Factors Affecting the Performance in the Implementation of Government Building Construction Projects: A Case Study in Bole Sub- City of Addis Ababa

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Abstract— Building project implementation has so many issues and complex performance, such as time, cost, quality, and safety. This study identified and assessed the essential factors influencing the implementation of public building projects, particularly in the Bole Sub-city of Addis Ababa. There were 46 factors identified, validated, and divided into 9 categories. Questionnaires are distributed to 120 respondents, of which 8 for owners, 25 for consultants, 86 for contractors, and one head of the office. The key factors decided upon were: liquidity of the organization, improved availability of commodity prices for people with high experience and expertise, and the quality of equipment and raw materials in the project. The agreement between the parties on the ranking of factors was calculated based on their Relative Importance Index. Besides, the value of the Cronbach's Alpha for variables calculated above 0.7, which means the data and scale are reliable and accepted for further analysis to correlate the different groups of factors. Results showed that cost, time, quality, productivity, and customer satisfaction are the top five essential factors affecting the performance of the government public building in the study area.

Keywords – Construction Industry, Correlation technique, Essential factors, Project performance, Public building project.

I. INTRODUCTION

With growing higher users' requirements, environmental consciousness, and limited resources on one side, and high competition for construction company market place on the other side, the contractor have to be capable of constantly improving their performance [1]**.** The value of project management within the industry cannot be overemphasized. However, research suggests that some of these projects fail because of delay, cost overrun, low requirement requirements, and complete abandonment [2]. It should be the issue of attention in the construction world due to problems associated with the construction project. So many projects fail to accomplish planned targets and objectives [3].

Consequently, literature was devoted to assessing the factors that account for these failures or factors that lead to poor performance. However, these studies have primarily looked at these variables from an industry-wide viewpoint or private sector [4]**.** In this study, it will shift away from this generic role to concentrate on only public building projects. Government construction projects have direct and indirect effects on the general population. It offers an avenue for social and economic-economic growth and development for the people through the provision of jobs, social facilities, and other related development [5].

According to Creswell (2003), performance improvement, in general, is one of the key goals for a company to achieve competitive advantages. To gain and sustain competitive advantages, many construction industries shifted their traditional patterns and adopted new methods and techniques. This helps to pave the way to new ideologies in service sectors such as synchronized engineering, lead construction, as well as towards others [6]**.** Likewise, Fugar (2010) had explained the idea behind these philosophies was to maximize an organization's external and internal performance, leading to re-evaluating the performance management systems by gaining competitive advantages and performance measurement [7]. On the other hand, Okuwoga (1998) stated that the failure of any construction project is directly related to the problems associated with performance. The construction sector performance problems in developing economies can be classified into three layers: problems of shortages or inadequacies in industry infrastructure (mainly supply of resources), problems caused by clients and consultants, and problems caused by contractor incompetence/inadequacies [8]. The construction sector is given high prominence, several defects that need immediate action. One significant problem is the fact that the current infrastructure and construction projects show significant cost variation. This is occurring in spite of the fact that the Ethiopian government played a significant role in assisting contractors by providing training, supplying machinery, and developing supportive guidance [9]. In Ethiopia, it is common that the public building sectors

experience various problems and issues that must be addressed. Hence, this study will try to determine performance problems and analyze the influencing factors affecting the construction projects in the study area.

II. RESEARCH METHODS

2.1 Sample Size and Selection

The Bole sub-city construction office has 28 experts, including the office head. Among these 12 professionals and 15 are an administrative public servant and one office head. However, the study's target populations were purposively conducted on only professional officials because the researcher believes that these peoples have better theoretical and technical knowledge and information concerning the study's issues.

In the sub-district, there are 122 projects ongoing. The target population included in the study comprised of 12 clients, 122 contractors, and 35 consultants of the projects in the sub-city. Therefore, the total population for this research is 170. The sample size is calculated using the following Slovin's formula [10-11], with a margin of error of 5% and 95% confidence levels.

$$n = N/[(1 + N * e^2)]$$ --(1)

$$n = 170 / [1+170(0.05)^2] = 120$$

Where:
n = sample size
N = the population size
e = the error margin

The sample size has at least 120 respondents.

