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RISK MANAGEMENT PRACTICES AND PERFORMANCE OF PUBLIC INFRASTRUCTURAL PROJECT: A CASE OF THE SECOND RWANDA URBAN DEVELOPMENT PROJECT IN THE CITY OF KIGALI.

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ABSTRACT

The main objective of this study was to carry out an analysis of the effects of risk management practices on the performance of public infrastructure projects in Rwanda. The study was carried out in the City of Kigali using the Rwanda Urban Development Project (RUDP II) as a case study. This study follows the following objectives: to evaluate the influence of risk identification practices on the performance of the RUDP II project, to assess the influence of risk analysis practices on the performance of the RUDP II project, and to determine the influence of risk mitigation practices on performance of RUDP II project. The study population comprised 70 staff of the city of Kigali involved in the implementation of the RUDP II and 62 from private companies within the project, a total population of 132. The sample size of 99 was determined using Slovin's Formula, and only 95 respondents returned well-filled responses. The researcher used primary and secondary data in this study. Descriptive research, correlation analysis, and multiple regression were used to assess the data. The results show that the majority of respondents agreed with the statement about the influence of risk identification on the performance of the RUDP II project. Whereby 31.6% agree and 63.2% strongly agree that the RUDPII project records the risks in risk identification. The findings are supported by an overall mean of 4.55 which is a high mean as evidence of the existence of the facts and also a standard deviation of 0.50 which shows that there was homogeneity of responses. The results show that the majority of the respondents 34.7% agreed and 50.5% strongly agreed that risk analysis begins at the quantitative analysis stage in RUDP II, with a high mean of 4.21 and a standard deviation of 0.52 in heterogeneity. The results show that 27.4% agreed and 15.8% strongly agreed that the RUDIPII project consistently picked the most effective risk acceptance to mitigate the risk with a moderate mean of 3.02 and achieved a 0.57 standard deviation heterogeneity. The regression analysis on model summary results indicated that there is a significant positive relationship between risk management practices and the performance of RUDP II, as it was revealed that a greater variation of 54.6% in the performance of RUDP II was due to changes in risk management practices measured by risks identification, risks analysis and risks mitigation practices. The results show that risk identification ($P=0.02<0.05$), risk analysis ($P = 0.000<0.05$), risk mitigation ($P = 0.000<0.05$) statistically significantly influence the performance of the RUDP II project in the city of Kigali. Hereby, the researcher rejected null hypotheses (Ho1, Ho2, and Ho3). The study recommended that RUDP II enhance the way it manages the delayed payment and risk connected with a supplier to improve its performance.

KeyWords: Risk Management, Public Infrastructure Projects, Projects, Performance Risks, Risk identification, Project imple-mentation, Monitoring and evaluation. his electronic document is a “live” template. The various components of your paper [title, text, heads, etc.] are already defined on the style sheet, as illustrated by the portions given in this document. (Abstract).

Introduction

Managing risks while implementing projects is important to ensure the success of the project. Poorly managed risks are the main reasons why projects fail. Risk management during project implementation is important as it averts project implementation failure as a result of ignoring the risks. A good infrastructure contributes immensely to the economic development of a country more so in developing nations. The construction industry which is responsible for infrastructure development contributes to a country's Gross Domestic Product (GDP) employing many people in the process (Qureshi, Khan, Qayyum, Malik, Sanil & Ramayah, 2020). The infrastructure development industry contributes immensely to the economic development of a nation and has other underlying benefits including the production and distribution of goods and services (Qureshi, et al., 2020).

Numerous pieces of research carried out worldwide on infrastructure projects identified time and cost as contributing to the project's performance. Studies carried out by Hillson and Simon (2020) on 8,000 projects worldwide identified only 16% of the projects fitting within the performance criteria which were delivered within the stipulated timeline under the set budget and of expected quality. The World Bank study (2020) on 258 infrastructure projects across 20 countries to determine issues related to budgets concluded that 90% ran into unplanned expenditures. Hence, sticking to the infrastructure projects' timelines and budget is a global challenge in project implementation.

In Nigeria, Cross and Cross (2019) support this strategy by highlighting the significance of risk identification as the process with the greatest impact on both quantitative and communicative outcomes, followed by risk reporting, risk registration and allocation, risk analysis, and finally risk control within infrastructure projects. According to the authors, an essential component of managing infrastructure projects is communicating project risk information to stakeholders.

Shema and Hategekimana (2022) state that development infrastructure projects in Rwanda have encountered problems associated with cost overruns, implementation delays, procurement-related hiccups, or lack of private financing. Other Scholars (Rwagasana, Wanyona & Kivaa, 2019; Sibomana, Diang'a & Wanyona, 2019) have attributed a lack of skills in the assessment of risks as a threat to public infrastructure project implementation. They contend that project managers in the construction industry are inadequately skilled in the risk management process.

Infrastructure projects rank high on the City of Kigali's agenda. Up to 58 road projects are set to be implemented in the neighbourhoods of the City of Kigali (CoK) before 2024 within the context of the Second Rwanda Urban Development Project (RUDP II). (City of Kigali, 2021). According to the resolutions of the CoK (2021), the capital will have a length of 215.6 kilometres of roads constructed or upgraded in six phases by 2024. The RUDP II project focuses on improving the infrastructure in the City of Kigali to achieve integrated urban planning, evidence-based management of sustainable wetlands, flood risk controls, and greenhouse gas monitoring in Kigali (MININFRA, 2020). Therefore, it is important to put in place robust risk management practices to stem losses and ensure success within public infrastructural projects.

