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Monitoring Techniques and Performance of Construction Projects in Rwanda. A case of Rehabilitation of Amahoro National Stadium in Gasabo District

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Abstract

This research aimed to evaluate the relationship between monitoring techniques and construction project performance in Rwanda, specifically in the rehabilitation of Amahoro National stadium. The study used a survey method with a well-structured questionnaire, with a sample size of 127 participants. Data was collected using descriptive statistical analysis, inferential statistics, and Pearson correlation (r) and multiple linear regression analysis. Results showed that 66.2% of participants agreed that requirements were well-planned in the rehabilitation of Amahoro National stadium, 89.8% agreed that requirements were communicated correctly, 63.7% agreed that process variation in the rehabilitation was consistent, and 68.5% agreed that project schedule status was continuously reviewed in meetings. Pearson correlation analysis revealed that the Requirement Traceability Matrix, control chart, and status review meeting all had positive and statistically significant relationships with project performance. The multiple regression model was significant, indicating that 57.2% of construction project performance can be attributed to the effectiveness of monitoring techniques used in the project. The researcher concluded that monitoring techniques have a positive effect on the performance of construction projects in Rwanda. To ensure inclusivity in the review process, the researcher recommends using status review meetings as an approach to communicate top-down project needs and reviewing from bottom-up. Customizing control charts to fit the specific project being monitored is highly recommended. For the rehabilitation of Amahoro stadium and other construction projects, owners should be keen to monitor progress to ensure effectiveness in performance.

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Keywords: *Monitoring Techniques, Performance, Construction, Projects, Rwanda*

1.0 Introduction

Globally, projects are one of the most important elements of today's organizations; a project is a set of well-defined resources dedicated to achieving specific result I am defined period of time. A project has a clear time frame (start and end), and a clear strategy of how to use resources to produce results. Projects are designed and implemented to address developmental needs or problems (Initiative, 2004) and project monitoring process is done to make sure everything goes according to plan, it identifies discrepancies, handles change management, and provides feedback to update and progressively elaborate the plan (Jack, et al., 2016). Africa has seen a surge in mega construction projects that are shaping the continent. CCE News mention some mega construction projects in Africa whose construction cost runs into billions of dollars like Mambila hydroelectric power project (Nigeria) cost $5.8 billion, Konza Technology City (Kenya) cost $14.5 billion (NEWS, 2017) for this growth of construction industry in Africa.

Most construction projects in Rwanda experience cost variations and completion delay problem. The Kigali convention Centre has been under construction for 6 years' while the contract period was less than three years. The Auditor General's annual report highlights delays and cost overruns in Bushenge hospital and wasteful expenditure in the proposed King Faycal expansion project. The reconstruction of the King Faisal Hospital has been under construction for the past six years while the initial construction period was 12 months. The initial contract amount was 2.4 billion Rwanda Francs. The construction team later realized that some key works were not included in the initial tender document and an addendum contract of 463 million Rwanda francs was negotiated and signed. The Auditor General in the 2013 report recommended the termination of the contract and the appointment of another contractor. The Auditor General's report however does not investigate the sources the problem in the project. Bushenge hospital project was marred by poor needs identification and validation process and by poor architect and engineer selection process.

In Karongi District, construction works worth two billion Rwanda Francs for Kibuye Hospital had been significantly delayed. The works were expected] to be completed by December 2012 but by the time of audit in October 2012, work was still in the early stages and only 17.9% of the construction works had been completed (Rwanda, 2013). Project performance can be improved if more attention is given to the issue of control that is why the Government of Rwanda established an institution to monitor and regulate the construction industry as a whole. The National Construction Council of Rwanda (NCCR) is in charge of regulating and promoting the construction industry in Rwanda. It is also tasked with monitoring construction related activities and implementing Government regulations related to the growth of the construction industry (Ministry of Infrastructure, 2012).

A project monitoring system is not the development of something entirely new. It is more the bringing together of many proven project monitoring techniques. Furthermore, because the exact combination of monitoring techniques varies significantly to meet the unique needs of each project, no single detailed monitoring system is appropriate for every construction environment. Therefore, every owner, contractor and engineer should become aware of all project monitoring techniques in order to be able to employ the most appropriate technique to his or her project (Schaufelberger & Holm, 2017). Therefore, this study aimed at assessing various monitoring

techniques and their effects on performance of construction projects in Rwanda a case of rehabilitation of Amahoro National Stadium in Gasabo district, Rwanda. This project is being carried out by Real Contractor Ltd. a company located in Gasabo District, Kigali City in Rwanda.

