

# Factors Influencing the Contractor Performance in Water Supply Projects In Rwanda

Innocent Ndikubwimana, Abednego Gwaya, Titus Kivaa Mbiti

**Abstract:** Construction industry in Rwanda is facing the poor Contractor performance in Water Supply Projects due to different factors. The research presents the results from field surveys conducted to identify and assess relative importance of critical factors influencing the contractor performance in water supply projects in Rwanda. The water supply projects are heavily affected by the application of the management tools and other causes of poor, if anybody does not know which factors may cause the poor performance then he cannot be successful. In this study the different water projects were investigated based on biggest respondent project in terms of money and complexity. In this research the questionnaires distributed to projects team members like owners, consultants, contractors, engineers and other stakeholders to obtain required data for assessing factors influencing contractor performance. The research categorized the factors into four main groups such as Client, Contractor, Consultant and External related factors. But the research was limited to the client and contractor related factors. Financial issues, Management Methods, Poor Implementation of project schedule, Design Errors, Lack of knowledge for new technology, Importation process, inadequate experience, Under Costing the project, Weak Organizational of the company, Staff Capacity, Inadequate Labors, Applied Management tools, etc are the potential factors that are likely to affect the time, cost and quality of projects and to know them help to avoid extra costs through claims and disputes when poor performance or failure are experienced.

**Keywords:** Construction Project Management, Water Supply Projects, Contractor Performance, Relative Importance Index.

## I. INTRODUCTION

The portable water demands are increasing to feed the required population in Rwanda. In this, the government of Rwanda launches water supply projects and related stakeholders (Engineers, Managers, Leaders, etc) in charge of water supply Development are responsible to plan, design, implement and manage them without delays and failure.

**Revised Manuscript Received on 30 May 2019.**

\* Correspondence Author

**Mr. Innocent ndikubwimana\***, Department of Construction Project Management, JKUAT

**Dr. Abednego Gwaya:** Department of Construction & Management JKUAT.

**Dr. Titus Kivaa Mbiti:** Department of Bldg Econ, University of Nairobi.

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an [open access](https://creativecommons.org/licenses/by-nc-nd/4.0/) article under the CC-BY-NC-ND license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

The contractor performance in water supply projects in Rwanda is influenced by the project scope changes, technical design, costs estimation, projects funding policies, project planning and procurement processes. (RPPA, 2014) To the owner of the water supply projects, the contractor performance means successful or failure of contractor to accomplish contracting works. (www.wasac.rw, 2016)

### 1. Statement of the Problem

As Rwanda is still developing the problem of insufficient portable water faced the development and some people do not have clear water used in daily activities that is why the government of Rwanda launches different water supply projects throughout the country to improve people wealth through water and sanitation services. The most water supply projects face the problem of delay and poor performance of contractors during the execution period. This is known from the observations, contractors' performance reports and interviewees.

### 2. Objectives

1. To identify the Client and Contractor related factors on contractor performance for water supply projects.
2. To assess the effects of Client and Contractor related factors on the contractor performance.
3. To identify the level of significance to Contractor performance.
4. To develop a framework for better contractor performance.

## II. LITERATURE REVIEW

### A. Introduction

This study reviewed the reports of the other researchers on the topics related to the study. Critique of the existing literature and identification of the research gap was also covered.

### B. Project Constraints in Project Performance

A constraint could be defined as state, quality or sense of being restricted in the process of carrying out an action (Lau & Kong, 2006). In construction projects, constraints are either internal or external and are likely to affect the project performance in one way or another. Constraints affect the contractor performance.

#### a) Technical or Logic Constraints

These are constraints related to the logical sequence and diagram in which project activities occur. These constraints deal with the actual construction processes that are tasked to complete the activities (Gidyalew, 2010).