Objectives of the study

General Objective

The goal of the study was to examine the existing relationship between projects' risk management practices and the performance of public infrastructure projects in Rwanda using the Second Rwanda Urban Development Project (RUDP II project.) as a case study. An understanding of the risk management practices of a project and their performance would inspire project managers to deliver quality projects within the set time frame and budget.

Specific Objectives

The specific objectives of the study were to:

i. Evaluate the influence of risk identification on the performance of the RUDP II project.
ii. Assess the influence of risk analysis on the performance of the RUDP II project.
iii. Determine the influence of risk mitigation on the performance of the RUDP II project.

1.4. Hypothesis of the study

The following null hypotheses guided the study:

H01: There was no significant influence of risk identification on the performance of the RUDP II project.

H02: There was no significant influence of the risk analysis on the performance of the RUDP II project.

H03: There was no significant influence of risk mitigation on the performance of the RUDP II project.

Literature review

The literature reviewed relates to risk management and infrastructural project performance practices in order to identify existing gaps. The theoretical and conceptual frameworks underpinning the research and definition of risk management practices in infrastructural project performance were also of interest in the literature review. The theoretical literature shed light on the operationalization and implementation of key concepts and their significance in the research. The empirical literature of the research provided selected studies carried out on risk identification, risk mitigation, risk analysis, and public infrastructure project implementation.

Risk Management Practices

Scholars define risk management differently. Organizations are beginning to appreciate the importance of risk management practices and are increasingly embedding them in projects. Abu Hussain & Al-Ajmi (2012) define risk management as a process that brings to the fore and controls risks associated with an exercise or project which can bring about disruption and cause losses to an organization. Tereso et al. (2019) identified a lack of a unified definition in a project. They defined a project in terms of activities bound by time, purpose, and outcome. The authors saw a project as temporal having a limited time of implementation aiming at deliverables that may be tangible or intangible. Cooke-Davies (2018) offers a definition that identifies the purpose, the activities to be undertaken, and a timeframe for implementation indicating the commencement and end period. PMI formulated PMBOK into 10 sections that all projects should go through (Jason Westland, 2019). Among the 10 PMBOKs is project risk management. According to Westland (2019), all risks in a project should be known and documented before implementation, together with ways of countering them. Risk management in public infrastructure projects involves isolating threats with the potential of adversely influencing the implementation affecting costs, timely completion, and attainment of objectives. The more complex a project becomes, the more risks it is likely to face hence a complex project ought to look forward to more risks by putting an elaborate risk plan (Marle, 2020). The performance of a project depends on how the risks are handled. Singh & Kalidindi (2016) identified potential risks that projects in the public and private sectors ought to anticipate facing and adequately prepare to address

Risk identification

Risk management aims at anticipating threats by identifying them in advance and planning how to control them when they occur (Sarvari et al., 2019). According to Otaalo et al., (2019), risk management can be defined in terms of what it involves. It reduces or mitigates risks, there is documentation of risk events, beginning with identification and evaluation of the events and finally, optimizing resources for monitoring and minimizing the events. Before risks can be managed they must be identified, and knowledge from previous experiences might apply to the current project (Qureshi, et al., 2020).

Ahmadi et al. (2017) indicated that a project risk management process was used to identify and analyze risks. The former is a process that consists of interviews, checklists, and brainstorming while the latter is performed through a data-driven methodology (Qureshi, et al., 2020). According to Petrovic (2017) research, the method of using past experience or historical data from similar projects provides insights about common factors in a comparison between the projects.

Rwagasana et al (2019) see risk Identification process as listing risks likely to affect a project after they have been identified. Risks should be constantly and methodically assessed for their effective management (Bazin, 2017). There are factors hard to control due to their nature such as natural disasters including earthquakes, floods, and wars among others that cause delays in the schedule of the project and affect the cost. A formal process of determining risks and putting a plan in place to face them is important and Rwagasana et al., (2019) recommend a priority treatment of the identified risks and putting in place a step-by-step method to counter the risks. The risks identified during the risk analysis stage are given numerical values to indicate the severity of the likelihood of the risks taking place (Sibomana et al., 2019; Jennifer, 2022).

Risk analysis

The construction industry relies on accumulated experience when determining, preparing, and dealing with risks shunning anticipation of risks through a risk analysis process, (Akintoye & MacLeod, 1997). During the risk analysis phase, the influence of the risks on time, cost, and scope are determined. In general, qualitative and quantitative methods guide the literature review on risk analysis. When necessary, risk analysis can be initiated at the quantitative analysis stage, and the stages of analyzing can be repeated (Dehdasht et al., 2015).

Activities are devised and broken down into small hierarchical units with a series of activities to address the risks. Additionally, the quantitative method may include risk dependencies and prioritization depending on how quick response is required to address the risk (Hillson & Simon, 2020). The analysis of risks through both types of analysis should transpire on an individual level as well as include the interrelationship of their effects (Dario, 2017).

