



# RISK MANAGEMENT AND SUCCESS OF MULTI-PHASE ROAD CONSTRUCTION PROJECTS IN LOCAL GOVERNMENT; A CASE OF REHABILITATION OF RUSIZI TOWN TARMAC ROADS (2015-2019).

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**Abstract:** *The study entitled “Risk management and success of multi-phase road construction projects in local government; A Case of Rehabilitation of Rusizi Town Tarmac Roads (2015-2019)” was conducted for assessing the significance of risk management and success of multi-phase road construction projects in local government. The study was used both descriptive, qualitative, quantitative, and correlative design. The total population of the study were 132 stakeholders of Rusizi town tarmac road rehabilitation project. The researcher has used Slovin formula to calculate the total sample which is equal to 99 respondents. And for sample selection purposive sampling which was based on the selection of knowledgeable people about the rehabilitation of Rusizi Town tarmac roads project from 2015 to 2019 was used. Questionnaire, interview, and documentation were used as important tools of data collection (both primary, secondary, qualitative, and quantitative data). Data analysis was displayed in form of descriptive statistics and inferential statistics. The study results confirm that, managing risks in project implementation is one of among tools for project success not only in road construction projects but also in all form of the projects. The quality of project outputs, or for a project to meet planned scope, budget, and deadline (time) depends on the quality ensured vis a vis risk management practice. This study has shown that risk management has contributed on 35.2% in the success of Rusizi town tarmac road rehabilitation project while remaining 64.8% was occupied by other factors not covered by this study. In other case, the project stakeholders have been confirmed that risk management was delayed, and decisions were also delayed it is in that context, the project was completed in 47 months and 12 days while only 10 months were planned, the project was completed with an increase of budget rated to 109% and the project scope was reduced to 5.05Km from 7.54Km planned. The researcher confirms that, there is a good contribution of risk management toward the success of multi-phase road construction projects in local government, this contribution was tested and found that it is statistically significant. Reference to the achievements or outputs of this research project owners or managers are recommended to ensure that project feasibility study was made before any project activity and was conducted by certified and qualified experts, project planning also should include clear plan and procedure for risk assessment, analysis, and handling. Other project stakeholders are recommended to respect the project expected outputs and ensure that any risk met or expected was reported on time and resolved or transferred before impacting the entire project.*

**Keywords:** *Risk management; Multi-Phase Road Construction Projects; Local Government, Rehabilitation.*

## 0. Introduction

Once a project manager or any project stakeholder needs better project outputs could take under consideration effective risks management to all steps and activities of the project. No one knows the future or tomorrow of his life’s project, only guessing or expectations. However, people or businesses could keep silent but keep being ready for any issue which may born from the operations or the environment effects on the project within the organization. It is the source of project risk management or provision for tomorrow (the future) (Lavanya, 2008).

With reference to the study conducted by Elkington and Smallman (2000) on British utilities company to assess their project risk analysis and management profiles. The study was survey and design where questionnaires were distributed to 20 project managers

selected from British utilities. Based on the information obtained, it was found that successful projects are those ones which made good performance in ensuring more practices in risks management than other projects. The perception of respondents also (90% agreed) confirmed that, the earlier started risk assessment and mitigation the more you reach project success. The study gives final notice that, PRM (Project Risk Management) is an important tool for project success (Elkington et al., 2000). The study of Elkington et al, 2000) has failed to ensure specification whether projects may differ from one scope to another on the effectiveness of risk management as well as contribution in project success or performance. This study has covered this gap and being conducted on specific project of Multi-Phase Road construction project which is Rehabilitation of Rusizi town tarmac roads project (2015-2019).

Success of multi-phase road construction projects in local government requires risk analysis and management practices from planning process to the end of project implementation. The proper practices of RAM are explained by the success of the project, failed project is distinct to the successful project by the way at which project risk analysis and management was made. Thus, as reported by the office of Rusizi District, rehabilitation of Rusizi town tarmac roads was planned to start in 2015 to be completed within 10 months (two phase projects of 4 months and 6 months respectively). This project was delayed being completed in 2019, meaning that it has taken 4 years instead of 10 months. It is in that context this study intends to examine whether risk analysis and management practices was applied properly or not. Thus, it intends to assess risk management made toward the success of multi-phase road construction projects in local government; A Case of Rehabilitation of Rusizi Town Tarmac Roads from 2015 to 2019.