# Factors Influencing the Contractor Performance in Water Supply Projects In Rwanda

## b) Physical Constraints

These are constraints related to physical properties of the site and the work. According to (Jackson, 2010), they include constraints such as space, technological dependency, safety, and environment

## c) Resource Constraints

A project resource constraint is any limitation or restraint placed on resource usage and the amount of a given resource available during a specified time frame (Tarek & Wail, 2010).

## C. Financial Funds

The financial adequacy is strongly and positively influencing contractor performance. (Rwanda, 2012)

## D. Adequate Equipment Availability

The adequate quality and availability of equipment had a significant positive relationship with contractor performance. It had significant but weak relationship with project quality (Kanda, August 2016).

## E. Decision Making Ability

By the length of time taken by the client to approve design documents and variation orders determined the decision making ability. The majority (70%) of respondents disagreed to the question as to whether the client approves design documents and variation orders on time. (Kanda, August 2016)

## F. Discussion

This chapter begins by discussing the concepts of factors influencing contractor performance and the techniques employed by different Project Managers in management of their projects. The various issues discussed under this literature include Financial, resource planning, applied managerial methods, time management, risk management, cost management. Other aspects discussed under project planning include the various project constraints such as resources, technical, physical economic, legal, social and environmental. The impact of these constraints on the contractor performance was discussed under each section. The different types of project management problems were identified as the Resource constraint, quality constraint and time constraint. A number of factors influencing contractor performance and their effects on the project were discussed in this section. Other topical issues discussed in this chapter include challenges experienced in implementation of water supply projects.

## III. METHODOLOGY

The data collected through the distributed survey questionnaires to respondent involved in daily activities of construction firms, consultants and semi-government institution in various regions in Rwanda. To identify the key stakeholders in water supply projects in Rwanda a sample size of 5 contractors, 5 projects, 2 consultants firms and 1 semi-government institution was used. The total number of 25 respondents out of 30 which were 83.3% of distributed questionnaires participated in the survey and provided data analyzed using SPSS and Microsoft Excel. The analysis of these data was done by a method of relative importance index (RII).

### Data Collection

The target populations were civil engineers, architects, Hydraulic Engineers, Managers and other stakeholders in water supply projects in Rwanda. Over 30 questionnaires

were distributed, the 25 questionnaires were received. From these received questionnaires the analysis was made to calculate the Relative Importance Index.

Relative Importance Index Technique is used to determine the relative importance of various factors and effects on the performance.

The same method was adopted in this study and the likert scale ranged from 1 (Very little degree affect) to 5 (Very high degree affect) was used and transformed to relative importance indices (RII) for each factor as follows:

$$RII = \frac{\sum W}{A * N}$$

Where,

**W** is the weight given to each factor by the respondents (ranging from 1 to 5)

**A** is the highest weight (i.e. 5 in this case)

**N** is the total number of respondents. Higher the value of RII, more important was the effect of the factors.

## IV. RESEARCH RESULTS AND FINDINGS

The relative importance index, RII was computed for each factor to identify the most impacting and significant factors.

From obtained RII values, the factors were ranked accordingly.

### Objective 1: To identify the Client and Contractor-related factors on contractor performance in water supply projects

Base on the ranking, the 12 most important factors on Contractor performance by RII were:

**Table 1: Critical Client related Factors on Contractor performance. Source: (Author, 2019)**

No.	Client Related Factors	RII	Ranking
1	Contract Duration is too short	0.920	1
2	Financing Institutions	0.912	2
3	Weak Organizational of Institutions	0.904	3
4	Financial preparation	0.864	4
5	Poor Feasibility Study	0.840	5
6	Procurement Process	0.816	6
7	Administration Process	0.792	7
8	Project Scope Management	0.792	7
9	Planning Control	0.776	9
10	Staff Capacity	0.736	10
11	Payment Process	0.712	11
12	Project Stakeholders	0.696	12

Graph 1: Critical Client related Factors on Contractor performance. Source: (Author, 2019)