2.2 Sampling Technique and method for sampling

The study was used a non-probability sampling technique and a purposive approach with a proportionate of 12 clients, the researcher purposively selected construction office head and a probability sampling techniques of simple random sampling techniques of lottery method with proportionate used to select 85 contractors out of 122 total contractors, 23 project consultants out of 35 project consultants.

2.3 Study Variable

2.3.1 Independent Variable

Independent variables cause a change independent variables. In this study, factors that affect building construction performance such as Time, Cost, Quality, and productivity are major independent variables.

2.3.2 Dependent Variable

The study's dependent variable is the response variable or output of the character that changes because of variations in the independent Variables. In this study, the dependent variable is the performance of building construction. It is considered dependent because its value depends upon the value of the independent variables. Hence, building construction performance is a factor that is observed and measured depending on the effectiveness of the independent variable's effect.

2.4 Data Collection Process

2.4.1 Interviews

Interviews are being used to supplement and validate the questionnaire's findings. Hence, some similar questions from the questionnaire were asked. An interview holds for the head, clients, and contractors in the study area.

2.4.2 Questionnaires

In this study, the questionnaire is not only a prepared method but also for interviews and observations in the study area. Both open-ended and closed-ended questionnaires were prepared and distributed to a total of 120 respondents. The open-ended questionnaire is used to know a general understanding and explore in-depth information. A closed-ended questionnaire was designed to identify certain statements' individual attitudes—a questionnaire designed efficiently.

2.5 Data Processing and Analysis

In analyzing the primary data, the Relative Importance Index (RII) was used for averages, percentages, tables and graphs, frequency, and standard deviation. The secondary qualitative data are analyzed using narrative explanations. The procedure used in analyzing data was aimed at establishing the Relative Importance of the various factors [12] that influence the implementation of building construction of government projects in Bole sub-city.

There were three steps employed to analyze the data: (1) Calculating the RII value of each factor; (2) Ranking of each factor based on RII value. And (3) Determining the degree of correlations in ranking the variable among project managers, Consultants, and Contractors. Besides, the Pearson Correlation coefficient is used for measuring the differences in ranking between two groups of respondents scoring.

RII=($\sum$W)/(A*N) --(2)

Where:

RII = Relative Importance Index

W= Weightage each factor by the respondents

A=highest weight (i.e., 5 in this case)

N= the total number of respondents

In the process, the SPSS methods were adopted to determine the ranking importance of variables for government building construction of Bole sub-city. The various groups of respondents considered, such as Clients, Consultants, and Contractors. The five-point Likert scale (1, 2, 3, 4, and 5) was used to calculate each factor's variables in determining the ranking.

III. RESULTS AND DISCUSSION

A questionnaire survey was distributed to collect the information required from professionals involved in the Ethiopian construction sector to respond to the basic research questions on behalf of clients, consultants, or contractors. The four groups of respondents in the different government buildings sectors received a total of 119 questionnaires. Out of 119 questionnaires, 104 questionnaires were collected, consisting of 7 from the clients, 22 from consultants, 74 from contractors, and one from the head of the office. These results indicated an answer rate of 87.4% that is enough for the analysis, as shown in Table I.

TABLE I

THE RESPONSE RATE OF THE QUESTIONNAIRES

No.	Group	Questionnaire Distributed	Questionnaire Returned	Percentage Returned (%)
1	Client	8	7	87.5
2	Consultants	25	22	88
3	Contractors	85	74	87.1
4	Office head	1	1	100
	Total	119	104	87.4