Risk mitigation

The risk management process in a project eliminates or minimizes risks guaranteeing that the project succeeds (Aven, 2016). Risk mitigation should not be undervalued. It is a crucial process in risk management that helps projects overcome uncertainty. As such, it is a useful tool for project risk management. Risk mitigation uses the collective information from the analysis stage to help make decisions about how to increase the likelihood that the project be completed on schedule, on budget, and with high-quality results (Bahamid & Doh, 2017).

During the risk mitigation stage, the project implementation process prepares responses to the major risks and designates individuals in charge of each reaction (Dario, 2017). A plan to counter the effects of the risks together with a process to monitor the risks for control was put in place. Putting a risk mitigation mechanism is crucial in a risk management process. Project managers should make judgments concerning risks at this point. Planning for risk mitigation is a neglected aspect of project risk even when the manager lacks time and resources to address the hazards (Gitau, 2015).

A management system should be designed to ensure the effectiveness of risk mitigation to minimize the effects of risks. Dario (2017) states that while there are tools and approaches for managing risks in a project, the available studies on how risk management affects project success are few. It is well recognized that the effectiveness of response measures may vary from project to

project, and it goes without saying that construction projects required different measures than those used in school projects because of their diverse uses, which call for a different reaction (Aven, 2016).

Rostami (2016) states that risk mitigation is a process of formulating alternative steps to undertake in order to enhance a project's opportunity and lower the threat thresholds. According to Hopkinson (2017), risk mitigation is a necessary step in managing risks. Risk avoidance, followed by risk reduction, and finally risk acceptance, were the most common risk mitigation techniques used by contractors. It was quite typical among developers to transfer risks to the other side. A risk management process was followed to guide contractors in identifying risks and in responding to the risks. The study found that while Swedish contractors did not adhere to a systematic and structured approach, the risk responses they had adopted were merely similar to the theoretical idea.

Public infrastructure Project performance

In general, Project performance refers to the completion of projects within the budgeted cost with basic criteria of scope, cost, and timeline. Watema & Tulirinya (2021) in their study isolated three parameters of a project informing a high-performance project, a project implemented within the budget, and delivered in the expected time and expected time. Other scholars have identified cost, time, and quality as important factors that project implementers have to pay attention to in order to register a good project performance. (Rainey & Jung, 2015), (Nguyen et al., 2022).

Projects in the public infrastructure sector are disjointed, transient, and complicated in character which inevitably exposes them to risks (Petrovic, 2017). It is therefore important for project implementers to be better versed in the areas of risk management to achieve high performance in the implementation of public infrastructure projects.

PMBOK defines Project Scope as the "The work that needs to be accomplished to deliver a product, service, or result with the specified features and functions". According to Otaalo et al. (2019), the scope of work in construction is the list of construction obligations, as well as work activities that all contractors, subcontractors, and suppliers are obligated to do. This is all written out in an agreement or contract, which is then called the scope of work. Along the same line, Pervez, et al. (2016) stipulate that all the goals of the project are laid out in the project scope. This is where all the quantifiable data can be found, along with the budget and the tech specifications. This is also an excellent place to list all the different milestones for the project.

In today's highly competitive and modern workforce, every project manager's dream is for the project to run smoothly from start to finish, with no delays or budget overruns. When it comes to project management, things are not that simple. Even if all of the issues are planned in advance with the project stakeholders, something will always impact the project's scope over time (Rwagasana, et al., 2019). When the scope of a project is unknown, stakeholders have no idea how much work must be completed to satisfy its goals. As a result, the project can fall behind the project deadline. Scope creep is a key concern for project managers, affecting 52% of projects (Qureshi, et al., 2020).

Scott, Young & Samson (2008) attributed project implementation success to a consideration of the cost and time taken to implement together with meeting the expected quality of the project. There are other criteria to consider when determining the success of a project which according to (Hammond, 2018) are composite. The process of determining the project budget involves aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline (Shema & Hategekimana, 2022). The project budget and time that results from the planning cycle must be reasonable, attainable, and based on contractually negotiated costs and the statement of work.

Risk identification and performance of public infrastructure project

Petrovic (2017) undertook research in the Swedish construction industry where different methods were used to identify risks. The study found that checklists, consultations with randomly selected project staff, and documentation were common methods regularly processes used in the initial stages of a project for risk identification. Project staff held brainstorming sessions to share their experiences and lessons learned from similar projects. A checklist is an important tool for identifying risk in the work atmosphere.

Sarvari et al. (2019) investigated approaches used in identifying risks in public-private partnership projects in Malaysia. The study concluded that projects that included risk identification, prioritization, and managing change registered an enhanced performance. They urged public-private projects in Malaysia to identify, allocate, and manage risks toward improved project performance.

Sastoque et al. (2016) saw risk management as significantly impacting both the public-private partnership (PPP) and public infrastructure projects whose origin can be traced to social infrastructure. Developing countries have involved PPP in the construction, transport, telecommunications and power generation projects. Those countries yet to use PPP in infrastructure development are hindered from doing it by poor legislation, uncertainties in risky allocation and financial constraints.