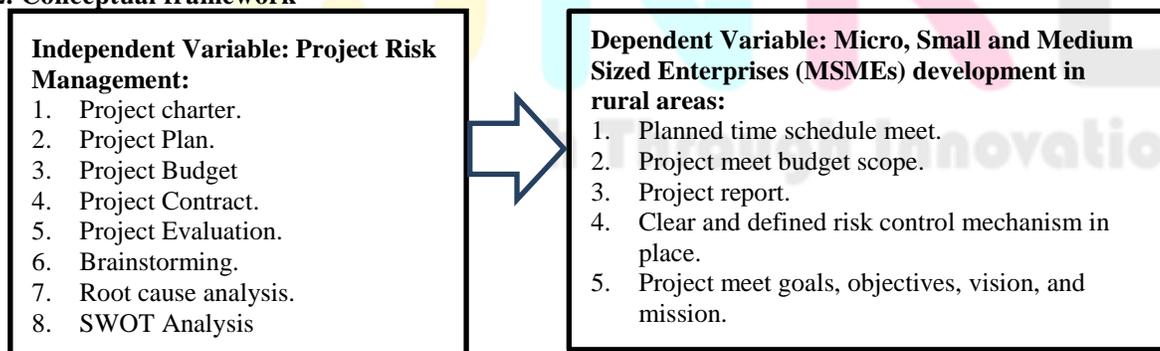
## 1. Literature review

A combine study of L. Castillo and C.A. Dorao, (2013) was proposed game theory as best case while designing oil and gas theory. Castell (2013) also has suggested game theory for LNG (Liquified Natural Gas) processes within industry multi-criterion nature (Castill, 2013). The book published by Kelly A., (2013) has confirmed that, game theory is a good tool while ensuring or taking important decisions in complex or high-level decision-making scenarios. This shows that, game theory is suitable while determining the objectives of the project and wat to achieve them. It provides best practices for determining or setting activities and best way of performance against internal and external risks which may affect success of the entire projects. It is also a good example for learning to the previous cases or learning from the previous faced and handled risks. Game theory is important to our study as it shows how project could succeed once people work closely hands in hands. This means that, a risk generated on one side for a project joining different sides like rehabilitation of Rusizi Town tarmac roads project, there is a need to support of sides for tackling the risk. It is in that context via this study, the researcher intends to assess risks affected rehabilitation of Rusizi Town tarmac roads project, the sides on which risks were generated as well as how other sides considered those risks (Kelly, 2013).

Anmol Okate, (2019), has explained a lot on how the projects of roads construction and rehabilitation faces significant or more risks due to its scope. No one knows well what is under the soil from the crest going down int the soil. Thus, any time soil nature, geographical and topographical features are the main hindrance of best practices of road project completion in due time with planned budget (Anmol, 2019). To ensure that, a road construction project is performed as planned need more expertise, the best engineers who faced before more challenges and knows exactly how to handle the risks meet. In developing countries like Rwanda where governments need extended infrastructure with low budget is difficult. Poor engineers take the projects and leave them before the completion due to poor risks assessment and later during the implementation they face risk which may cost double of the entire project cost (Perera, 2010).

In the assessment made by (Alshibly, 2013), the main objective was to study the impact of risk management on success or performance of a construction project. The researcher has conducted a survey to the project's stakeholders. Assessment was made into two sections, where the 1st section took consideration on process of risk management within organization and the 2nd focus on criteria used on the achieved project success. Only 200 questionnaires were received from 230 distributed (87.4%). The study finds that risk identification and assessment is positively impacting project success, project scheduling, planned budget, time, and project ability to achieve the expectations. Study findings also indicate a good response to the happened risks ensure good performance or reduce risks-based costs and poor response or delay increases projects failure (Alshibly, 2013). This study was conducted to evaluate whether risk management was ensured properly or poorly vis a vis the success obtained on the rehabilitation of Rusizi town tarmac roads projects since 2015 to 2019.

## 2. Conceptual framework



Source: Compiled by the researcher, 2020

**Figure 1: Conceptual framework of the study**

Project risk management is tool for project success. This is done with assessment and ensuring proper requirements on management of project charter, plan, budget, contract, evaluation, brainstorming, root cause analysis and SWOT analysis. Once proper risk management practices are effectively and efficiently ensured, the multiphase road construction projects in local government as referred

to this study is successful completed with planned time, budget, with clear report, with experience to other projects on risks management and with achieved goals, objectives, vision, and mission.

