



Research Paper

Assessment on Performance and Challenges of Ethiopian Construction Industry

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ABSTRACT: The main reason that initiated this research was the finding of a recent study at the London School of Economics (LSE) in UK that reported the management practice in Africa is poor as compared to Europe and North America. According to this report, Ethiopia is the second from the last followed by Mozambique which indicates that the management practice in Ethiopia is even far behind from those poor performing developing countries in Africa. With this driving fact, this research assessed the performance of Ethiopian construction industry with respect to construction project management practices and its challenges in order to identify the major issues for intervention. The results revealed that the level of construction project management practice in terms of adapting general project management procedures, project management functions, tools & techniques to be unsatisfactory. Particularly, the level of practice in terms of safety, risk and time management was found to be very low. The amount of schedule slippage ranges between 61-80% and that of planned costs and other variables such as risk, quality, resources utilization and safety deviates in the range 21-40% from predetermined requirements or anticipated at the beginning of the project.

Keywords - Civil engineering, Performance evaluation, Challenges, construction, Ethiopia.

I. INTRODUCTION

A. Ethiopia from the global perspective

A recent study by Centre for Economic Performance at the London School of Economics (LSE) in UK on management practice that bases on three aspects (lean operation, talent management and performance management) reported that Africa and Latin American countries are performing less [1]. The assessment was conducted on 33 countries around the globe including 7 African countries. According to this report Ethiopia is the second from the last followed by Mozambique as compared to all the 33 countries in the studies and that of the 7 countries representing Africa (See Fig. 1).

Ethiopia is one of the developing countries in the horn of Africa bordered by Eritrea to the north and northeast, Djibouti and Somalia to the east, Sudan and South Sudan to the west, and Kenya to the south (Fig. 2). The country is the second populous country in Africa next to Nigeria, with over 90 million inhabitants, it occupies a total area of 1,100,000 square kilometers (420,000 sq mi), and its capital and largest city is Addis Ababa [2], [3].

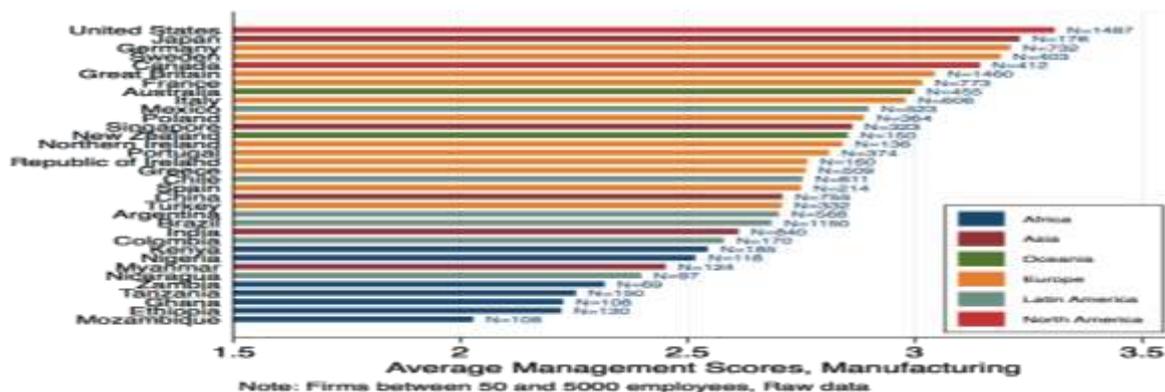


Figure 1. Average Management Scores (source: [1]).