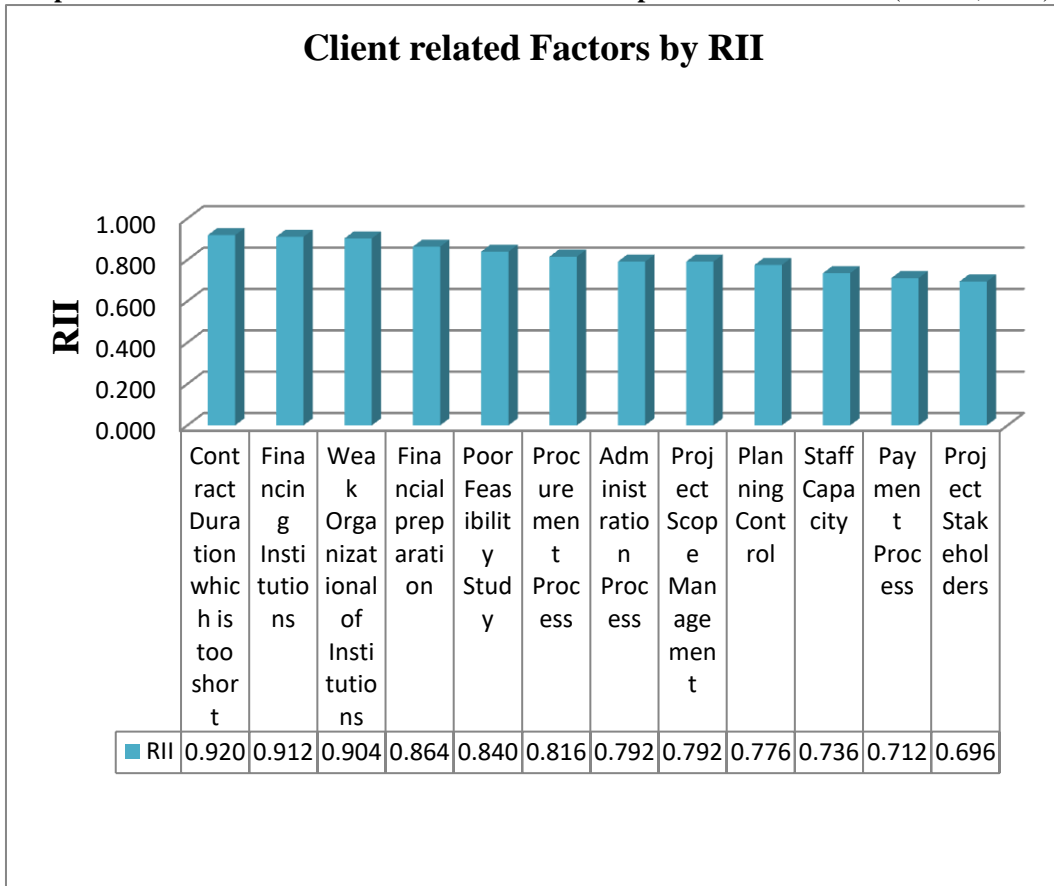
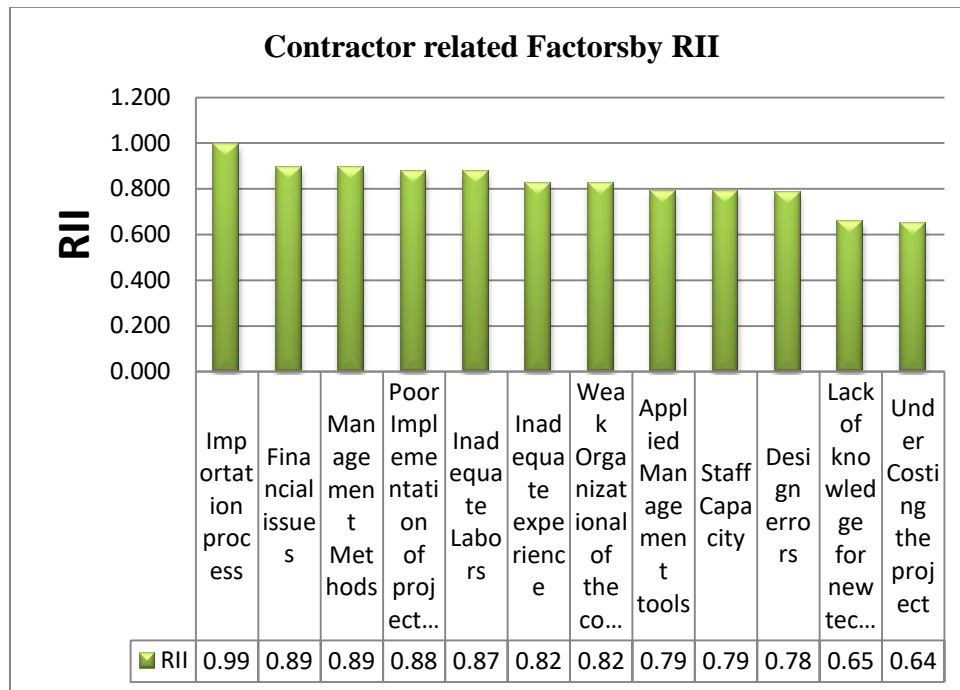


