the study. Pearson correlation coefficient was computed at 95 percent confidence interval (error margin of 0.05). Table 4.2 illustrates the findings of the study.

Table 4.2: Correlation Matrix

		Performance of Road Construction Projects
Design risks	Pearson Correlation	.643**
	Sig. (2-tailed)	.000
	N	60

As shown on Table 4.2 above, the p-value for design risk was found to be 0.000 which is less than the significant level of 0.05, ($p<0.05$). The result indicated that Pearson Correlation coefficient (r-value) of 0.643, which represented an average, positive relationship between design risks on performance of road construction projects in TransNzoia County, Kenya.

4.1.2 Multiple Linear Regression

Multiple linear regressions were computed at 95 percent confidence interval (0.05 margin error) to show the multiple linear relationship between the independent and dependent variables of the study.

4.1.2.1 Coefficient of Determination (R^2)

Table 4.3 shows that the coefficient of correlation (R) is positive 0.236. This means that there is a positive correlation between effect of risk management practices and performance of road construction projects in TransNzoia County, Kenya. The coefficient of determination (R Square) indicates that 53.0% of performance of road construction projects in TransNzoia County, Kenya is influenced by the risk management practices. The adjusted R^2 however, indicates that 13.0% of performance of road construction projects in TransNzoia County, Kenya is influenced by the effect of risk management practices leaving 87.0% to be influenced by other factors that were not captured in this study.

Table 4.3 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.236[a]	.053	.013	.99661610

a. Predictors: (Constant), Design Risk,

4.1.2.2 Analysis of Variance

Table 4.4 shows the Analysis of Variance (ANOVA). The p-value is 0.000 which is < 0.05 indicates that the model is statistically significant in predicting how risk management practices affects performance of road construction projects in TransNzoia County, Kenya. The results also indicate that the independent variables are predictors of the dependent variable with an F of 67.218.

Table 4.4: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.248	1	1.219	67.218	.268[b]
	Residual	94.367	59	.923		
	Total	99.615	60			

a. Dependent Variable: Performance of road Construction Projects

b. Predictors: (Constant), Design Risk

4.1.2.3 Regression Coefficients

From the Coefficients table (Table 4.5) the regression model can be derived as follows:

$$Y = 49.126 + 0.702X_1$$

The results in table 4.5 indicate that all the independent variables have a significant positive effect on performance of road construction projects in TransNzoia County, Kenya. The design risk with a coefficient of 0.702 (p-value = 0.000) had an influence on performance of road construction projects in TransNzoia county. According to this model when all the independent variables values are zero, performance of road construction projects in TransNzoia County, Kenya will have a score of 49.126.

Table 4.5: Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	49.126	3.712		58.420	.000
Design risk	.702	.134	.613	3.138	.000

4.1.3 Hypotheses Testing

Ho_1: Design risk does not have a significant effect on performance of road construction projects in TransNzoia County, Kenya.

From Table 4.5 above, design risk ($\beta = 0.702$) was found to be positively related performance of road construction projects in TransNzoia County, Kenya. From t-test analysis, the t -value was found to be 3.138 and the ρ -value 0.000. Statistically, this null hypothesis was rejected because $\rho<0.05$. Thus, the study accepted the alternative hypothesis and it concluded that design risk affects performance of road construction projects in TransNzoia County, Kenya.

5. CONCLUSION AND RECOMMENDATION

In conclusion basing on the findings, design risk ($\beta = 0.702$) was found to be positively related performance of road construction projects in TransNzoia County, Kenya. From t-test analysis, the t -value was found to be 3.138 and the ρ -value 0.000. Statistically, this null hypothesis was rejected because $\rho<0.05$. Thus, the study accepted the alternative hypothesis and it concluded that design risk affects performance of road construction projects in TransNzoia County, Kenya.

The study recommends that the management of road projects in TransNzoia county should monitor all designs for avoiding design risk which has the potential for a design to fail to satisfy the requirements for a project including fundamentally flawed, infeasible, inefficient, and unstable or below client standards that manifest itself as functional defects or hurdles to development that impede project progress. Provision of open and effective communication, clear and precise briefing documents, clear intention and objectives of client and clear project goal and objectives as critical success factors. Provision of a well-organized and cohesive facility team; a series of contracts allowing to encourage the various specialists to behave as a team without conflicts and to allocate risk and reward correctly; experience in various aspects of similar facilities, and timely, valuable optimization information from related parties in the planning and design phases and that design risk management enhances performance of construction projects. They should also comply with new laws and regulations as a significant expense that may include the cost of changing products, processes and legal structures though authority is expected to eliminate the events of unscrupulous contractors who shoddy jobs in construction work thus leading to collapse of buildings. In order to avoid disaster, they need to be able to properly assess, control, and monitor risks once they have been identified.

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