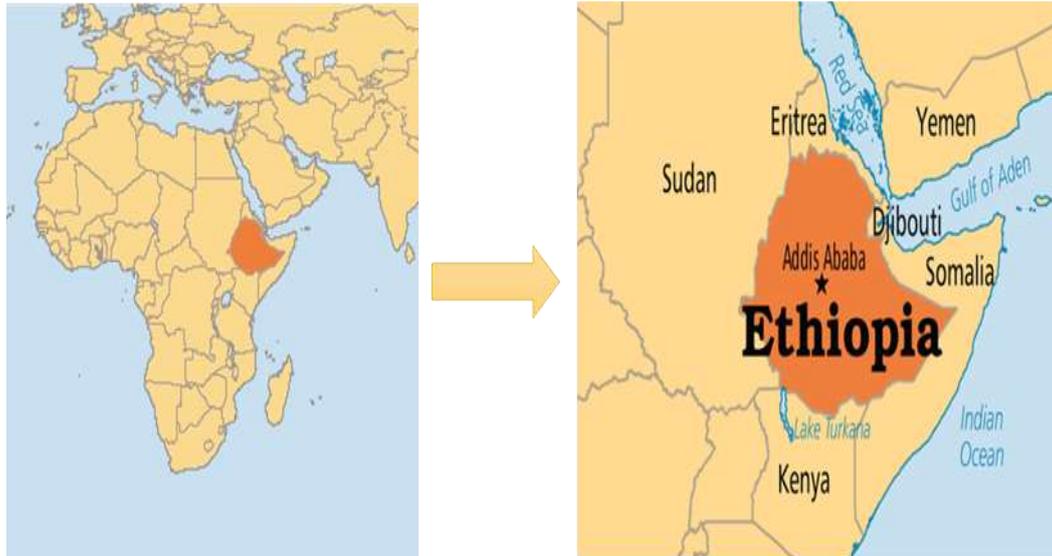


Figure 2. Description of the study area Ethiopia (Source: <http://www.operationworld.org/ethi>)

B. Ethiopian Construction Industry

Based on [4], the Ethiopian construction industry can be viewed in six distinct periods for its evolution. The following table summarizes these distinct periods and their feature.

Table 1. Summary of Ethiopian construction industry six distinct periods. (Adapted from [4]).

| Period | Designation | The Feature of Each Periods |
|-------------------|--|--|
| Pre 1968 | Foreign Company Domination | This was a period where almost all construction activities in the country were undertaken by international construction companies |
| 1968-1982 | Emergence of small scale domestic construction companies | A period that encourages private sector development, which results in establishment of small-scale domestic construction companies in the country. |
| 1982-1987 | Parastatal Companies domination | This period was known as parastatal company domination period since the government has taken the private construction company that was established earlier and those state owned construction firms undertook almost all construction activities. |
| 1987-1991 | Fragmentation of Phases | During this period design services and construction phases was introduced as a separate phase to Ethiopian construction industry. |
| 1991-2001 | Era for Re-emergency of privatization | The year 1989 brings another change in government with completely different policies that re-emerge private sector development. As a result of this a number of private construction companies were established in the country and started taking parts in many construction activities. |
| Since 2001 | Emergency of Integration and capacity building | Realizing the performance and capacity limitation of domestic firms, which begins to be involved in some projects, the government has introduced the concept of integration and capacity building in 2001. |

The construction industry in Ethiopia has been developing tremendously since 2001. Recent studies by (Zewdu & Aregaw 2015) indicated that the GDP contribution of the industry has been raised to 5.6% and approaches to the sub Saharan average (6%). Meanwhile, the Gross Domestic Capital Formation (GDCF), which was about 60 percent in 1996/97, has reached nearly 75% in 2002/03. Beyond its contribution to the nation, the industry is also the 6th major contributor of the content infrastructure stock following South Africa, Egypt, Morocco, Algeria and Nigeria [5].

Since then, the country has been implementing significant number of programs/projects, which include the University Capacity Building Program (UCBP), the housing development program and the road sector programs among others. Table 2 summarizes the major construction projects undertaken during this period.

Table 2. Summary of Major Construction Projects in Ethiopia during this period.