Table 2: Critical Contractor related Factors on Contractor performance. Source: (Author, 2019)

No	Contractor Related Factors	RII	Ranking
1	Importation process	0.994	1
2	Financial issues	0.896	2
3	Management Methods	0.896	2
4	Poor Implementation of project schedule	0.880	4
5	Inadequate Labors	0.872	5
6	Inadequate experience	0.824	6
7	Weak Organizational of the company	0.824	6
8	Applied Management tools	0.792	8
9	Staff Capacity	0.792	9
10	Design errors	0.784	10
11	Lack of knowledge for new technology	0.656	11
12	Under Costing the project	0.648	12

# Factors Influencing the Contractor Performance in Water Supply Projects In Rwanda

Graph 2: Critical Client related Factors on Contractor performance



Objective 2: To assess the effects of client and contractor related factors on contractor performance

Table 3: Effects of client and contractor related factors on contractor performance

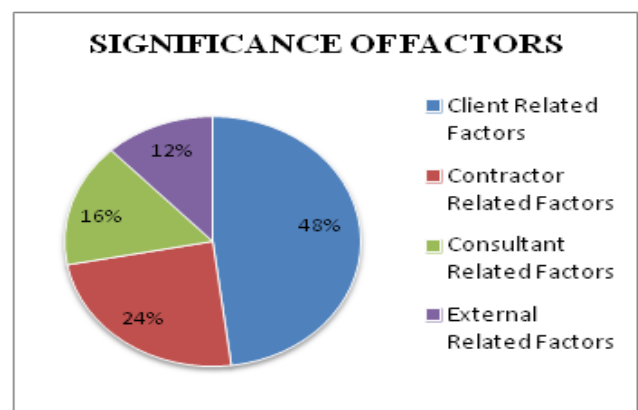
No	Effects of Client and Contractor related factors	RII	Ranking
1	Time Delay	0.912	1
2	Scope Changes	0.864	2
3	Cost increase	0.848	3
4	Financial issues	0.832	4
5	Lack of sponsors	0.800	5
6	Penalties	0.792	6
7	Poor Quality	0.656	7
8	Poor Management	0.608	8
9	Claims	0.584	9
10	Disputes among parties	0.568	10

Objective 3: To identify the level of significance to Contractor performance

### The Level of Significance on Contractor Performance

The study categorized the factors into four groups based on the different projects stakeholders' views.

From different respondents asked about the significance of four categories of factors influencing the contractor performance. The results are shown in graph 3 below.



Graph 3: Significance of factors Source: (Author, 2019)

**Objective 4: To develop a framework for better contractor performance**

For any organization or institution has to consider the following measures as shown in table 5 to improve the

performance to success. The respondents ranked measures based on their experiences.