1.1 Problem Statement

A 2015 global construction survey revealed that construction projects often fail due to core reasons such as people, time, and money. In Rwanda, despite the rise in infrastructure development, many house construction projects have failed due to increased risk and uncertainty. Contracts for 78 projects worth Frw 126,052,898,036 were delayed and not completed within the contract period, with 14 projects worth Frw 3,368,946,434 failing to proceed or contracts being abandoned after paying Frw 1,898,334,461 to the contractors. A report by KT Press Team in Kigali Today newspaper stated that the Regional Convention Centre in Rwanda had to be opened after failing three times, resulting in a $300 million project that was initially supposed to be completed in 2011. The report also highlighted the importance of project control in improving project performance. A project monitoring and control process is essential to ensure everything goes according to plan, identifying discrepancies, handling change management, and providing feedback to update and elaborate the plan.

Developing a suitable project control system is an important part of project management effort, as it combines many proven project control techniques. However, no single detailed control system is appropriate for every construction environment, so owners, contractors, and engineers should become aware of all project control techniques to employ the most appropriate technique for their project. This study aimed to assess monitoring techniques and their effects on the performance of construction projects in Rwanda, specifically the rehabilitation of Amahoro National Stadium in Gasabo district. While there are numerous articles supporting the importance of monitoring in achieving project objectives, no single detailed system is appropriate for every construction project.

1.2 Research Objective

The Study aimed to assess the relationship between monitoring techniques and construction project performance in Rwanda taking a case of rehabilitation of Amahoro National stadium in Gasabo district, Rwanda.

2.1 Theoretical Review

2.1.1 Project Monitoring Techniques

Projects are one of the most important components of today's organizations. According to PMI (2000), the term project is a temporary endeavor designed to produce a unique product, service or result with a defined beginning and end undertaken to meet unique goals and objectives, to bring about beneficial change or added value. A project has a clear time frame and a clear strategy of how to use resources to produce results. The temporary nature of projects stands in contrast with business as usual or operations, which are repetitive, permanent, or semi-permanent functional activities to produce products or services (Evalcareers, 2020). Projects are designed and implemented to address developmental needs or problems. Project monitoring techniques help in making sure everything goes according to plan. Particularly, it identifies discrepancies, handles change management, and provides feedback to update and progressively elaborate the plan (Jack, et al., 2016). To put formally, a project monitoring system works to minimize the deviations from the project plans and consists of identifying and reporting the status of the project, comparing it

with the plan, analyzing the deviations, and implementing the appropriate corrective actions. Hence it includes the set of policies, methods and tools that would ensure the achievement of the project targets there are a range of monitoring techniques that can be used by project managers, including: Requirements Traceability Matrix (RTM), control chart and status review meetings.

2.1.2 Requirements Traceability Matrix (RTM)

PMI's Pulse of profession (2014) describes requirements activities, as the process "of determining, documenting, and managing stakeholder needs to meet project objectives. In other words, while the project manager needs to deliver the end product, the business analyst needs to ensure it is usable and meets stakeholder needs when it is delivered to those stakeholders. Well-managed requirements are documented and traced. Traceability is a structured way to keep track of requirements. Requirement traceability matrix is a tool to help ensure that the project's scope, requirements, and deliverables remain "as is" when compared to the baseline. Thus, it "traces the project's requirements to the deliverables. The matrix correlates the relationship between two baseline documents. This makes the project's tasks more visible. It also prevents new tasks or requirements being added to the project without approval. A requirement should be traceable backward to the requirements and stakeholders that motivated it and forward into the requirements and design entities that satisfy it (Bourque & Richard, 2014). According to Marone (2022) the usage of Requirement Traceability concepts is an approach based on the completeness of the "evolution" that every project "workstation" has to incorporate in the path to a final acceptable product. The foundation for this control method is a complete collection of customer requirements, mutually agreed between the customer and the supplier who is conducting the project.