| Sector | Program/Projects | Description |
|---------------------------|--|---|
| Building | University capacity building Program | It was a program with an objective of constructing 13 university projects together with capacity development of domestic construction and consulting firms. The program was designed and implemented with involvement of GTZ IS as a project-implementing agent. |
| | Housing development Program | This was a program that aims to construct 450,000 housing units in 5 years in the capital and creating employment opportunity for small and medium scale enterprises. |
| Road and Transport | Road Sector Development Program I -III | A 13 years program that was planned to implement 38,080 Km of road together with capacity building of domestic construction and consulting firms. At the end of the 13 years the program was succeeded to accomplish 105% of its target (39,965km). In addition to road infrastructure the country has also identified potential railway corridors to connect the capital with major cities. Currently there are two active railway projects in Ethiopia: The Light Railway Transit in the capital and the Addis Ababa- Djibouti rail way that connects the capital to the port of Djibouti. |
| | Railway | |
| Energy | Gilgel Gibe I-III, Tekeze and Beles | These are hydropower projects constructed for the last two decades to generate 3,230 MW of electricity. Except Gilegel Gibe III all of these projects are completed some years back and started functioning. |
| | The Renascence (GRD) | Besides the above hydropower projects, the country is also undertaking the construction of the great renaissance dam (GRD) which is expected to generate 600GW. |
| | Geo-Thermal Project | This is also one of the mega and largest Geo-thermal plant in Africa launched at a cost of 4Billion USD recently. |

Despite its prominent role, the construction industry in Ethiopia, like in other developing countries, faces many challenges in its practice. Some of these challenges are project overruns, poor quality, inappropriate procurement systems, and a failure to cope with project requirements and the inability to adopt best practices [4], [2], [6].

II. CONSTRUCTION PROJECT MANAGEMENT AND ITS CHALLENGES IN DEVELOPING COUNTRIES

Project Management is a specialized management technique necessary for the planning, organization and control of projects under one strong point of responsibility [7]. [8] also described Project Management as the application of knowledge, skills, tools, and techniques to project activities in order to meet project requirements. On the contrary, Lack of sound Project Management by owners or contractors on projects on the other hand leads to construction delays and extra costs for both parties [9]. Similarly, [10] define professional project management practices as the skills and science of planning, designing, and managing activities throughout the project lifecycle. In agreement with the above authors, [11] stated that Project Management is clearly designed to achieve a successful outcome of the projects and argue that if not properly practiced it may convey a differ result. [12] on the other hand argue that construction projects are somewhat difficult to manage and meet these requirements due to the nature of the industry; such as complex and unique nature, mobile workforce, ingrained culture, working conditions, and project-based setup, diverse sub-contractors and suppliers.

The function of construction project management is therefore to predict as many of the risk and problems as possible and to plan, organize and control activities so that the project is completed successfully [13].

The performance of these projects against what was planned can be measured and evaluated using a large number of performance indicators that could be related to various dimensions (groups) such as time, cost, quality, client satisfaction, business performance, health and safety [14]. They further argue that time, cost and quality are, however, the 3 predominant performance evaluation dimensions. [15] also agreed with [14] and they pointed out that cost, time and quality are the three basic and most important performance indicators in construction projects. [8] on the other hand stated that the application of sound Project Management practices provides construction project stakeholders with the means to meet their objectives which is described in terms of

meeting the intended, purpose, the level of quality, time, cost; and safely and while protecting the environment. According to [12], [7], [16], the success of a project is measured by the extent to which it meets the predetermined criteria of cost, time, safety, resource allocation, and quality as determined by the owner which are quite difficult to meet in most construction projects.

[17] on the other hand explains that whether an organization manages stand-alone or multiple projects, whether those projects are small or large, whether the customers are internal or external, or whether the nature of the work performed is product development, construction, design, IT, or service; most projects are difficult to manage because of two things: first, they involve uncertainty. Second, they involve three different and opposing commitments: Due date, budget, and content (quality and scope).

[18] on his part contends that in spite of the extensive efforts that has been made to improve the performance of the construction industries in many developing countries, the industries in these countries continue to face problems including poor cost, time and quality performance; lack of work opportunities and poor level of professionalism. As it is described by [19], the main reasons for project failure in developing countries are: lack of advance planning, a holistic approach, lack of comprehensive engineering and management strategy, inconsistency in monitoring and follow-up, coordination and communication lapses and above all, absence of a methodical approach. Extending his argument [20] further described that these factors significantly affect the efficient performance of construction team and in most cases lead to project failure [21].

According to [18], developing countries in general fall short when compared with other sectors of the economy within their own countries, as well as with their counterparts elsewhere with regard to productivity, quality, safety and health, and environmental performance. Although these problems are common for most construction industries in all countries, those in the developing nations face them to larger extent due to the additional difficulties of economic stress, resource shortages, and institutional and legal which make the task of improving their performance even more demanding [18].