3.1 Factors Affecting the Performance of the Industry

3.1.1   Cost Related Factors

TABLE III

RELATIVE IMPORTANCE INDEX (RII) OF COST FACTORS

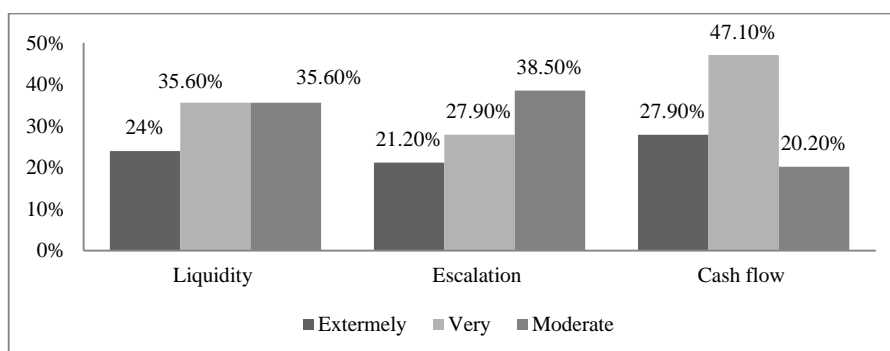| NO.	COST FACTOR	RII	RANK
1	Market share of the organization	0.65962	5
2	Cost of project overtime	0.58269	7
3	Differentiation of coins prices	0.63654	6
4	Material price escalation	0.78269	2
5	Cost of project Design	0.70769	4
6	Liquidity of organization	0.80385	1
7	Project cash flow	0.76538	3

Fig. 1. Top three highly important cost factors

The above-mentioned Table II was classified with an RII of 0.80385, based on the organization's average relative importance index value and liquidity. Respondents regarded this factor as most important as any project's cost performance depends primarily on the organization's liquidity.

This is because the liquidity of the organization is significant for project budget evaluation and cost performance. It is mainly due to economic and political circumstances. When the researcher referred to the political environment as the main factor, its political problems have not been stable for the last two to three years. They have affected the free flow of people and materials as needed. This factor has a strong impact on project planning and project cost performance.

According to the respondent's measurement and relative importance index, the second major cost factor is increased material prices with an RII value of 0.78269. Increased prices of materials impact both the government and the contractor, and the project's overall performance leads to projects being completed with poor output. The material price increase affects owners' liquidity (government) and the contractors' profit rate.

The project's cash flow has been ranked third with an RII value of 0.76538 by the respondents. At any stage in the project, cash flow can provide an important cost evaluation for the contractors. Contractors can also improve their cost performance through ongoing cash flow review. Cash flow is an important factor in assessing and measuring the performance of contractors. However, in most government projects, the contractor claims the early execution of payment certificates.

3.1.2   Time-Related Factors

TABLE IIIII

RELATIVE IMPORTANCE INDEX (RII) OF TIME FACTORS

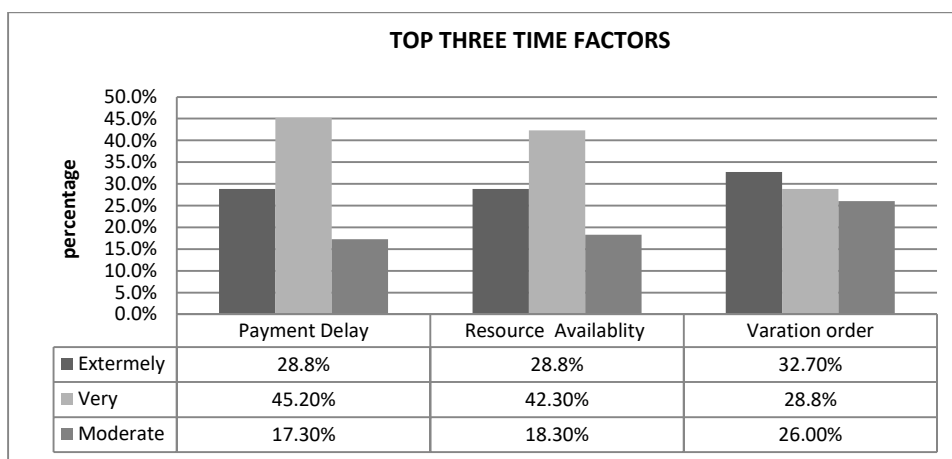| NO	TIME FACTOR	RII	RANK
1	Site preparation time	0.72885	4
2	The planned time for project construction	0.71731	5
3	The average delay in payment from the owner to contractors	0.78654	1
4	Time for a variation order	0.75577	3
5	Resources availability	0.77692	2