### 3. Methodology of the study

This research study adopts a mixed design consisted by descriptive, qualitative, and quantitative research designs. Descriptive survey approach on district staff and rehabilitation of Rusizi Town tarmac roads project contractors and technicians were applied. The qualitative and quantitative approaches were employed using a mixed list of questions with open and closed ended questions. The quantitative technique was used to collect and analyze data in form of statistical approach like frequency, mean, standard deviation and correlation. The qualitative approach was used to examine the data in way of ideas. This design is also correlative because it brings out clearly to establish the relationship between project risk management and success of multi-phase road construction projects in local government.

#### 3.1. Methodology of the study

The population is the totality of persons or objects with which a study is concerned (Mugenda, 2013). Population of this study comes from project stakeholders as shown below:

**Table 1: Risk affected rehabilitation of Rusizi town tarmac roads project**

No	Project stakeholders	Number of targeted populations	Sample size
1	Staff at Rusizi District level	85	63
2	District council	12	9
3	Staff of Kamembe Sector	15	10
4	Staff of Kamashangi Cell	2	2
5	Technical staff of Contractor	6	5
6	Technical staff of supervisors	10	8
7	Assigned staff from funding Agencies (RTDA&LODA)	2	2
	<b>TOTAL</b>	<b>132</b>	<b>99</b>

#### 3.2. Sampling methods and techniques

A sample, we understand a group of subjects that is selected from the general population and is considered as representative of the true population for that specific study (Bazeley, 2017). As populations seems to be big (population size greater than 100), the sampling methods were applied through which the Slovin formula was used for calculating the sample size. The Slovin formula is written as:  $n = N / (1 + Ne^2)$ ; where  $n$  = Number of samples,  $N$  = Total population and  $e$  = Error tolerance. Therefore, by applying the above Slovin's formula, the sample size is given by  $132 / (1 + 132 * 0.05 * 0.05) = 99.25$  which is 99 after rounding off.

Purposive sampling technique was used to target 99 respondents from the whole population. A purposive sample is a non-probability sample that is selected based on characteristics of a population and the objective of the study. It is in that context that only knowledgeable people about the rehabilitation of Rusizi Town tarmac roads project from 2015 to 2019 were considered.

#### 3.3. Data collection tools

This study has used both primary and secondary data for assessing validity of its objectives. Secondary data was collected using documentary review (District Development Strategy Report and District Imihigo Reports). Primary data were collected using questionnaire, and this questionnaire were filled by the researcher as an output of face-to-face talks between the researcher and the sampled respondent.

#### 3.4. Specific objectives

This study focuses on four angles:

1. To identify scope, cost, time, technology, resource, communication, and procurement risks affected performance of rehabilitation of Rusizi Town tarmac roads project.
2. To examine how rehabilitation of Rusizi town tarmac roads project charter, plan, budget, contracts, evaluation plan, SWOT analysis mitigate risks faced.
3. To suggest proper risk management practices required toward success of multi-phase road construction projects.
4. To establish the relationship between project risk analysis and management and success of multi-phase road construction projects in local government.

#### 3.5. Data analysis

The data obtained through the questionnaires administered to the respondents was examined by using the statistical package of social sciences (SPSS) and the results obtained was presented in the form of tables in chapter four. The data were analyzed using the frequencies, descriptive and Pearson correlation tools in SPSS version 20. The standard deviation helps to measure how far or near the mean. A measure of the middle is not enough to describe a distribution well. It tells the researchers about the spread of the data. For Pearson correlation ( $r$ ) is ranked between  $\pm 1$  and ranked into various category based on the level strong, weak, or moderate positive or negative correlation. This correlation may be statistically significant once Sig.(2-tailed) is less or equal to 0.05.

#### 4. Study Findings

The study findings reflect to the study objectives and hypothesis. The researcher has presented summaries in this study, and they are in forms of descriptive statistics and inferential statistics. Here below are results:

##### 4.1. Perceptions of respondents on risks affected performance of rehabilitation of Rusizi town tarmac roads project

No doubt that the project of rehabilitation of Rusizi town tarmac roads was delayed, changed budget and scope due to multiple risks. But the project was not totally cancelled or failed, using several risk management techniques it was succeeded. Thus, this section evaluates the perception of respondents on several risks which affected the project.