2.1.3 The Control Charts

The control chart is an extremely powerful tool that should be used in the monitoring process to determine if processes are in control. When special causes are identified, root-cause analysis is the correct response using cause and effect diagrams discussed under quality assurance (Rever, 2007). A Guide to the Project Management Body of Knowledge defines control chart as a graph used to study how a process changes over time. Data are plotted in time order. It has a central line for the average, an upper line for the upper control limit, and a lower line for the lower control limit. These lines are determined from historical data. By comparing current data to these lines, you can draw conclusions about whether the process variation is consistent or in control and is unpredictable or out of control, affected by special causes of variation (Project Management Institute, 2000).

2.1.4 Status Review Meetings

Status review meetings are periodically scheduled events at different levels in which information relating to a project is shared. When executed correctly, effective status meetings can create unity among teammates or colleagues based on shared goals. It also keeps all relevant stakeholders in the loop with regards the status of the project. Jones (2021) states that effective status review meetings can reduce schedule delays, enhances progress visibility and improves accountability among the team and has mentioned 10 roles of Review and status meetings like: Reviewing the project schedule status, going over the project scope status, share the project budget status, let the team know how much has been spent compared to the plan, discussing issues and risks, ask for team member updates, focus language around what needs to be done and what can be controlled or managed, focus less on what has been done and what went wrong since the last meeting, restate any decisions that are made so the team understands what is going on, gives summary of all actions decided, including who is going to do what and when and enhance project progress visibility.

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A Guide to the Project Management Body of Knowledge defines status review meetings as regularly scheduled events to exchange information about the project. On most projects, status review meetings will be held at various frequencies and on different levels. For example, the project management team can meet weekly by itself and monthly with the customer (Project Management Institute, 2000). During the construction project, the contractor, or commonly referred to as administrator (sometimes referred to as architect' or 'contract administrator', 'engineer', 'project manager' or simply an agent') holds regular construction progress assessment meetings which are attended by the necessary members of the project consultation team. Recording the minutes of the meeting is also important as it remains a document of citation; this can be prepared using a construction meeting agenda template so that one can record faster and more efficiently. One of the project manager's key responsibilities is to be aware of the status of the project at any given time. In order to do that, status meetings become a critical tool throughout the lifecycle of the project (Brownlee, 2008).

2.1.5 Project Performance

Performance is the manner in which a process, system, processor, network, or device behaves for a particular load or unit of work. Performance measurement provides the project manager with visibility to make sure he is operating within the approved time and cost constraints and that the project is performing according to plan. It also alerts management if a project begins to run over budget or behind schedule so actions can quickly be taken to get the project back on track. The project is performing well if the process is in control over time with team member updated and when requirements are fulfilled as planned (Phillips, 2019).

2.2 Empirical Literature

A research was done in Nigeria assessing the project monitoring techniques used by Ondo State Agency for Road Maintenance and Construction. The result of the assessment conducted to identify the monitoring techniques used in the study area and their effects on project delivery revealed that the major techniques used are Program Evaluation and Review Technique (PERT) for time/schedule control and Earned Value Management (EVM) for cost control, and that these techniques aid in timely delivery of projects and mitigate against cost overruns (Adebayo, et al., 2018) but they did not cover all monitoring techniques like requirements and monitoring technique and other more.

2.2.1 Requirements traceability matrix technique and construction project performance

Poor requirements management is a major source of failed projects. PMI's Pulse of profession (2014) found that 37% of all organizations reported inaccurate requirements as the primary reason for project failure. Requirements management focuses on the product, service, or end result of the project and is defined as "the discipline of planning, monitoring, analyzing, communicating, and controlling requirements" (PMI's Pulse of profession, 2014). The 2011 Games in Guadalajara will shine an international spotlight on Mexico, infuse the country with brand-new infrastructure, and serve as a compelling argument for greater foreign and domestic financial investment. Delivering the megaproject on time, on budget and without severe setbacks despite numerous obstacles could be just the ringing endorsement project management needs in the developing nation, says Alejandro Acevedo, PMP, a project management consultant and trainer for IIL México (International Institute for Learning), Mexico City, Mexico. Our traceability matrix is one of our fundamental project management tools. All projects, tasks and endeavors are aligned upon this matrix to ensure that we're on the right path and accomplish our objectives.