Mwangi (2015) researched on how risk management techniques are used during the planning stage of building projects in Rwanda and recommended for further studies in this field to draw up manual developers and various agencies of the in-project implementation. The study discovered a tenuous relationship between the selection procedures for architects and engineers. Therefore, more investigation is required into how choosing an architect and engineer affects the success of a project. According to the findings of the study, a significant proportion of those in charge of project implementation including architects and engineers lacked knowledge of risk management, particularly the risk identification process before project implementation. A further recommendation of the study was that more research needed to be carried out to identify the shortcoming in the training of architects and engineers.

Igihozo and Irechukwu (2022) assessed the risk management process and project performance of the Mpazi channel construction project. The descriptive research design with a mixed qualitative and quantitative approach was used for a sample of 118 respondents selected from 168 target populations using a stratified sampling technique and Sloven's formula. SPSS Statistical software was used in the analysis of the collected data into descriptive statistics with the help of mean and standard deviation. The inferential statistics were also analyzed as regression and correlation analysis. The results of this research have shown that project risk identification and project performance of has a highly positive and significant relationship, with a coefficient of correlation of 0.970 and sig=.000, which is less than 0.05 level significance. The research also found that a combination of project risk identification, risk management plan, and risk plan response contributed to 97.5 percent (R2= 0.975) of the Mpazi Channel construction project success. Thus, the researcher concluded that the project risk management practices have an impact on the performance of the Mpazi Channel construction project.

Risk analysis and performance of public infrastructure project

In (2019), Hartono et al. studied construction projects in China focusing on the effects of project risk management. They found that the success of infrastructure projects was determined by the availability of a risk manager and the risk management processes used. The study further recommended a thorough understanding by project and risk managers of risks through the risk analysis process for the success of a project.

Pimchangthong and Boonjing, (2017) studied the management of risks and success of projects in the IT sector paying attention to the effects of the practices and success registered. They established that risk analysis was important in risk management practices with a high level of importance (X= 3.55; S.D.= 0.807) and process performance with a high level of importance (X= 4.05; S.D.= 0.788). They concluded that for a project to achieve high performance, a risk management process should be in place including risk analysis.

Alsaadi & Norha (2020) used quantitative methods to study risk management practices and project performance in construction projects in Oman. The outcome showed that risk management techniques used considerably enhanced the performance of building projects. Based on this finding, it is important to employ the services of a qualified project manager familiar with risk management's primary processes. According to the writers, making the appropriate decisions at the appropriate times and placing the appropriate people in the appropriate positions ensures the effective completion of projects.

Otaalo et al., (2019) aimed to investigate the effect of risk management practices on road construction project performance in Kenya. The instrument of data collection was structured questionnaires. The target population consisted of 80 project managers, road engineers, project managers, road supervisors, road inspectors, road surveyors, and contractors in Kakamega County. The unit of analysis was ongoing and completed road projects implemented by Kakamega county government. Simple random sampling was used to select 80 of whom 70 respondents returned the questionnaires representing 87% of respondents. The findings showed that risk identification has a positive and significant effect on risk management practices in road construction projects. Risk analysis has a positive and significant effect on risk management practices in road construction projects.

Using the WASAC Rwanda and the Japan International Cooperation Agency (JICA) executed project SUS water & sanitation project no: p-rw-f00-016 as a case study, Ndungutse (2021) investigated the link between risk management and project performance. The researcher identified some issues with the project, but they were quickly discovered and effectively resolved, resulting in successful execution. The researcher proved that the lack of collaboration by the three implementing parties caused timeline problems resulting in expenses and cost overruns.

Rwagasana et al. (2019) studied the risk management practices incorporated into Rwandan construction projects. They established that the construction industry employed advanced analytical decision support systems to monitor, identify and address risks in their risk management processes. Ntwali (2019) assessed the practices of risk management in energy projects and their effects on performance. The research targeted project managers and other staff working on energy projects and used quantitative methods of data collection. The study concluded that there existed a direct relationship between managing risks and the performance of projects in the energy sector. It recommended the identification and addressing of risks in project planning and through its implementation. The study identified a need for constant improvements in the practices used in risk management.

Risk mitigation and performance of public infrastructure project

In his 2017 study, Dario focused on the perspective of Swedish contractors as he investigated and assessed project risk management within the construction sector. The goal was to assess the project managers' understanding of risk management and how they practically applied it. The methodology entailed a review of the literature review on the principles of risk management, attitudes, and knowledge management. The study findings showed that risk management theory, models, and processes were not known. Organizations individually applied some methods but lacked structure and terminologies as found in the risk management theory. Research available indicates contractors and developers underutilized knowledge and risk management processes.

Hnottavange-Telleen et al. (2011) examined risk management for a large-scale carbon dioxide geosequestration pilot project in Illinois, USA. The project included risk mitigation actions taken to support the project's performance. They concluded that the risk responses incorporated into the project impacted decisions made during project execution, including participation in a systematic

decision-making process that ultimately led to high performance. The analysis suggests that public infrastructure projects in Illinois, United States, should employ procedures for mitigating risks by identifying, assessing, monitoring, and mitigating all risks within a unified framework. Risk management procedures strive to increase the likelihood of project success. This study is significant because it will serve as a resource for other scholars.

Hwang et al. (2013) studied project risk factors in public-private partnership (PPP) projects executed in Singapore and found that partners openly shared and allocated risks among themselves transparently for addressing resulting in high performance of the projects implemented.