**Table 2: Risk affected rehabilitation of Rusizi town tarmac roads project**

Risk affected rehabilitation of Rusizi town tarmac roads project	Mean	Stdv.	Comment
Rusizi tarmac roads project has faced scope risk	3.67	.948	Strong Heterogeneity
Rusizi tarmac roads project has faced cost risk	3.52	.719	Strong Heterogeneity
Rusizi tarmac roads project has faced technology risk	3.59	.969	Strong Heterogeneity
Rusizi tarmac roads project has faced resource risk	3.80	1.020	Strong Heterogeneity
Rusizi tarmac roads project has faced communication risk	3.45	1.145	Moderate Heterogeneity
Rusizi tarmac roads project has faced procurement risk	3.63	.943	Strong Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project has faced the risk of poor project management	3.82	1.091	Strong Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project has faced the risk of Safety hazards that lead to worker accidents and injuries	3.64	.775	Strong Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project has faced the risk of Managing change orders	3.87	.911	Strong Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project has faced the risk of Incomplete drawings and poorly defined scope	3.82	.825	Strong Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project has faced the risk of Unknown site conditions	3.49	.761	Moderate Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project has faced the risk of Poorly written contracts	3.43	1.002	Moderate Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project has faced the risk of unexpected increases in material costs	3.68	1.048	Strong Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project has faced the risk of Labor shortages	3.39	1.114	Moderate Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project has faced the risk of Damage or theft to equipment and tools	3.45	.993	Moderate Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project has faced the risk of Natural disasters	3.68	1.185	Strong Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project has faced the risk of Issues with subcontractors and suppliers	3.60	.807	Strong Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project has faced the risk of availability of building materials	3.89	.856	Strong Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project has faced the risk of delay of funds availability	3.47	.873	Moderate Heterogeneity

Source: Primary source of data, October 2020

With the assessment on the 1st study objective, the findings show that no doubt that the project of rehabilitation of Rusizi town tarmac roads was delayed, changed budget and scope due to multiple risks. But the project was not totally cancelled or failed, using several risk management techniques it was completed. Generally, 100% of respondents agreed that the project has faced scope, cost, technology, communication, resource, poor design and plan, poor definition, and other risks. To manage these risks, project implementers have delayed but later they have ensured project plan review which assessed and changed time of the project and scope. Today the project was completed due to multiple effects and from which risk management played its role.

##### 4.2. Perception of respondents on Rusizi town tarmac roads project risk management practices used toward its performance

Rehabilitation of Rusizi town tarmac roads project was achieved after successful performance of project stakeholders. These include project funders, contractors, project employees and district staffs. Projects stakeholders were applied various risk management techniques which include project charter review, project plan review, project budget review, project contract renew, project evaluation

analysis, brainstorming, root cause analysis, SWOT analysis, risk assessment, data register and monitoring, project communication, probability and impact matrix and risk management and mitigation plan.

**Table 3: Risk management practices ensured by the rehabilitation of Rusizi town tarmac roads project stakeholders**

Risk affected rehabilitation of Rusizi town tarmac roads project	Mean	Stdv.	Comment
All stakeholders of rehabilitation of Rusizi Town tarmac roads project have a clear knowledge or understanding of the project requirements	3.95	.919	Strong Heterogeneity
The management of the project has created a Risk Response Team	3.28	.796	Moderate Heterogeneity
Management of rehabilitation of Rusizi Town tarmac roads project has developed and formalized project management roles	3.80	1.020	Strong Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project planned with time defined, scope defined, resources defined, and quality defined	3.82	1.248	Strong Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project management has developed competencies alongside technical competencies	3.18	1.335	Moderate Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project was transparent and its purpose was emphasized	3.88	1.072	Strong Heterogeneity
There was a regular communication among rehabilitation of Rusizi Town tarmac roads project team	4.05	1.101	Strong Heterogeneity
Funds for implementation of rehabilitation of Rusizi Town tarmac roads project was availed on time	4.06	.740	Strong Heterogeneity
There was assessment of possible risk by the rehabilitation of Rusizi Town tarmac roads project team and evaluators	3.92	1.037	Strong Heterogeneity
Identified risks were analyzed by the rehabilitation of Rusizi Town tarmac roads project team and evaluators or supervisors	3.94	.806	Strong Heterogeneity
Identified risks were reported to the concerned person to handle it and each step has report for the rehabilitation of Rusizi Town tarmac roads project for findings record	3.80	.903	Strong Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project team and supervisors have respected baseline evaluation, mid phase evaluation and final evaluation and record of findings	4.16	.792	Strong Heterogeneity
For rehabilitation of Rusizi Town tarmac roads project review was made, and project planning revised	4.07	.860	Strong Heterogeneity
Rehabilitation of Rusizi Town tarmac roads project all risk was monitored, treated, and responded	3.99	.909	Strong Heterogeneity