**Table 5: Measures to better Contractor Performance**

No.	Measures to improve Contractor Performance	RII	Rank
1	Promote trainings	0.952	2
2	Enough preparation in Planning before implementation of the project	0.976	1
3	Enough preparation of funds	0.920	5
4	Enough preparation in Feasibility Studies and Design	0.856	9
5	Adequate Resources Mobilisation	0.776	13
6	Develop strategic communication	0.728	14
7	Project control, Supervision, Monitoring and Evaluation	0.864	8
8	Better use of available resources	0.944	3
9	Integration of new technology	0.848	10
10	Management of project stakeholders	0.688	15
11	Staff recruitment based competencies	0.944	3
12	Promote Staff Capacity Building	0.872	7
13	Promotion of Professionalism	0.832	12
14	Adequate application of Management tools	0.888	6
15	Hiring of Contract Manager	0.840	11

After analyzing the results from collected data, the factors with the higher degree of RII values had higher impact on the contractor performance.

The above table shows measures to better contractor performance. If every team member satisfactorily accomplishes assigned activities, the performance will result into successful in terms of quality, cost and time.

The measure which has the highest impact on contractor performance is enough preparation in Planning before implementation of the project with RII value of 0.976 and the lowest impacting measure is management of project stakeholders which has RII value of 0.688.

**Discussion of the results**

**The Client Related Factors**

The client related factors had the following RII values: Contract Duration is too short(RII= 0.920 ), Financing Institutions(RII=0.912 ), Weak Organizational of Institutions(RII=0.904), Financial preparation ( RII=0.864), Poor Feasibility Study ( RII=0.84), Procurement Process ( RII=0.816 ), Administration Process ( RII= 0.792 ) , Project Scope Management(RII=0.792 ) , Planning Control ( RII=0.776), Staff Capacity(RII=0.736 ), Payment Process ( RII=0.712 ) , Project Stakeholders ( RII= 0.696). The mean of RII values for client related factors was 0.81.

For client related factors the highest RII value was 0.920 for Contract Duration which is too short and the lowest was 0.696 for Project Stakeholders.

**The Contractor Related Factors**

The factors had the following RII values: Importation process(RII=0.994), Financial issues(RII=0.896), Management Methods(RII=0.896), Poor Implementation of project schedule(RII=0.880), Inadequate Labors(RII=0.872), Inadequate experience(RII=0.824), Weak Organizational of the company(RII=0.824), Applied

Management tools(RII=0.792), Staff Capacity(RII=0.792), Design errors(RII=0.784), Lack of knowledge for new technology(RII=0.656), Under Costing the project(RII=0.648).

For contractor related factors the highest RII value was 0.994 for importation process and the lowest was 0.648 for under costing of the project.

The mean of RII values for contractor related factors was 0.82 and this was greater than 0.81 of client related factors. It means that the contractors impacting their performances than the clients. But the results from qualitative analysis stated that the client related factors were most impacting the performance at 48% followed by contractor related factors of 24%.

**V. CONCLUSIONS**

No project can be implemented and managed perfectly, however can be planned to the successful performance before execution.

The main objectives of this study were to assess the factors influencing the contractor performance, indicate the level of significance and develop a framework for better contractor performance in water supply projects.

The above objectives were achieved using a detailed literature review and field survey data from water supply stakeholders in Rwanda.

A total of 25 factors attributes were identified and categorized into four groups of contractor, client, consultant and external related factors. The limitation of this study was client and contractor related factors.

# Factors Influencing the Contractor Performance in Water Supply Projects In Rwanda

This study indicated that the most affecting group of factors was the contractor related factors which had the high RII values compared to the client related factors. The results and findings of this study highlight the following recommendations to improve the contractor performance in water supply projects:

## Recommendations to the Clients

1. The contractor invoices should be paid on time to finance the works.
2. The clients also should maintain the same scope of the work throughout the construction period.
3. The procurement process should be improved to speed the contracting awards and select experienced and capable contractors and Supervisors.
4. Clients should also mobilize the required resources to the contracting works before the implementation period to avoid unnecessary stoppages due to the shortage of finance.