Risk management was examined in a large-scale carbon dioxide geosequestration pilot project in River State, Nigeria, by Cross and Cross (2019). The project included risk mitigation actions taken to support the project's performance. They concluded that the risk responses incorporated into the project impacted decisions made during project execution, including participation in a systematic decision-making process that ultimately led to high performance. Therefore, the analysis suggests that public infrastructure projects in Illinois, United States, should employ by identifying, assessing, monitoring, and mitigating to all risks within a unified framework, risk management procedures strive to increase the likelihood of project success. This study is significant because it will serve as a resource for other scholars.

Githau (2013) conducted a study to identify the skills essential for successful performance in Kenya's construction industry. The outcome was that adopting tools to schedule processes and planning for and monitoring and controlling were essential to a project's success. The projects required careful cost control and skilled human resources who could effectively handle all project communications. The study concluded that persons who can effectively use tools and follow instructions finish their assignments successfully.

Aimable (2015) studied risk responses on project performances at the Rwanda Social Security Board (RSSB) whose recommendation helped RSSB to achieve quality in multi-store constructions by 29 percent, while risk avoidance assisted them in managing resources by 41 percent, and risk avoidance assisted them in ensuring project plan by 11 percent. The risk transfer mechanism allocates the risk of a commercial contract's performance among contracting parties. Aimable's study found that risk retention tactics passed hazards from one party to another, with 44% of risk retention having an influence on multi-story constructions. The majority of respondents regarded avoidance at 62%, mitigation at 61 percent, and acceptance at 55% in Swedish construction projects, whilst transfer received a response rate of 36 percent.

Theoretical framework - the Lean Construction Theory

The study is well informed by Lean Construction and the Stakeholders' Theories which are reviewed here. Since the beginning of the 1990s, the lean construction theory has undergone transformation spearheaded by luminaries among them Koskela, Bertelsen, and Ballard (Biton & Howell, 2013). In 1991, Koskela presented a seminal piece on lean construction in the field of engineering construction management. Lean construction aims at bringing about efficiency in the construction industry through waste reduction and has expanded considerably (Crnkovi & Vukomanovi, 2016). As a result, a number of conceptual pillars, core values, fundamental practices, and a more or less uniform vocabulary have developed. These innovations put traditional project management's tenets, guidelines, and methods under review. The current issues in the construction sector are a result of traditional project management lacking a comprehensive underpinning theory. Lean construction is an invention that emerged as a result of established methods' failure to address a number of recurring, widespread issues on projects. Koskela borrowed heavily from the Toyota Production System and its culture (Crnkovi & Vukomanovi, 2016) in propounding the lean construction theory.

Koskela's 1992 report brought to the limelight the creed of the Lean Construction research agenda observing that the foundations upon which construction engineers went through in academic institutions were antiquated with a need to base the training on modern conceptual and intellectual grounding. The approach was a turning point for academicians and research institutions as they felt challenged to practically translate the new thinking into in the training of construction engineers. Cross & Cross, (2019) cautiously held that the new paradigm shift was realizable but only as a long-term research and training goal.

The new philosophy gained traction among academicians and construction engineers out of a failure of the project management styles in use. The styles emphasized predetermined relations and delivery periods which adversely impacted the project's timelines, budget, and quality and led to the development of the Transformation Flow Value (TFV) generation theory of production (Koskela et al. 2007). The lean construction theory metamorphosed into TFV adding to it the theory of management and highlighting the usefulness of project planning, execution, and control. The model helps in the project's completion, and arbitration of misunderstandings in the construction industry by consideration of ideas from outside the industry (Ling, 2017).

Critics of lean construction theory include Winch's failure to appreciate two critical tenets of the theory: the importance of production in management and controlling waste in construction (Koskela & Howell, 2002). Bertelsen (2003) challenges the theory contending that the construction process is not the only method to view construction, despite the TFV-process model's attempt to explain construction and construction project management. It involves an interaction between individuals involved in the project and other stakeholders each undertaking their respective assignments such as suppliers, government officials, and insurance (Crnkovi & Vukomanovi, 2016).

The Lean construction theory is anchored in this study in affirming that most projects follow the process of design of bid then build (DBB) or design while you build (DB). In DBB, the implementation of the project follows three phases of designing, and

upon acceptance and agreement on the final outlook of the finished product, bids are floated and a contract is drawn with the winner to build (ProjectSight, 2022). Design-build integrates all the stakeholders in the project from the onset bringing in the builder to input ideas in the design and other processes. All parties collaborate actively throughout the project until it is commissioned.

Theoretical framework - the Stakeholder Theory

Freeman (1984) propounded the Stakeholder Theory as a management approach that considered the ethical and moral interests of all concerned parties in an organization. The Stakeholder Theory advocates for satisfied stakeholders in every venture or business and the performance of a company or organization (Dario, 2017). Without focusing only on profits for the shareholders or owners of the company, the management should consider also the interests of the clients. also need to be satisfied with the product put on the market, and the staff at the company should be motivated enough to put in their best performance culminating in high profits. In risk management, the theory emphasizes performance by deploying a risk management process to reduce or eliminate threats to attain the company's goals (Bazin, 2017). In public infrastructure projects, the stakeholders may be donors, the public, the government, and the staff implementing the project. They all need to get value for money through the implementation of a project whose risks are minimized or eliminated. The stakeholder theory introduces the consideration of the interests of both the proprietors and non-proprietors' stakeholders. Contracts binding all types of stakeholders are entered into to safeguard their interests (Dehdasht et al, 2015).