C. The Extent of the Problem in Some Developing Countries

A study on cost and time overrun by [22] in Malaysia indicated that the Malaysian construction industry is characterized by poor performance leading to failure in achieving effective time and cost performance. The findings of this study revealed that 92% of construction projects were overrun and only 8% of project could achieve completion within contract duration. In terms of cost performance only 11% of respondents mentioned that normally their projects are finished within budgeted cost while 89% of respondents agreed that their projects were facing the problem of time and cost overrun in the range of 5-10% of contract.

Another study by [23] in Malaysia on the other hand concluded that only 46.8% and 37.2% of public sector and private sector projects respectively are completed within the budget. The study by [24] also contends the same idea: 9 out of 10 transportation infrastructure projects costs are underestimated and that for all project types, the actual costs are on average 28% higher than estimated costs. The situation seems to be worse in India where studies on construction projects, found that more than 60% of projects experienced up to 200% time overrun and 750% cost overrun [25].

D. The Extent of the Problem in Some Selected African Countries

Most of these challenges are also observed in many African developing countries such as Nigeria, Kenya, Ghana, Uganda and Tanzania. [25] in Tanzania found out that total cost and time overrun rates on average to be 44% and 26% respectively by considering seven projects. [25] further identified that among other factors the average contribution of inadequate design to be 26% and 32% respectively and the extent to which inadequate design contributes, as a percentage, to cost and time overruns was 61% and 85% respectively.

The case in Ghanaian construction industry as it is highlighted by [26] has also several of the characteristics of construction industries in developing countries. According to [26] the industry's performance in most respects, such as cost, time, quality, safety and health of its workers, the durability of its products and the satisfaction of its stakeholders is inadequate.

The Nigerian construction industry is also still struggling with a lot of intrinsic challenges, ranging from inadequate technical and managerial know-how to insufficient financial, material and equipment capital base [27]. A study on evaluation of management challenges facing the Nigerian construction industry also revealed that time; cost, quality, and safety remain the top management challenges facing construction managers in Nigeria [12].

The case in Kenya is also not different with other most of African countries. The industry is facing lots of challenges such as the expenditure exceeding the budget, delay to complete the project in time, the building defects and over-reliance on foreign workers. Most construction projects especially road infrastructure in Kenya are exposed to extreme cost escalation to the extent that it calls not only for extra funding but also specialized expertise hence leading to technical and project managerial conflicts between project's parties [28].

[29] in his study in Botswana on the other hand investigated that seven out of ten public projects had reported cost overruns and the factors that influence cost overruns have been identified and ranked in order of

significance, accordingly variations, re-measurement of provisional works, contractual claims and fluctuations in the cost of labor and materials, with variations being the most significant. He also cited a recent study in which only 16% of the projects were considered successful (i.e. completed on time, within budget, and to specification).

III. RESEARCH METHODOLOGY

The study approach involves both literature search and the use of structured questionnaire, which was considered to be the most appropriate tool to reach the population of the study with limited time and from a distance at a time. The literature review was conducted to extract the variables for the assessment and to have a conceptual bases on the subject matter. Accordingly, the survey was designed based on variables extracted from literatures and organized in three parts which include questions related to respondent profiles, performance related issues and management challenges.

The designed survey were then sent to 135 professionals selected through stratified random sampling from academic institution, owner’s origination, implementing agencies, construction and consulting firms in the following proportions in Addis Ababa in order to reach majority of the companies and more experienced professionals: 21 to client; 38 to consultants; and 46 to contractors, 15 to academicians and 15 to others. Out of the 135 questionnaires distributed, 81 were received and only 69 were duly completed and found suitable for analysis, representing a responses rate of 51.11%.

The data obtained from the survey was analyzed using mean score together with standard deviation in order to rank the level of project management practices and major management challenges facing the industry. The output of the analyzed data is presented using tables, graphs and simple percentage for further interpretation.