Fig. 2. Top three highly important time factors

Delay of payment of progress to contractors ranked first with a value of RII of 0.78654. The main reason why progress is delayed is that virtually all building payments submitted by the official government official have to be reviewed at the tender point, which usually takes more time to process. This is usually aggravated when there is a comment that needs revision at a lower level. Since only three people are available to check payments at the head office and a minimum contractual time of three weeks for processing, it will impact contractors who needed their money as soon as possible. The second major time factor was the availability of resources and ranked RII of 0.77692 in the respondents' second position. In most government projects, materials have been supplied by the government and will not be delivered on time as required by contractors. If the contractor does not possess resources as planned throughout the project, time and cost performance will be affected.

The respondents have ranked the time needed to implement variation orders in the third position with an RII value of 0.75577. The time required to implement the variation orders will affect the basic schedule's performance. If orders from consultants to the contractor are delivered late, the project's performance will also be delayed. Therefore, this will affect the time of implementation. The estimated schedule, for example, is changed and amended.

3.1.3 Quality-Related Factors

TABLE IV

RELATIVE IMPORTANCE INDEX (RII) OF QUALITY FACTORS

NO.	QUALITY FACTORS	RII	RANK
1	Compliance in specification	0.725	4
2	Quality assessment and Monitoring	0.74808	3
3	Quality training	0.80385	1
4	Quality of equipment and raw materials	0.75192	2

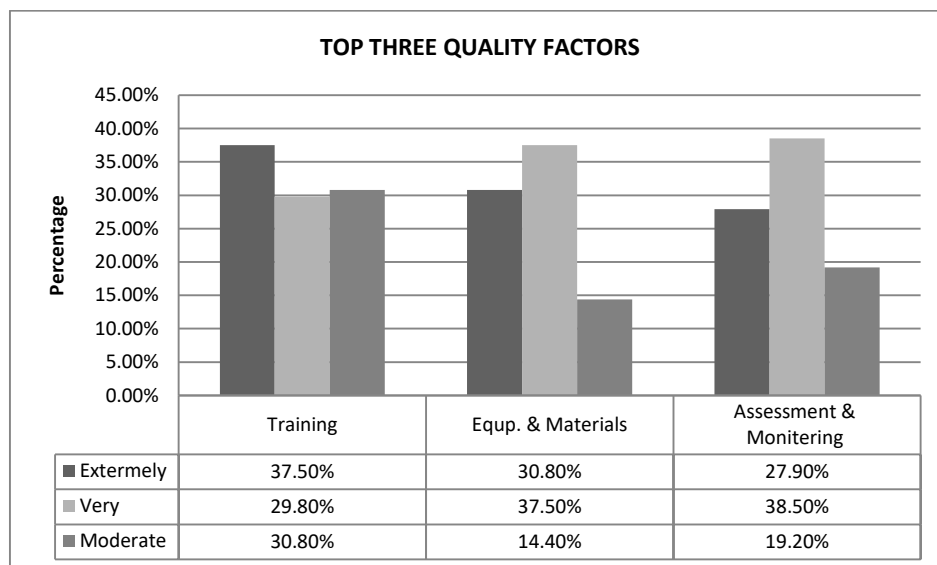| TOP THREE QUALITY FACTORS	Training	Equp. & Materials	Assessment & Monitering
Extermely	37.50%	30.80%	27.90%
Very	29.80%	37.50%	38.50%
Moderate	30.80%	14.40%	19.20%

Fig. 3. Top three highly important quality factors

Respondents ranked the availability of highly experienced and qualified personnel through first place training with an RII value of 0.80385. This factor is the most crucial factor for contractors and consultants due to the availability of highly experienced and qualified persons to assist contractors in the successful and appropriate implementation of their projects. The study is also conducted in Ethiopia; generally, most site managers are civil engineers with good work experience and little training or management education. Assist consultants in the project's supervision with good professionalism for the availability of highly experienced and qualified staff; this also helps them satisfy the owner with the project's successful performance.