Consumers' faith in a service industry is enhanced when assured of service continuity. In their expectations, the services should continue, hence, they attach a high value to the company. Companies can continue to exist and hence satisfy and maintain high consumers' expectations by taking measures that mitigate the risks they are likely to face including financial shocks. The claims likely to be made may be way off the capability of the company and may plunge it into bankruptcy. Therefore, a prudent and well-thought risk management process considering the tenets of the stakeholder theory may mitigate those claims and save the company (Klimczak, 2011).

The study of the effect of stakeholder theory on risk management, (Dario, 2017) investigated the connection between corporate goals and risk management tactics. It focused on the interests of general stakeholders and shareholders and the risk management strategy used in both cases. The study concluded that the management that had stakeholder interests hedged its currency exposure more than that inclined to safeguard shareholders' interests. The considerations of the stakeholders influence the risk management strategy. This study shall apply the Stakeholder Theory since the projects implemented involved a lot of public funds. It is relevant in the choice of a risk management strategy to use considering the various stakeholders involved in any public infrastructure project in Rwanda including the RUPD II.

Conceptual Framework

The research is guided by a conceptual framework in its planning, development, and organization all contributing to the study's findings. It brings together the interrelated components that include variables and depicts their interactions, relationships, and effects on the expected results. (Creswell & Creswell, 2018), (Ito & Aruga, 2022).

Figure 1 presents the study variables alongside their sub-components. The independent variables depict the risk management practices in public infrastructural projects. The performance of the project was directed by the dependent variables which the study was interested in.

Figure 1: Conceptual Framework

In this study, the independent variables were risk identification, risk analyses, and risk mitigation practices while the dependent variable was the performance of the public infrastructure project. Indicators of the risk analysis were interviews and historical records. Indicators of the risk analysis were quantitative, and qualitative analyses. Indicators of risk response were risk acceptance and risk avoidance. All the variables affect the time, cost, and scope of the project as indicators of performance in public infrastructure projects.

The literature reviewed dwelled on incorporating risk management processes during the implementation of public infrastructure projects and their performance. It showed that scholars considerably paid attention to the area of public infrastructure project implementation against their management. The study augments the body of available infrastructure development projects in Rwanda.

Although the variables utilized were the same, their use centered on projects involving banking and construction, and little attention was given to the research of the constructs in projects on infrastructure development. This research closes the empirical gap and assesses risk management techniques and their effect on the implementation of infrastructure projects in Rwanda. The study also examined the performance of infrastructure projects in a developing nation lacking adequate scholarly attention. Infrastructure in developing countries is crucial in supporting all sectors; it is a foundational element of sustainable development.

Given the enormous costs of infrastructure projects and the effort that financiers, researchers, customers, builders, owners, and engineers must put forth to ensure the least amount of risk (Guido, Juan, and Maria 2016). However, due to ineffective risk management procedures, many developing nations continue to struggle with the issue of ineffective infrastructure project performance. As a result, greater project performance through effective risk management is required. No one can eliminate project risks,

but we can plan and include risk management activities in our project plans, setting up safeguards, redundancies, and additional resources to safeguard the business in the event of a catastrophe.

The argument has ramifications for both academics and policy. Most studies focus on banks and the construction industry. The research offers a comprehensive understanding of risk management of infrastructure projects which needed attention to add to the available academic literature on Rwanda in infrastructure development. The thesis has practical applications as well. The study's findings can assist project managers in improving their current risk mitigation strategies, which will benefit the many stakeholders in the infrastructure sector by streamlining the project development process and lowering the risks associated with public infrastructure projects.

Research Methodology

The research methodology outlines a step-by-step process of tackling and solving the research problem (Kothari, 2011). A description of the methodology to solve the research problem followed by an outline of the research design and the characteristics of the target study population are presented. The sampling techniques used for data collection and the collection process are given. The method to assure the validity and reliability of the data collected is presented in terms of reliability and validity tests, and the approaches used in analyzing the data described. All the study variables and their relationships are clearly explained.

Research design

Virginia Tech (2018) avers that a research design is a plan followed toward a solution to a research question. Research advocates the use of a good research design that ensures that the data collected is sufficient enough to solve the research question. The study employed a cross-sectional research design using both analytical and descriptive methodologies primarily to examine risk management practices and the performance of infrastructure projects. To evaluate the link between the study variables the researcher applied correlational design with multiple regressions testing the study hypotheses using collected data which was primarily primary and secondary.

The Second Rwanda Urban Development Project (RUDP II, 2019-2022) was studied as the case study. Based on RUDP II project's size, duration, and scope, the researcher gathered only pertinent data to achieve the study objectives. The City of Kigali has a lot of infrastructure projects aiming to turn the capital city into a regional hub of financial services. The researcher chose to conduct this study here because it is easily accessible and to provide input to improve the risk management practices in infrastructural projects undertaken by Public Institutions.