IV. RESULTS AND DISCUSSION

E. Respondent Background

As it can be observed from Figure 3 below, the distribution of the response is 70% from contractors and consultants (35% each), 18% from academicians and implementing agents (which is 9% each) and 11% from clients. In terms of experience, more than 66% of the respondents have more than 10 years’ professional experiences in the industry.

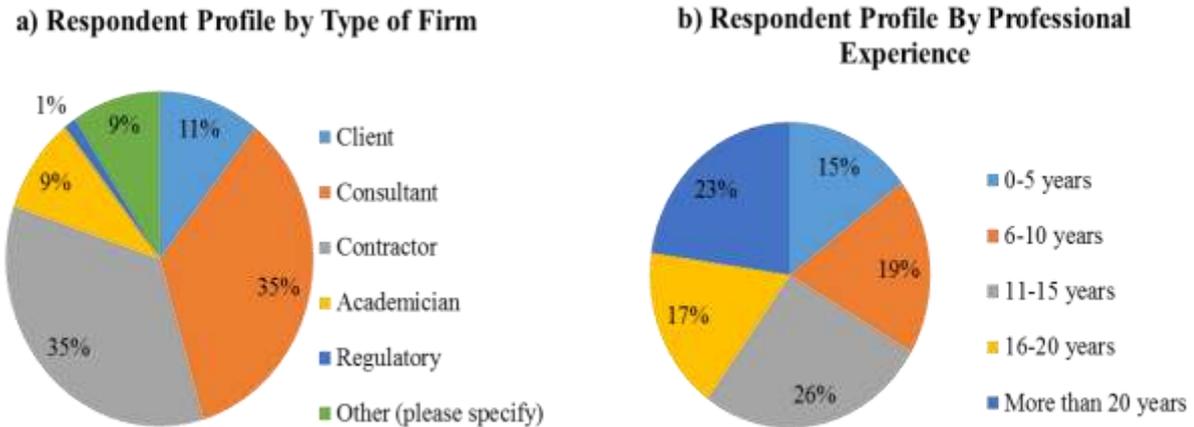


Figure 3. Respondent Profile by: a) type of firm, b) professional experience.

F. Project Management Practice in Ethiopian Construction Industry

Following their profile identification, respondents were asked about their experiences in General Project Management Practices; mainly to what extent they practiced project management functions, tools & techniques, adapting construction project management procedures and some other important aspects of construction management practices such as quality, safety and contract management etc. The respondents were asked to note each parameter as follow: 1. Very low 2. Low 3. Medium 4. High 5. Very High. Table 3 presents the results of this question. The response revealed that the level of practice on these project management aspects in general and that of safety (1.59), risk (1.84) and time (2.07) in particular is very low.

Tableau 3. Response on Project Management Practices

| Project Management Practices | Mean Score | Standard Dev. | Rank |
|--|-------------------|----------------------|-------------|
| General Construction Project Management Practices (Extent of Application of Project Management Functions, Tools and Techniques) | 2.25 | 0.65 | 4 |
| General Construction Project Management Practices (State of Adoption and Implementation of Construction Project Management Procedures) | 2.28 | 0.61 | 5 |
| Risks Management Performance – Stake Holders Perception, Trend, Identification of Causes of Risks and their Responsibility Allocation | 1.84 | 0.63 | 2 |
| Delay Management Practices – Identifying/Understanding Causes of Delays and Delay Responsibility Allocation | 2.07 | 0.75 | 3 |
| Safety Culture – Perceptions and Practices | 1.59 | 0.64 | 1 |
| Quality Culture – Perceptions and Practices | 2.53 | 0.72 | 6 |
| Constructability Practices | 2.68 | 0.78 | 8 |
| Contract Management Practices | 2.81 | 0.58 | 9 |
| Bid Procurement Practices | 3.06 | 0.7 | 10 |
| Addressing Client Satisfaction | 2.67 | 0.72 | 7 |

The results agreed with [18] who identified safety and time performance as a major shortcoming of construction industry in developing countries. A study on cost and time overrun by [22] in Malaysia also revealed similar trends in Malaysian construction industry which is characterized by poor performance that leads to failure in achieving effective time and cost performance. [7] has also identified that construction projects as full of risk which is very difficult to anticipate in advance due to its complex nature as well as the involvement of many participants. [30] on the other hand described that construction projects have often suffered from high fragmentation, large waste, poor productivity, cost and time overruns which leads to long term disputes in some cases. In agreement with others [31] also pointed out that poor construction management as one of the major causes of cost and schedule overruns that can eventually lead to the extent of total project abandonment.