Source: Primary source of data, October 2020

Learning from the 2nd study objective, risk was assessed, managed, and controlled toward success of the project. This was due to the decisions taken for changing the budget of the project, change of time of the project and change of project scope (length in Kilometers). Proper risk management practices employed is SWOT analysis, review of the project charter, plan, budget review, review of contracts, evaluation system improved, assess root Cause of the activities. Reference to the 3rd objective of the study around 100% of respondents confirm that for proper risk management of construction projects there is a need to create a flow of communication at each project level and among project team, make a habit of continuous planning, for each project level and activity, observe and ask questions, budget project with a work execution platform (4.80 mean to 0.606 Stdv.) and embrace automated reporting system. Meaning that for ensuring project success, there is a need of ensuring exhaustive planning system, ensure that communication is effectively ensured, all scopes are captured.

#### 4.3. Suggested proper project risk management practices could be taken toward success of projects related to the Rusizi Town tarmac roads project

This section gives in summary the perception of respondents on the success at which Rusizi Town tarmac roads rehabilitation project was made, recommended project risk measures to be used for similar projects, assessment of reported indicators on the nature, changes, and scope of the project as well as measures taken for completion.

**Table 4: Evaluation of Rusizi town tarmac roads project success**

Risk affected rehabilitation of Rusizi town tarmac roads project	Mean	Stdv.	Comment
Rusizi town tarmac roads project was completed with change of scope, time, and budget.	4.28	.453	Strong Homogeneity
Rehabilitation of Rusizi town tarmac roads project was completed after consideration of non-captured conditions in feasibility study (during planning period)	4.72	.453	Strong Homogeneity

Risk affected rehabilitation of Rusizi town tarmac roads project	Mean	Stdv.	Comment
Rehabilitation of Rusizi town tarmac roads project completion report is not accessible to all stakeholders	3.44	1.409	Moderate Heterogeneity
Rehabilitation of Rusizi town tarmac roads project was completed with multiple of around 2.5 times change of planned period and budget. 2/5	5.00	0.000	Strong Homogeneity
Rehabilitation of Rusizi town tarmac roads project was completed and now (October 2020) is under use for the population (facilitating people's movements).	4.43	0.498	Strong Homogeneity

Source: Primary source of data, October 2020

Table 4 given in details the findings on the perception of respondents on the extent to which Rusizi town tarmac roads rehabilitation project was completed. Respondents confirm that Rusizi town tarmac roads project was completed with change of scope, time, and budget (4.28 mean to 0.453 Stdv.), Rehabilitation of Rusizi town tarmac roads project was completed after consideration of non-captured conditions in feasibility study (during planning period) (4.728 mean to 0.453 Stdv.), Rehabilitation of Rusizi town tarmac roads project completion report is not accessible to all stakeholders (3.44 mean to 1.409 Stdv.),

Rehabilitation of Rusizi town tarmac roads project was completed with multiple of around 2.5 times change of planned period and budget. 2/5 (5.00 mean to 0.000 Stdv.), Rehabilitation of Rusizi town tarmac roads project was completed and now (October 2020) is under use for the population (facilitating people's movements) (4.43 mean to 0.498 Stdv.). To all assessed items the lowest mean obtained is 3.44 (medium) and the highest obtained is 5.00 while the lowest standard deviation obtained is 0.000 (homogeneity) and the highest is 1.409 (heterogeneity) meaning that respondents confirm the successful completion of the projects but after several modifications mainly planned project period, budget, and length (kilometers) and these were results of project risk management. In his study Kishk et al. (2008) in the study on the impact of effective risk management on project success, have concluded that, effective risk management should be continuously undertaken through the project lifecycle to enhance project success. This could be achieved by ensuring that, risk was avoided, transferred, reduced, and accepted.