The target population

Asiamah et al. (2017) define the target population in a study in terms of attributes possessed by an individual solely or as a group that the study views as relevant. The study targeted the staff of the City of Kigali in the Nyarugenge District working on different projects including the RUDP II project. They comprised 32 administration and finance officers, 28 consultants & support staff, 19 contractors, 32 Architectures/ Engineers, and 21 project managers.

The study's overall target population was 70 staff of the city of Kigali involved in the implementation of the RUDP II and 62 from private companies within the project, a total population of 132. The individuals were chosen as the study's target audience to provide information on the risk management practices used in the project and their effects on the performance of public infrastructure projects.

Determination of the size of the study sample

The sample size in the study was calculated using the Slovin's Formula, $n = N / (1 + Ne^2)$

Where n represents the size of the sample, N the total size of the population, and e error margin (5%). In this study, N=132. To calculate the required sample size for the study at 5% margin of error using the formula, the sample size was calculated at 99.

n=132/(1+132〖(0.05)〗^2)= 132/(1+0.33)=132/1.33=99

Sampling technique

Kombo & Tromp (2006) define sampling techniques as processes followed in selecting a study group, individuals, or objects from a population. In this research, the random sampling method was used to select a representative population of 99 employees. Each employee was chosen by chance in a simple random sampling technique that accorded each member of the population the same chance of selection.

Data collection

Both primary and secondary data were collected in the study. Information gathered from the respondents is the primary data while secondary data focuses on information gleaned from other sources such as reports, and studies among others. A desk review of available literature was conducted to support the main information and tie the results to other methods already in use.

Data collection instruments

A questionnaire and a desk review research on available documentation for data collection were used to collect data in the study. The questionnaire was distributed to 99 CoK staff. The researcher distributed a self-administered paper-based questionnaire to CoK staff. The self-structured questionnaire was based on the Likert scale which is a rating scale that requires the subject selected for the study to indicate his/her level of agreement or disagreement with a given statement (Kothari & Garg, 2014). The Likert scale captured respondents' perspectives on risk management and public infrastructure project performance within the case study. (Kenfield, 2019) defines documents as items that provide details about a topic that academics are interested in studying. The

researcher took care to compare the information from the questionnaire with information from other sources, such as public papers. This study obtained additional information on project performance by consulting available documentation on the subject. They include books, reports, journals, newspaper articles, blog posts, and reports.

Data collection procedures

Frequency tables, statistical means, and standard deviations were used in interpreting the numerical data collected. Qualitative data was collected which further clarified the respondents' perceptions of risk management practices and project performance. The quantitative data collected was analyzed using Statistical Product & Service Solutions (SPSS) version 23.0.

Piloting

Piloting studies before the actual research helps in understanding the parameters and dynamics surrounding the actual research (Junyong, 2017). The researcher undertook a pilot study to test the level of understanding of the respondents of the contents of the questionnaire at the contractor's units of ECHNM Ltd a construction company with more than 10 years in the field.

Validity and reliability

In this study, the paper-based questionnaire set out to collect information on the risk management practice at the RUDP II project in the City of Kigali. The researcher ensured the reliability and validity of the instrument so that the data collected when analysed would lead to making reliable conclusions on the research, (Erlinawati, & Muslimah, 2021). Before the research tools were administrated to the respondents, the researcher first pre-tested the questionnaire to ensure their validity and reliability. A small group of 5 respondents 'staff chose randomly to represent the others for pre-testing. A set of 3 research scientists reviewed the questionnaires until they were sent to participants to guarantee that quizzes can satisfy the goals stated for equipment validation. In this study, the content validity was 0.75 for Risk identification, 0.89 for Risk analysis, 0.74 for Risk mitigation, and 0.78 for project performance. Validity by the Confirmatory Factor Analysis and the covariance between the main construct and the items of the questionnaire were determined where variables whose factor loading was less than 0.5 were excluded from subsequent analysis or replaced with relevant content with passed the test.

Methods of data analysis

Original, excellent publications that emphasize many aspects of the current statistical theory as well as significant applications were found in the field of statistical methods. In addition to fostering links between statisticians and scientists from other domains who are interested in statistical techniques generally, this thesis intends to stimulate research. Descriptive and inferential statistics of correlation and multiple regression analysis were used for data analysis and computed applying the SPSS 23.0.

Descriptive statistics

The research used descriptive statistics of mean, frequency, and standard deviation to characterize risk management practices. The practices of risk identification, risk analysis, and risk mitigation helped determine the degree of public infrastructure project performance related to scope, cost, and timeline.

Pearson Correlation

The statistical relationship between risk management methods and project performance for public infrastructure projects was measured extremely well using the Pearson correlation coefficient.

Multiple linear regressions

With multiple regression analysis, the impacts of several predictor variables (rather than just one) on the dependent measure are evaluated. Linear regression was used in the identification of the mean change that was observed in a variable when a unit change occurred in each independent variable. Ordinary Least Squares regression (OLS) is utilized when the dependent variable is continuous (ratio or interval data) and the independent variable is another variable that could be categorical, continuous, or ordinal. Since the dependent variable in this study is ratio data rather than ordinal data (Likert scale of five responses), multiple linear regression analysis was performed after testing the hypotheses.

Multiple regression models examined the significance of independent variables exerted on the dependent variables. Based on previously utilized models that have been used to assess the impact of each predictor, the current study used the Multiple Linear Regression Formula.