Respondents ranked the quality of equipment and raw materials in the second position of the project with an RII value of 0.75192. Contractors must implement their projects following the required and agreed quality, as owners and consultants usually want the materials used in the supervised project per the specifications and agreements. But in a government project, all materials and equipment will be delivered, and possibly low quality due to budget and liquidity.

3.1.4   Productivity Related Factors

TABLE V

RELATIVE IMPORTANCE INDEX (RII) OF PRODUCTIVITY FACTORS

No.	Productivity Factors	RII	RANK
1	The sequence of work according to schedule	0.76538	2
2	Amount of new projects /year	0.67692	3
3	Management - labor relationship	0.79243	1
4	Lack of estimated rate	0.63462	4

TOP THREE PRODUCTIVITY FACTORS

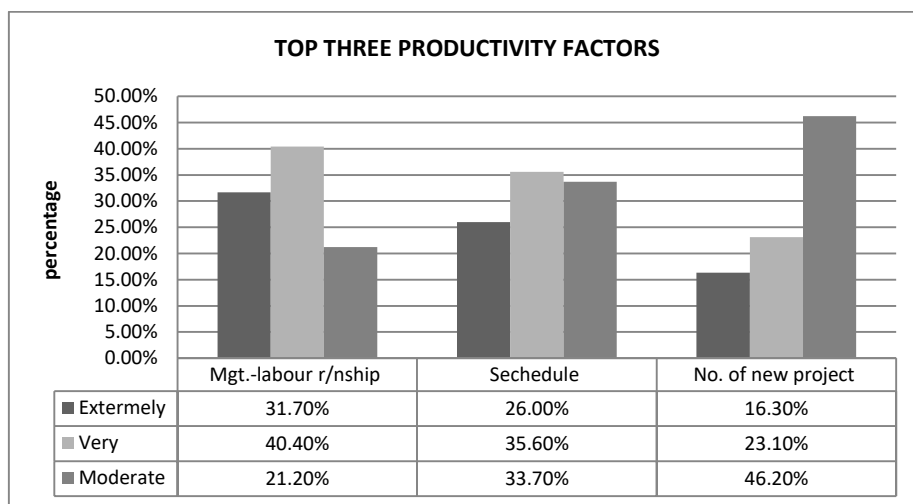|	Mgt.-labour r/nship	Sechedule	No. of new project
■ Extermely	31.70%	26.00%	16.30%
■ Very	40.40%	35.60%	23.10%
■ Moderate	21.20%	33.70%	46.20%

Fig. 4. Top three highly important productivity factors

Respondents ranked the Work-Management Relationship in the first position with an RII value of 0.79243. Management-labor relations can help ensure strong coordination and motivation between the level of work and management level. It will lead to the successful implementation of the project's productivity and the project's appropriate time-performance.

According to the schedule, the respondents ranked the sequence of work in the second position with an RII value of 0.76538. This factor is the most critical factor for contractors. According to the schedule, the work sequence helps contractors implement the project within the timeframe for completion of the project. This factor is the essential factor for a consultant because the schedule of work sequences allows consultants to deliver the project to the owner according to the project's scheduled time. Contractors will, therefore, not suffer from time and cost performance problems.

3.1.5 Factors that impact Customer satisfaction

Leadership skills were ranked first by the respondents, with an RII value of 0.7385. It is the most important factor for owners, consultants, and contractors since project managers' management skills influence project performance and customer satisfaction. The main reason is to manage project activities properly. It is usually reflected in either low quality of work, delaying the site's completion time, or unnecessary additional costs for the project. It will also result in delays in processing payments to contractors due to several comments made during the next higher-level engineer's check. Several disputes between the owner and the project parties; the second-ranked respondents were ranked with an RII value of 0.7327.

The problem between the owner and contractor will affect the relationship between them, and the degree of client satisfaction will be affected. This factor is essential for contractors because some disputes substantially impact customer satisfaction and construction contractors' performance. Disputes between both the owner and the consultant will affect the relationship between them, and the extent of satisfaction of the client will be affected. It can affect the performance of the project as a whole.