**Table 1: Change of Rehabilitation of Rusizi town tarmac roads project period and scope**

Project Name	Project Phase	Contractor	Supervisor	Initial contract duration	Extension	Final project duration	Initial Target (Km)	Final Achievement (Km)
Rehabilitation of Rusizi town tarmac roads	Phase1: Unconditional phase	Horizon Construction Ltd	GENCO Ltd & ASSETIP	4months	9months & 22days	13months & 22days	2.6	2.6
	Phase2: Conditional phase	Horizon Construction Ltd	GECO Africa Ltd	6months	27months & 20days	33months & 20days	4.94	2.45
<b>Total</b>				<b>10 months</b>	<b>34 months &amp; 26 days</b>	<b>47 months &amp; 12days</b>	<b>7.54</b>	<b>5.05</b>

Source: Rusizi District, (2020)

Table 5 explain the characteristics of Rusizi town tarmac roads rehabilitation project completion process and indicators. The project of rehabilitation of Rusizi town tarmac roads was into two phases, (1) unconditional phase and (2) conditional phase). The phase one was planned to take 4 months but due to several risks it was completed in 13 months and 22 days with constant length of 2.6 Km. The second phase was planned to take 6 months but later it was taken 33 months and 20 days.

However, the time increased on phase two, but length of the road has reduced from 4.94 Km planned to 2.45 Km constructed. In general, the project was planned to be performed in two phases, and to be completed in 10 months, the extension made was 34 months and 26 days and total duration was taken 47 months and 12 days. The project was planned to construct 7.54 Km, but it was completed only with 5.05 Km. The main issue that caused this project to have such delay especially Phase 2 is to get the budget for expropriation and the construction works started at the same day with expropriation and there was not enough fund for this expropriation which finally caused the project scope to be reduced from 4.94km to 2.45km for phase 2. This is the gap of planning and implementation where budget availability and expropriation exercises were not made in proper way, currently for all projects which use public assets, expropriation should be made before the beginning of implementation of the project.

**Table 6: Change of Rehabilitation of Rusizi town tarmac roads project budget**

Project Name	Project Phase	Initial contract amount (Frws)	Additional amount (Frws)	Final paid amount (Frws)	Expropriation cost	Supervisor initial contract amount	Supervisor final paid amount
Rehabilitation of Rusizi town tarmac roads	Phase1: Unconditional phase	1,797,594,712	178,417,628	1,976,012,340	0	54,609,305	78,263,071
	Phase2: Conditional phase	2,630,267,984	225,260,363	2,855,528,347	918,543,274	42,952,000	152,456,000
<b>Total</b>		<b>4,427,862,696</b>	<b>403,677,991</b>	<b>4,831,540,687</b>	<b>918,543,274</b>	<b>97,561,305</b>	<b>230,719,071</b>

Source: Rusizi District, (2020)

As seen from table 6, rehabilitation of Rusizi town tarmac road project both phases were delayed and changed scopes and budget. For the phase one, planned budget was around 1.8 billion but latter an addition of 178 million was made which made the total phase to cost around 2 billion Rwandan francs. For Supervision the planned budget was 54.6 million and later the Supervision were completed with a total budget of 78.3 million.

Phase two also was delayed and caused the changes in budget as follows, at initial stage 2.6 billion was planned and later around 2.9 million were used, Supervision cost around 43 million was planned and later 152.5 million were used. In total the project was changed and increased 1.09 times with an additional of 403.7 million Rwandan Francs. The reason for budget increase was due to the additional works which were not captured before (in planning phases).

**Table 7: Proper project risk management practices could be taken toward success of projects related to the Rusizi Town tarmac roads project.**

Proper risk management practices which could be taken toward success of construction project	Mean	Stdv.	Comment
Create a flow of communication at each project level and among project team	4.19	.396	Strong Homogeneity
Make a habit of continuous planning	4.58	.497	Strong Homogeneity
For each project level and activity, observe and ask questions	4.00	0.808	Strong Heterogeneity
Budget project with a work execution platform	4.80	0.606	Strong Heterogeneity
Embrace automated reporting system	4.21	0.760	Strong Heterogeneity

Source: Primary source of data, October 2020

As seen from table 7, it is clear that from 99 assessed rehabilitation of Rusizi town tarmac road project stakeholders confirm that, for proper risk management of construction projects there is a need to create a flow of communication at each project level and among project team (4.19 mean to 0.396 Stdv.), Make a habit of continuous planning (4.58 mean to 0.497 Stdv.), for each project level and activity, observe and ask questions (4.00 mean to 0.808 Stdv.), budget project with a work execution platform (4.80 mean to 0.606 Stdv.) and embrace automated reporting system (4.21 mean to 0.760 Stdv.). Meaning that for ensuring project success, there is a need of ensuring exhaustive planning system, ensure that communication is effectively ensured, all scopes are captured.