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Das and Ngacho (2017) examined the critical success factor that drive the performance of development projects in Kenya. The authors used a sample of 175 respondents. The data was collected using questionnaires. The authors found that the various factors involving the success of projects can be grouped as contractor-related, client-related, environment-related, consultant-related, and project-related and supply-chain related. These define the various requirements for the project to be completed within the stated budget, scheduled time and within the desired quality. The authors found that these factors are relevant and cannot be overlooked. Rwagasana, et al., (2019) investigated the risk management practices in construction projects in Rwanda. The authors were interested to find if the risk management practices propose requirements that the project managers must be keen to implement in order to make construction projects successful. The findings showed that the risk measures require that risk mitigation practices be placed in the logistical, physical and design to avoid project failures and increase the possibility of success in construction projects.

2.2.2 The role of control chart technique on Maintenance and Construction

In a study carried out by Kenley and Harfield (2015) on "Construction Project Control Methodologies and Productivity Improvement". The main objective of the study was to identify the project control methods used by organizations to improve production efficiency. Upon adopting the critical realism methodology for their explorative research and numeral analysis for data description, they identified project control as a contributing factor to project success, and stated that the project management literature is replete with models promising control of cost and duration using a control chart, process models for more effective project delivery and software to support their research findings. They also concluded that controlling external and internal uncertainty is considered a major part of any construction project for the implied outcome of improving overall project productivity the control chart is an extremely powerful tool that should be used in the monitoring process to determine if processes are in control. When special causes are identified, root-cause analysis is the correct response using cause and effect diagrams discussed under quality assurance (Rever, 2007).

Yar'adua, (2022) investigated the role of monitoring on the project management of construction projects in northern Nigeria. The authors were interested with various monitoring techniques and tools such as control charts, balanced score cards and critical path evaluation. They used questionnaires and structured interview to gather primary data from 59 respondents. The data was analyzed using descriptive and correlation methods. The findings showed that the monitoring used can help project managers improve the performance of the construction projects. Mudaheranwa and Mulyungi (2018) studied the determinants which affect project schedule performance in construction projects in Rwanda. Using descriptive survey design, the authors collected data from 42 respondents. The findings showed that the monitoring techniques used significantly influence the performance of the projects. The reported R^2=0.759 indicating high rate of influence of the control techniques on project performance.

2.2.3 Status Review Meetings and Construction Project

A study done by Brownlee, (2008) on the secrets to running project status meetings that work! Concludes that project status meetings are a critical tool in the project manager's tool box. Unfortunately, too few project managers have adopted methods and techniques to ensure that these sessions are succinct, productive, and valuable. It's not uncommon for project managers to conduct at least one 90-minute status meeting per week. For a team of six, that's an investment of nearly

40 hours in just one month! Too many project managers assume that a status meeting means sending out a meeting invitation and just showing up. In reality, effective status meetings require so much more! The good news is that when project status meetings are effective and efficient, the results are tremendous! Productive project status meetings increase team morale, provide timely information on project status, uncover potential risks, provide a forum for timely issue resolution, and encourage relevant information sharing (Brownlee, 2008).

Ngacho and Das (2014) examined the effect of a multidimensional performance evaluation framework on the success of development projects in Kenya. Among the researchers' interests is the influence of formal meeting in ensuring effective communication and progressive reporting on the performance of development projects. Primary data was collected from 175 respondents. The findings showed that project performance can be evaluated based on six dimensions, namely, time, quality, site disputes, safety and environmental impact. Kanyago et al., (2017) investigated the project management skills on performance of construction projects in Rwanda. The author's interests were on the project planning skills, communication skills and risk management skills. They argued that the ability to plan and communicate the project plans through meetings and reports is essential in the project performance. The authors found that the amount of time used in planning and effective communication allows construction project to succeed.

3.0 Methodology

The research design that was used for this study was the survey method using a well-structured questionnaire that researcher used to elicit appropriate information from respondents. The population of the study consisted of 185 respondents who are part of the project management team and workers in the Rehabilitation of the National Amahoro stadium project run by Real Contractors Ltd. The sample size was 127 which was selected using simple random sampling technique. Data was collected using structured questionnaire. The collected data was analyzed using descriptive statistical analysis with use of mean and standard deviation, and inferential statistics by the use of Pearson correlation (r) and multiple linear regression analysis. The researcher used Statistical Package for Social Sciences (SPSS version 23).