TOP THREE CUSTOMER SATISFACTION FACTORS

	Leadership skill	Dispute	Attitude
■ Extermely	22.20%	32.70%	13.50%
■ Very	40.40%	26.90%	23.10%
■ Moderate	25.00%	17.30%	28.80%

Fig. 5. Top three highly important customer satisfaction factors

3.1.6 Factors Related to Regulatory & Community Satisfaction

Respondents ranked the quality and availability of regulatory documentation in the first position with an RII value of 0.700. Quality and availability of regulatory documentation have an impact on regular and community satisfaction. Project performance will also be affected by this. In the second position, the respondents classified problems with the RII value of 0,67115 among their neighbors and site conditions. This problem affects the performance of the contractors and causes disputes and delays to the project. There are some disputes over compensation for the property owner, which will affect the community's cost, time, and satisfaction in the present study.

TOP THREE REGULAR & COMMUNITY SATISFACTION FACTORS

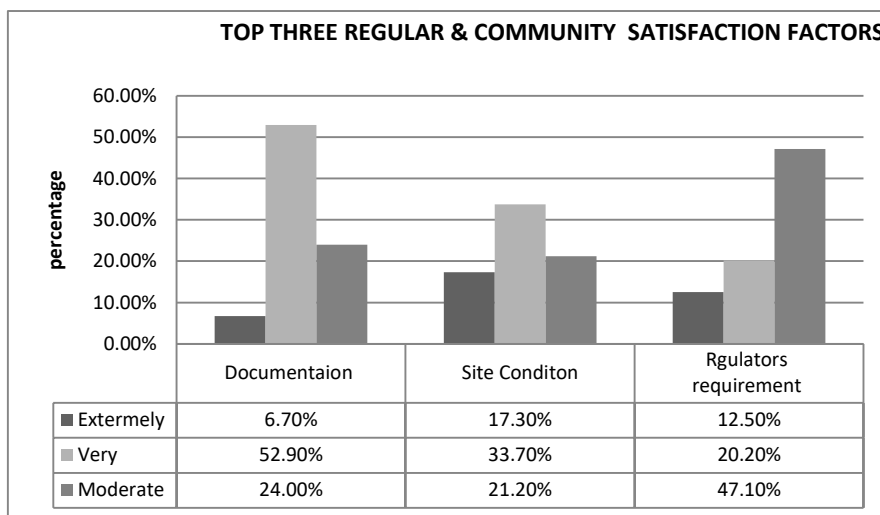|	Documentaion	Site Conditon	Rgulators requirement
Extermely	6.70%	17.30%	12.50%
Very	52.90%	33.70%	20.20%
Moderate	24.00%	21.20%	47.10%

Fig. 6. Top three highly important Regular & Community Satisfaction factors

3.1.7 Factors that affect the health and safety of the project

The application of health and safety factors in the organization was ranked first by the respondents, with an RII value of 0.78462. The most important factor for consultants is that the application of health and safety factors in construction projects will satisfy the owners. This factor is the most important factor for contractors, as the application of health and safety factors in construction projects will improve the performance of construction contractors in the project.

The project's reported the second-ranked respondents ranked accident rate with an RII value of 0.72115. Owners regarded this factor as the most important because the reported accident rate usually affects the safety performance and customer satisfaction of construction projects.