#### 4.4. Test of significance

Test of significance between risk management and success of multi-phase road construction projects in local government was made using SPSS tool on primary data collected. Meaning that, the researcher has tested the mean for indicators tested representing independent (risk management) variable to the mean resulted from perception of respondents on indicators tested for dependent variable (success of multi-phase road construction projects). As explained in the 3rd chapter, the researcher has adopted the use of Bivariate analysis which produce Pearson correlation (r) and significance two tailed (Sig. (2-tailed)). Here below are the results:

**Table 8: Test of correlation between variables**

Tested Variables	Risk management	Success of multi-phase road construction projects in local government
<b>Risk management</b>	Pearson Correlation	.352**
	Sig. (2-tailed)	.000
	N	99
<b>Success of multi-phase road construction projects in local government</b>	Pearson Correlation	.352**
	Sig. (2-tailed)	.000
	N	99

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Source: Primary source of data, October 2020

The table 8 shows that, Pearson correlation or  $r$  is 0.352 (positive but weak) while Sig. (2-tailed) is 0.000 (statistically significant). This means that risk management is positively correlated to the success of multi-phase road construction projects in local government however this correlation is weak. In other words, the test results tell that risk management have contribute 35.2% to the success of multi-phase road construction projects in local government and the remaining 64.8% is the share contribution of other factors not captured by this study. And the contribution between risk management and the success of multi-phase road construction projects in local government is statistically significant. All in all, respect and ensuring proper risk management increase the probability, rate, or level of success of multi-phase road construction projects in local government.

## 5. Conclusion

Project risk management is one of among tools for project success not only in road construction projects but in all form of the projects. The quality of project outputs, or for a project to meet planned scope, budget, and deadline (time) depends on the quality ensured vis a vis to risk management practice. The study results were confirmed that scope, costs, time, technology, communication and procurement risks were affected rehabilitation of Rusizi tarmac roads project and this was confirmed by the extent to which all items assessed the lowest mean obtained was 3.39 (moderate) and the highest mean is 3.89 (strong mean) however some respondents disagreed on some risks to the project and this is explained by lowest standard deviation 0.719 (heterogeneity) and the highest is 1.185 (also heterogeneity) meaning that, there is high level of dispersion of respondents' perception from the average (mean) perception.

The study findings also were confirmed that charter, plan, budget, contracts, evaluation plan, SWOT analysis are risk management strategies used to mitigate risks faced for rehabilitation of Rusizi town tarmac roads project (for all items assessed the lowest mean was 3.18 (moderate) and 4.16 as the highest mean (strong) to 0.740 as the lowest standard deviation (heterogeneity) and 1.335 as the highest standard deviation (heterogeneity).

The study assessment has also suggested proper strategies for risk management toward project success such as create a flow of communication at each project level and among project team, make a habit of continuous planning, for each project level and activity, observe and ask questions, budget project with a work execution platform and embrace automated reporting system. Meaning that for ensuring project success, there is a need of ensuring exhaustive planning system, ensure that communication is effectively ensured, all scopes are captured (confirmed with strong mean).

This study gain has shown that risk management has contributed on 35.2% in the success of Rusizi town tarmac road rehabilitation project while remaining 64.8% was occupied by other factors not covered by this study. In other case, the project stakeholders have confirmed that risk management was delayed, and decisions were also delayed, it is in that context, the project completed in 47 months and 12 days while only 10 months were planned, the project was completed with an increase of budget rated to 109% and the project has reduced the scope where only 5.05Km was constructed instead of constructing all 7.54Km planned before.

All in all, the study objectives were achieved, and research questions were answered, and the researcher confirms that, there is a positive contribution of risk management toward success of multi-phase road construction projects in local government, this contribution was tested and found that is statistically significant.

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