4.0 Findings and Discussions

This section provides the information from the field related to the research specific objectives. The section is having three more subsections for specific objectives one, two and three.

Findings on the effect of requirements traceability matrix technique on construction project performance

The study aimed to examine the effect of requirements traceability matrix technique on construction project performance. In order to achieve this objective, the researcher gave a set of questions to the participants rated on a five-point Likert scale. The findings are presented in the table that follows.

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Table 1: Participants' views on requirement traceability matrix

Statements	SA		A		N		D			
	n	%	n	%	n	%	n	%	M	std
1.Requirements are well planned	34	26.8%	50	39.4%	41	32.3%	2	1.6%	2.09	.81
2.Monitoring requirements is done properly	62	48.8%	56	44.1%	7	5.5%	2	1.6%	1.60	.67
3.Requirement analysis is done perfectly	56	44.1%	52	40.9%	17	13.4%	2	1.6%	1.72	.75
4.Requirements are communicated in right way	57	44.9%	57	44.9%	12	9.4%	1	0.8%	1.66	.68
5.Controlling requirements are effective	66	52.0%	41	32.3%	20	15.7%	0	0.0%	1.64	.74
Overall Average									**1.74**	**.73**

Source: Researcher (2023)

Table 1 reports the findings on the views expressed by the participants in regards to Requirement Traceability Matrix (RTM). As per the findings, 39.4% of the participants agreed that requirements are well planned in the rehabilitation of Amahoro National stadium project while 26.8% of the participants strongly agreed, however, 32.3% of the participants said they were neutral while 1.6% disagreed, resulting to a mean score of 2.09 and standard deviation of 0.81. Though the standard deviation showed divergence in views, majority of the respondents were in agreement that requirements are well planned in this particular project.

On whether the monitoring requirements is done properly in the rehabilitation of Amahoro National stadium project, 48.8% of the respondents strongly agreed and 44.1% agreed. This showed that a total of 92.9% of the participants were in agreement on the monitoring requirements. The remaining 5.5% of the participants indicated that 5.5% neutral and 1.6% disagreed. The resulting mean score of 1.60 and standard deviation of 0.67 implied majority were in agreement that monitoring requirements are important in ensuring the performance of the projects. On the statement that requirement analysis is done perfectly, 44.1% of the participants strongly agreed and 40.9% agreed to the statement. The total of this was 85% while 13.4% said they were neutral and 1.6% disagreed. The mean score of 1.72 and standard deviation of 0.75 implied that most of the participants were in agreement on the statement.

On whether requirements in the rehabilitation of Amahoro National stadium project are communicated in right way, 44.9% of the participants strongly agreed and another 44.9% agreed to the statement. On the other hand, 9.4% of the participants said they were neutral and only 0.8% disagreed with the statement. The mean score was 1.66 with a standard deviation of 0.68. On whether controlling requirements are effective in the rehabilitation of Amahoro National stadium project, 52.0% of the participants strongly agreed and 32.3% said they agreed. This implied that a total of 84.3% of the participants were in agreement while the remaining 15.7% of the participants said they were neutral. The mean score obtained was 1.64 with a standard deviation of 0.74 which confirmed the high number of participants in agreement.

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On the overall, the mean score of 1.74 with standard deviation of 0.73 indicated that most of the respondents were agreeing that RTM is an important monitoring technique which if effectively used can increase the performance of the rehabilitation of Amahoro National stadium project. These findings concur with other findings from previous researches. For instance, PMI (2014) found that 37% of all organizations reported inaccurate identification of requirements as the primary reason for project failure. Similarly, Das and Ngacho (2017) define the various requirements for the project success that should be incorporated earlier enough in the project initial stages. These include contractor-related, client-related, environment-related, consultant-related, project-related and supply-chain related which provide project managers with a preview of what requirements should be in the project.

Findings on the role of control chart technique in construction project performance

The study aimed to find out the role of control chart technique in construction project performance. In order to achieve this objective, the researcher gave a set of questions to the participants rated on a five-point Likert scale. The findings are presented in the table that follows.