TOP THREE HEALTH & SAFETY FACTORS

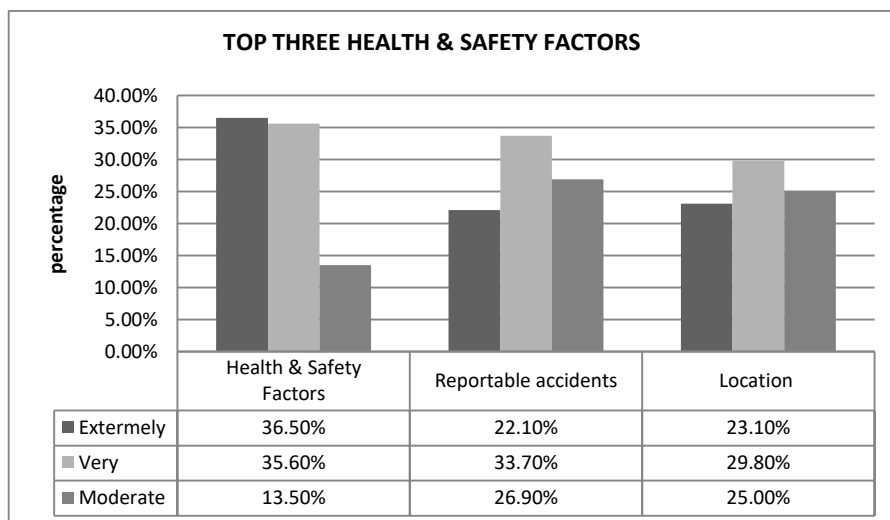|	Health & Safety Factors	Reportable accidents	Location
Extermely	36.50%	22.10%	23.10%
Very	35.60%	33.70%	29.80%
Moderate	13.50%	26.90%	25.00%

Fig. 7. Top three highly important Health & Safety factors

3.1.8 Innovation and Learning Factors

Respondents ranked the best practice and experience of others in the first position with an RII value of 0.79231. It is an essential element for consultants and consultants because it can develop and improve the party's current and future projects. As learning from the best experience and practice of others, affects the parties' performance as it affects the innovation required for construction contractors' supervision and performance. This is related to customer satisfaction. Learning from their own

experience and history was ranked second by respondents with an RII value of 0.76538. It means it can improve and develop the performance of current and future projects by a consultant. Learning through their own experience and history affects contractors' performance since it affects the innovation and learning needed to implement projects.

TOP THREE INNOVATION AND LEARNING FACTORS

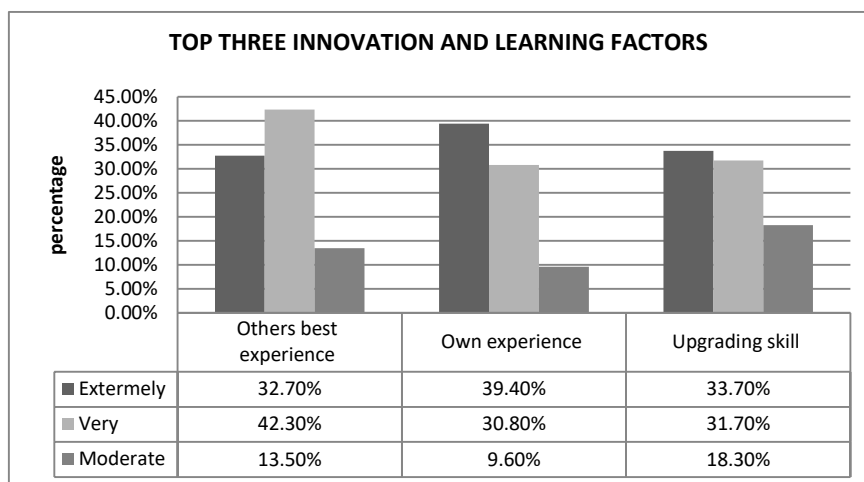|	Others best experience	Own experience	Upgrading skill
■ Extermely	32.70%	39.40%	33.70%
■ Very	42.30%	30.80%	31.70%
■ Moderate	13.50%	9.60%	18.30%

Fig. 8. Top three highly important Innovation and Learning Factors

3.1.9 Environmental Factors

TABLE VI

RELATIVE IMPORTANCE INDEX (RII) OF ENVIRONMENTAL FACTORS

No.	FACTORS	RII	RANK
1	Air quality	0.60962	3
2	Noise level	0.625	2
3	Wastes around the site	0.69615	1
4	Climate condition in the site	0.4808	4

The waste around the site has been ranked with an RII value of 0.69615 by the respondents in the first position. This is the most critical aspect because waste around the site affects the health and safety of employees. The respondents ranked the noise level in the second position with an RII value of 0.625. This affects the productivity and time performance of the project.