$Y=\beta 0+\beta 1X1 +\beta 2\ X2 +\beta 3\ X3 +\varepsilon$:

X = Independent Variable (Risk management Practices), Y = Dependent variables (project performance), $\beta 0$ = Constant coefficient,
X1= Risk identification practices (RIP),
X2= Risk analysis practices (RAP), X3= Risk mitigation practices (RMP).
ε= error term

Diagnostic Tests

After the model had been run, post-estimation tests were carried out to make sure the model fits the data well and that the estimates it produces are accurate and trustworthy. Conditional diagnostics statistical tests were successfully completed by this investigation. The study checks for multicollinearity, and normalcy. Where two or more variables attained a VIF equal to or greater than five then one of them was eliminated from the regression analysis (Akinwande, Dikko, & Agboola, 2015).

Normality which predicts outcomes of dependent variables and depicts the distribution's shape (Paul & Zhang, 2010) was determined by the Kolmogorov-Sminorv test. A normal distribution registered a result of less than 0.05.

Findings, discussions, and conclusions

Effect of risk identification practices.

The findings showed a weak correlation existed between risk identification practices and the performance of the RUDP II project. However, regression model 1 revealed that the variables risk identification practices (measured by interview and historical record) and the performance of infrastructural projects (measured by scope, cost, and time) contribute to 25.9% of performance in RUDP II. The overall model was positive and significant as the calculated F statistic of 1.074 was large than the critical F and p-value calculated =0.00 is less than the Critical p-value =0.05 level of significance. Therefore, jointly the sub-variables interview and historical records significantly contributed to the variation of performance (scope, cost, and timeline). The study concluded that the R and R2 values between risk identification practices and the performance of RUDP II are statistically significant. Risk identification practices positively and significantly influenced the performance of RUDP II. The interview ($\beta1$= .417; t= .367, p-value=0.024<0.05), and historical record ($\beta2$= .189; t= .358, p-value=0.031 <0.05) positively and significantly affected the performance of RUDP II. Therefore, a 1 percent increase in interviews and the historical record would lead to 0.417% and 0.189% increase in the performance of the RUDP II project.

Effect of risks analysis practices on performance

Findings on this variable showed that the correlation was high between risk analysis practices and performance of RUDP II as shown by a correlation figure of 0.781**, ρ-value was equal to 0.000 and less than 0.05 level in a 2-tailed measure. Regression model 2 revealed that the variables risk analysis practices (measured by Qualitative method and Quantitative method) and the performance of infrastructural projects (measured by scope, cost, and timeline). The two variables of risk analysis practices (Qualitative method and Quantitative method) contribute to 46.4% of performance in RUDP II. The overall model was significant since the computed F statistic of 4.897 and the calculated p-value of =0.000 is lower than the key p-value of =0.05 level of significance.
Therefore, the variables: Qualitative method and Quantitative method jointly had a significant effect on the variation of performance in RUDP II. The results indicate that qualitative ($\beta1$= 0.081, t=1.587, p-value=0.047<0.05) has a positive and significant effect on the performance of RUDP II, while the Quantitative method ($\beta2$= 0.703, t= 0. 2.106, p-value=0.073>0.05) has a positive but insignificant effect on the performance of RUDP II. This shows that a 1 percent increase in the qualitative method will lead to a 0.081% increase in the performance of RUDP II, while a 1 percent increase in the Quantitative method will lead to a 0.303% increase in the performance of RUDP II but an insignificant.

Influence of risk mitigation practices on performance

The findings revealed that there was a moderate correlation existed between risk mitigation practices and the performance of the RUDP II project. A correlation value of 0.703** at a ρ-value =0.000<0.05 level in a 2-tailed measure was observed. The findings of the multiple regression analysis showed the variables risk mitigation (measured by Risk acceptance and Risk avoidance) and the performance of infrastructural projects (measured by scope, cost, and time). The findings revealed that the two variables of risk mitigation practices (Risk acceptance and Risk avoidance) contribute to 33.3% of performance.
Findings indicate that the overall model was significant because the calculated F statistic of 1.874 and the p-value of 0.021 is less than the critical p-value of 0.05. Therefore, this implies that jointly the variables: Risk acceptance and Risk avoidance had a significant effect on the variation of performance in RUDP II. Therefore, it was concluded that the R and R2 between risk mitigation practices and the performance of RUDP II are statistically significant. The results indicate that risk acceptance ($\beta1$= 0.049, t=1.111, p-value=0.033<0.05) and Risk avoidance ($\beta2$= 0.051, t=1.326, p-value=0.029<0.05) have a positive and significant effect on the performance of RUDP II. This shows that a 1 percent increase in Risk acceptance and Risk avoidance will lead respectively to 0.049% and 0.051% increase in the performance of the RUDP II project in Rwanda.

Conclusion

The study concluded that a positive significant relationship with a variation of 54.5% existed between risk management practices and the performance of the RUDP II project due to changes in risk practices of identification, analysis, and mitigation. The findings also suggested that the RUDP II project's performance had been evaluated in terms of its scope, cost, and timeline.
The study also concludes that all null hypotheses were rejected at all levels of significance as shown in ANOVA tests. The results indicated that a positive and significant relationship existed between risk management practices and the performance of a project. Therefore, the objectives of the study were so achieved very well

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