Table 2: Participants' views on control chart technique

Statements	SA		A		N		D			
	n	%	n	%	n	%	n	%	M	std
1.It is easier to know whether the process variation consistent	21	16.5%	60	47.2%	45	35.4%	1	0.8%	2.21	.72
2.It is easier to know whether the process variation is out of control	51	40.2%	60	47.2%	15	11.8%	1	0.8%	1.73	.70
Overall Average									**1.97**	**.71**

Source: Researcher (2023)

Table 2 shows the views from the participants in relation to the use of control chart technique as a monitoring technique in the rehabilitation of Amahoro National stadium project. The findings on the statement that it is easier to know whether the process variation in the rehabilitation of Amahoro National stadium project is consistent, 47.2% of the participants agreed and 16.5% strongly agreed. This gave a total of 63.7% of those participants who were in agreement. However, a sizeable percent equivalent to 35.4% of the participants said they were neutral while 0.8% disagreed. The mean score was 2.21 and standard deviation of 0.72 indicating majority of the respondents were in agreement.

On the statement that it is easier to know whether the process variation in the rehabilitation of Amahoro National stadium project is out of control, 47.2% of the participants agreed and 40.2% strongly agreed with the statement. This showed that a total of 87.4% of the participants were in agreement. On the other side, 11.8% of the participants said they were neutral and 0.8% disagreed with the statement. The mean score of 1.73 ad standard deviation of 0.70 showed that most of the responses were in agreement. The overall average of 1.97 with standard deviation of 0.71 indicated that majority of the participants in this study were of the view that control chart technique can help in monitoring the performance of the rehabilitation of Amahoro National stadium project. These findings are in line with previous researchers who pointed the use of control techniques as

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monitoring techniques needed to make project successful. For example, Kenley and Harfield (2015) identified project control as a contributing factor to project success, and stated that the project managers must incorporate control techniques in the project management process if they are to achieve the project goals. Further, Yar'adua, (2022) has shown that control charts can help project managers improve the performance of the construction projects if effectively implemented.

Findings on the role of status review meetings technique on construction project performance

The study aimed to evaluate the role of status review meetings technique on construction project performance. In order to achieve this objective, the researcher gave a set of questions to the participants rated on a five-point Likert scale. The findings are presented in the table that follows.

Table 3: Participants' views on status review meeting technique

Statements	SA		A		N		D			
	n	%	n	%	n	%	n	%	M	std
1.Project Schedule status is continuously reviewed in meeting	39	30.7%	48	37.8%	39	30.7%	1	0.8%	2.02	.81
2.Project Scope status is always well reviewed in meeting	56	44.1%	58	45.7%	12	9.4%	1	0.8%	1.67	.68
3.Budget status review is always reviewed within meetings	58	45.7%	41	32.3%	26	20.5%	2	1.6%	1.78	.83
4.Issues and risk review is done within Status review meetings	60	47.2%	54	42.5%	12	9.4%	1	0.8%	1.64	.69
Overall average									**1.78**	**.75**

Source: Researcher (2023)

Table 3 reports the views of the participants in respect to status review meeting as a monitoring technique that can help managers to improve the project performance. On whether the rehabilitation of Amahoro National stadium project schedule status is continuously reviewed in meeting, 37.8% of the participants agreed and 30.7% strongly agreed, giving a total of 68.5% of all those in agreement. On the other hand, 30.7% of the participants said they were not sure while only 0.8% of the participants who disagreed. The mean score was 2.02 and standard deviation of 0.81, clearly showing that most of the participants were in agreement about the use of project schedule status review as a monitoring technique.

On whether the rehabilitation of Amahoro National stadium project scope status is always well reviewed in meeting, 45.7% of the participants said they agreed and 44.1% strongly agreed, leading to a total of 89.8% of the participants in agreement. 9.4% of the participants said they were neutral and 0.8% disagreed. The mean score for this was 1.67 and standard deviation of 0.68 showing that majority of the participants were in agreement. On whether the budget status review is always reviewed within meetings, 45.7% of the participants agreed and 32.3% strongly agreed