3.2 Correlation on Major Building Project Performance Factors

3.2.1 Reliability of research instruments

Reliability estimates the consistency of the measurements or, more simply, the degree of uniformity of the results obtained from repeated measurements. For this purpose, the quality of data was measured, evaluated, and guaranteed using appropriate techniques. The data quality has been assured and measured through an internal validity instrument to correct the research instruments' application for accurately measuring the variables during the data collection procedures. Besides, data consistency was checked using a reliability test [13]. According to Taber (2018), Reliability less than 0.6 is considered to be poor, those in the 0.7 range, acceptable, and those above 0.8 are good. Cronbach's Alpha is a statistical test used to examine the internal consistency of the attributes determined for each dimension [14]. As shown in Table VII, the value of the Cronbach's Alpha for variables was found to be above 0.7, which is an indication of the acceptability of the scale for further analysis for correlating the different groups of factors.

TABLE VII

CRONBACH'S ALPHA COEFFICIENT OF VARIABLES

No.	Variables	No. of Items	Cronbach's Alpha Coefficients (α)
1	Cost	7	0.706
2	Time	5	0.756
3	Quality	4	0.775
4	Productivity	4	0.801
5	Customer satisfaction	9	0.876
6	Regulatory & community satisfaction	4	0.739
7	Health and safety	4	0.829
8	Innovation and Learning	5	0.804

| 9 | Environmental factors | 4 | 0.701 |

3.2.1 Correlation of Group of Factors

Result from the RII value and ranks shown in Table VIII, Cost was ranked as the first key performance indicator with an RII of 0.804. This is because the cost impact on project performance is very high and has been a first-class performance issue in construction projects. Quality was the second performance indicator with RII equal to 0.798. Quality has a major impact on the overall performance of construction projects. The third key performance indicator is time, with 0.794.

The overall impact on the performance of the project will be high. Productivity was ranked as the fourth key performance indicator with RII equal to 0.787. The efficiency of the project has a significant impact on the overall performance of building projects. Based on the result, health and safety were ranked 5th with an RII of 0.785. It affects the overall performance of the project. Customer satisfaction was the top six key performance indicators with an RII of 0.783, in addition to health and safety factors. This factor ranked in this position is due to its moderate impact on overall project performance.

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TABLE VIII

RELATIVE IMPORTANCE INDEX (RII) OF KEY PERFORMANCE INDICATORS

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No.	KEY PERFORMANCE FACTORS	RII	RANK
1	Cost	0.804	1
2	Time	0.794	3
3	Quality	0.798	2
4	Productivity	0.787	4
5	Customer satisfaction	0.783	6
6	Regulatory & community satisfaction	0.738	7
7	Health and safety	0.785	5
8	Innovation and Learning	0.700	8
9	Environmental factors	0.696	9

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IV. CONCLUSION

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The major performance issues most frequently encountered in the study area were cost, time, quality, productivity, customer satisfaction, health and safety, innovation and learning, and environmental factors of varying importance. Liquidity of organization and Escalation of material prices have been a critical factor leading to an overrun of project costs and its cost performance. The cost of materials and equipment has a major impact on project cost performance. There have been insufficient resources at project sites to carry out projects on time. The critical factors affecting project time have been too much variation in owners' orders, changes in design, and contractors' financial constraints. There has also been a delay in regular payments from owners to contractors.

The critical quality factor was the lack of availability of quality materials and equipment or machinery. Most of the projects do not have competent staff to achieve the projects' quality, and contractors have problems with the projects' performance to confirm the quality specifications. The critical factors leading the projects to a failure in productivity performance were the sequence of work according to schedule, weather conditions, workforce shortages, unskilled machine operators, unavailability of competent staff and machines. There has been a high rate of absenteeism through the projects, and, as a result, there is a productivity problem at the project sites.

The delivery of the projects by the owner was problematic, and this led to the project owners being dissatisfied. Several disputes between the owner and the project parties and some contractor's claims have been critical factors affecting the client's satisfaction. There has been a lack of awareness of workers' safety and the proper use of safety equipment. On the project site, there was no health and safety application.

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