## Recommendations to the Contractors

1. The contractors have to ensure enough preparation in planning before commencement of the works
2. They have to employ the competitive staff.
3. Contractors should ensure the advance arrangements for equipment ordering processes to avoid their delivery delay on the sites.
4. The contractor should also consider the proper use of project management tools to ensure the successful performance.
5. Integration of new technology has to be considered in system build up

## Areas of Further Research

1. The role of resource planning in Construction industry in Rwanda
2. Factors influencing Technical innovation in Construction Industry in Rwanda

## VI. ACKNOWLEDGEMENTS

First I would like to thank the Almighty God for his mercies during the preparation of this work. I could not surely be where I am today without his protection and unending grace. I would also like to extend my gratitude to the Jomo Kenyatta University of Agriculture and Technology for giving me a chance to fulfill my dream of pursuing this noble course.

Special gratitude goes to my supervisors Dr. Abednego O. Gwaya and Dr. Titus Kivaa for their support and academic guidance during the accomplishment of this work.

I would also like to thank the following: Dr. Githae Wanyona, for his insight and advice during the early stages of preparation of this work. I wish to sincerely thank my University supervisors, parents, my family, my employer, Fabrice Nyakayiro Nkurikiyimana, Jean De Dieu Uwisengeyimana And Turacyayisenga Pierre Celestin.

Special thanks to WASAC Ltd( Semi Government Institution), CAVICON Consultants( Consultant Firm), Culligan International EACA and HYGEBAT Ltd Construction Companies for their provided information and time. I would also like to sincerely thank all those who participated in my data collection.

## REFERENCES

1. (2008). In surveying for construction 7th edition year 2008.
2. (2016, march). Retrieved 11 5, 2012, from [www.wasac.rw](http://www.wasac.rw).
3. Authority, W. a. (2014). Affordable Housing Report. Kigali: WASAC.
4. CMAA. (July 2015). Construction Project Management. in Afrikaans: CMAA.
5. Forum, 3. (June 2003). International Construction Project Management. Berlin: 3rd Forum.
6. M.J., J. (1986). Computers in Construction Planning and Control. London: Allen & Unwin.
7. MINISTRY OF INFRASTRUCTURE. (2017). Economic Study Report. Kigali: Rwanda Transport Development Agency.
8. Ministry of lands,environment,forestry,water and mines. (2004, 2). Retrieved 6 19, 2012
9. Ndikubwimana, I. (2017). Kanyonyomba water treatment plant. (WASAC, Performer) Eastern, Rwanda.
10. PARSONS. (2014). Standard Specifications for Raod and Bridge Works. RTDA.
11. RPPA. (2014). Causes of construction projects delay. Kigali.
12. Rwanda, N. I. (2012). Fourth Rwanda Population and Housing Census\_Housing. Kigali: NISR.
13. Viera, G. (April 2010). What Is Construction Project Management? CMAA.

## AUTHORS PROFILE



**Mr. Innocent ndikubwimana:** Bachelor of Technology (Surveying and Geomatics Engineering), University of Rwanda. Master of Science, Construction Project Management, JKUAT (Ongoing).



**Dr. Abednego Gwaya:** B.A (Bldg.Econ.),U.O.N,MSc. Civil Eng. Makerere, PhD (Const. Eng. & Mngt),JKUAT. Specialization: Construction Project Management, Civil Engineering Construction, Contract Documentation, Project Management Modeling, Project Procurement Systems and General Quantity Surveying.



**Dr. Titus Kivaa Mbiti:** PhD (RMIT, Australia), MA (Bldg Mngt, MON) BA (Bldg Econ, University Of Nairobi), CIQSK, RQS Specialization: Quantity Surveying, Construction Management, Project Management & Construction Research