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giving a total of 78% of those in agreement. The participants who said they were neutral were 20.5% while 1.6% said they disagreed. The mean score was 1.78 and standard deviation of 0.83, showing divergence in views. On the statement that issues and risk review is done within Status review meetings, 47.2% of the participants strongly agreed and 42.5% agreed with the statement giving a total of 89.7% of those in agreement. However, 9.4% of the participants were neutral and 0.8% disagreed. The mean score was 1.64 and standard deviation was 0.69. In the overall, the majority of the participants were in agreement as shown by a mean score of 1.78 that status review meeting can be used as a monitoring technique for the purpose of improving the performance of construction projects in Rwanda. The findings reported in this study concur with previous studies which showed the need for frequent status review meetings. These meeting should be held to communicate project progress, project changes to incorporate as well as to monitor the project for effectiveness. For example, Brownlee, (2008) concludes that project status meetings are a critical tool in the project manager's tool box. Ngacho and Das (2014) in Kenya found that the influence of formal meeting in ensuring effective communication and progressive reporting on the performance of development projects cannot be ignored. Kanyago, et al., (2017) argued that the ability to plan and communicate the project plans through meetings and reports is essential in the project performance. The authors found positive relationship between the amount of time used in planning and effective communication which allows construction project to succeed.

The participants were also asked to shows how they would rate the performance of the rehabilitation of Amahoro National stadium project. The findings given below show the rating provided by the participants.

Table 4: Participants' satisfaction rating

Statements	**ES**		**S**		**N**		**D**			
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	M	std
1.Requirements are always fulfilled	33	26.0%	48	37.8%	44	34.6%	2	1.6%	2.12	.81
2.Process control over time done well	49	38.6%	62	48.8%	13	10.2%	3	2.4%	1.76	.73
3.Project Team member receive Updates	78	61.4%	35	27.6%	12	9.4%	2	1.6%	1.51	.73
Overall average									**1.80**	**.76**

Source: Researcher (2023)

Table 4 shows the rating the participants gave on their satisfaction about the performance of the rehabilitation of Amahoro National stadium project. On the statement that the project requirements are always fulfilled, 37.8% of the participants were satisfied while 26% were extremely satisfied. On the other hand, 34.6% of the participants said they were neutral about this and 1.6% were dissatisfied. The mean of 2.12 and standard deviation of 0.81 indicated divergence in satisfaction level while at the same time indicating that majority were just satisfied with the fulfilment of project requirements. On whether the process control over time done well, 48.8% of the participants were satisfied and 38.6% were extremely satisfied. 10.2% of the participants however said they were neutral and 2.4% dissatisfied. The mean score was therefore 1.76 and standard deviation was 0.73 indicating that majority of the participants were satisfied. On whether the

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project team member receive updates, 61.4% of the participants were extremely satisfied and 27.6% satisfied. On the other side, 9.4% of the participants said they were neutral and 1.6% dissatisfied, leading to a mean score of 1.51 and standard deviation of 0.73. On the overall, majority of the participants were satisfied as shown by the overall mean of 1.80.

Table 5: On which monitoring technique is frequently used

Technique	Frequency	Percent
Control chart	57	44.9
Requirement traceability matrix (RTM)	55	43.3
Status review meetings	15	11.8
Total	**127**	**100.0**

Source: Researcher (2023)

Table 5 shows the responses to the question about the most frequently used monitoring technique is applied at Real Contractors ltd. To this question, 44.9% of the participants selected control chart followed by requirement traceability matrix with 43.3% of the votes while status review meetings was selected by 11.8% of the participants. The results showed that all these monitoring techniques are used by Real Contractors, but at different levels of frequency.

Table 6: Participants' views on the effectiveness of the monitoring techniques

Statements	SA		A		N		SD			
	n	%	n	%	n	%	n	%	M	std
1. Does or do the monitoring technique(s) effectively identify project activities that are critical?	56	44.1%	49	38.6%	16	12.6%	6	4.7%	1.83	.98
2. Is or are the monitoring techniques effective in monitoring planned versus actual progress?	63	49.6%	39	30.7%	18	14.2%	7	5.5%	1.81	1.05
3. Would you say that monitoring techniques are effective and reliable in meeting set project deliveries?	44	34.6%	60	47.2%	13	10.2%	10	7.9%	1.99	1.08
4.Clients are highly satisfied with projects delivered to them when using these monitoring techniques	50	39.4%	53	41.7%	13	10.2%	11	8.7%	1.97	1.13
Overall average									**1.90**	**1.06**

Source: Researcher (2023)

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Table 6 reports the views from the participants regarding the effectiveness of monitoring techniques used to monitor the performance of construction projects in Rwanda, and more specifically, on the rehabilitation of Amahoro National stadium project. On whether the monitoring technique(s) effectively identify project activities that are critical, 44.1% of the participants strongly agreed and 38.6% agreed with the statement. The total of those in agreement was 82.7% of the participants while 12.6% were neutral and 4.7% strongly disagreed. The results gave a mean of 1.83 and standard deviation of 0.98. On whether the monitoring techniques effective in monitoring planned versus actual progress, 49.6% of the participants strongly agreed and 30.7% agreed with the statement. However, of the total participants, 14.2% were neutral and 5.5% strongly disagreed. The mean score was 1.81 with a very high level of divergence of 1.05. On whether the research participants would say that monitoring techniques are effective and reliable in meeting set project deliveries, 47.2% agreed and 34.6% strongly agreed giving a total of 81.8% of those in agreement. 10.2% of the participants were neutral and 7.9% strongly disagreed. On whether the clients are highly satisfied with projects delivered to them when using these monitoring techniques, 41.7% of the participants agreed and 39.4% strongly agreed. 10.2% of the participants however were neutral and 8.7% strongly disagreed. The mean was 1.97 with a divergence which was very high as indicated by the standard deviation of 1.13. the overall average showed that even if there were divergence views, majority of the participants were in agreement about the effectiveness of the monitoring techniques in improving the performance of construction projects in Rwanda.

The researcher also used inferential statistics in order to perform deeper analysis of the relationship between monitoring techniques and performance of construction projects in Rwanda. In this study, the inferential statistics used were Pearson correlation analysis and multiple regression analysis, which helped to give further understanding and measure the effect of monitoring techniques on the performance of construction projects, particularly, the performance of the rehabilitation of Amahoro National stadium project.

5.0 Conclusion

This study was carried out to investigate the effect of monitoring techniques on the performance of constrction projects in Rwanda, taking a case study of the rehabilitation of Amahoro National stadium project. The result of the assessment conducted to identify the monitoring techniques used in the study area and their effects on project delivery revealed that techniques used aid in timely delivery of projects and mitigate against cost overruns. Also, the result of the assessment carried out to establish the value of project monitoring and control to the project execution of the construction company in the study area revealed that the project management process is indeed fundamental and indispensable to project execution and success. The result of the test conducted to assess the relationship between the type of project monitoring and control technique used by a construction company and project delivery/success revealed that there is indeed a critical relationship existing between type of project monitoring and control technique used by a construction company and project delivery/success.

The researcher formulated research objectives and research hypotheses based on the three key monitoring techniques identified, namely, requirement traceability matrix, control chart and status review meetings. The regression analysis showed that the proposed model was statistically significant. Hence, the researcher concluded that monitoring techniques have a positive effect on the performance of construction projects in Rwanda. This imply that the use of monitoring techniques would help project managers to improve the performance of construction projects in

Rwanda. This research was a scientific research where a case study was selected, the rehabilitation of Amahoro National stadium project, to represent other construction projects in Rwanda. Therefore, the findings can be generalized to other similar construction projects and the effective use of monitoring techniques such as requirement traceability matrix, control chart and status review meetings, would improve the performance of the construction projects in Rwanda.

6.0 Recommendations

This study has shown the significant role played by monitoring techniques towards the performance of construction projects in Rwanda. Hence, the researcher recommends that project managers should be keen to always monitor the progress of the construction projects. Continuous monitoring and evaluation of a project helps in communicating the project progress while at the same time reviewing the risks and challenges the project team is experiencing. In this way, the project managers can be able to communicate to all other stakeholders including the clients and the donors on the progress of the project. Through effective monitoring process, construction projects can become successful, be completed on timely basis and within the budgeted costs. It is therefore imperative for project managers to be abreast with the modern monitoring techniques and exhaustively cover all areas of the construction project. In the light of the findings, the researcher further recommends the need to use status review meetings as an approach not only of communicating top-down project needs, but also of reviewing from bottom-up to ensure inclusivity in the review process. Considering the positive effect that control charts have on the performance of construction projects, the researcher highly recommends customizing of the control charts to fit to the particular project being monitored. In this way, the project managers can be in power to influence the performance of the project.

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