The survey result also revealed that the level of application of General Project Management Functions, tools & techniques (2.25) and that of adapting construction project management procedures (2.28) are unsatisfactory. This result also agreed with the findings of [19] who identified the main reasons for project failure in developing countries as lack of advance planning, a holistic approach, lack of comprehensive engineering and management strategy, inconsistency in monitoring and follow-up, coordination and communication lapses and above all, absence of a methodical approach. It also agreed with [18] who pointed out developing nations are more vulnerable to performance problems in larger extent due to the additional difficulties of economic stress, resource shortages, and lack of institutional and legal frame works. The findings also agreed with those of [32] who studied Project Management Maturity in Ethiopia and demonstrated that the processes maturity level is at informal level and the maturity level in terms of practice is even at basic level.

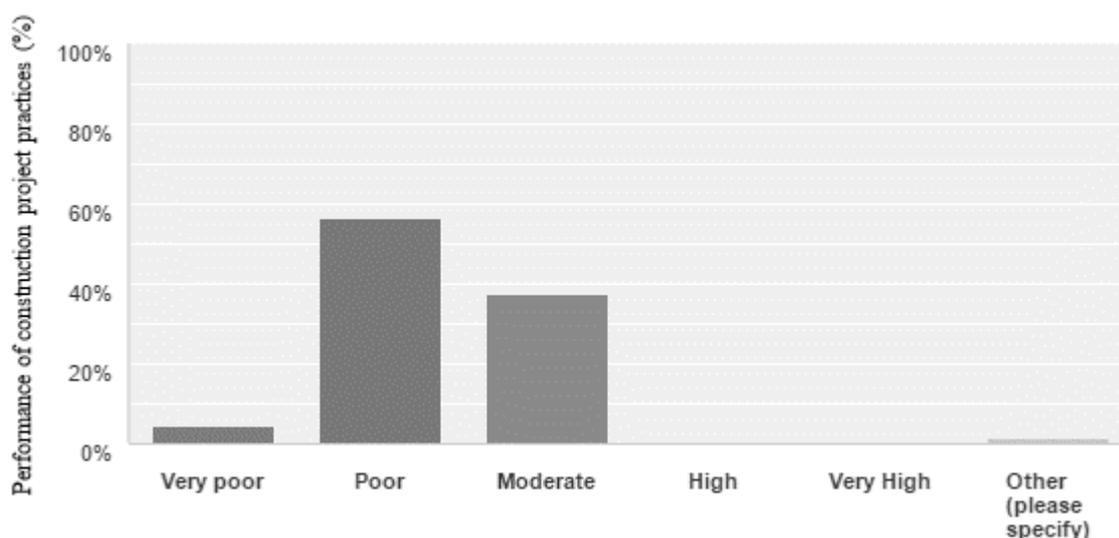


Figure 4. Overall performance of Ethiopian construction industry in construction project practices

Figure 4 presents the perception of the respondents regarding the overall performance of Ethiopian construction industry in practicing the construction project management practices shown in Figure 3. 56.52 % and 37.68 % answered respectively “Poor” and “Moderate” to describe their perception. Those two categories add up to 94.2% of total answers. Only one respondent chose “Other” and his written answer was written as follow: “On transition from Poor to Moderate owing to the improvement interventions being made these days”. Those results reveals that the overall performance of the Ethiopian industry is more likely on the side of the “Poor level”. Statistically speaking, the mean is: 2.39 and the standard deviation is: 0.71 (1 stands for “Very Poor” and 6 for “Other”).

G. Management Challenges

In this regards, respondents were asked to identify the management challenges they face while managing construction projects. Table 4 presents the response on Management Challenges of the Ethiopian construction industry. The notation used is as follow: 1. Not at all 2. Very little extent 3. Moderate extent 4. Large extent. Accordingly, they identified time (3.3), cost (3.28), risk (3.17), resources (3.17) and safety management (3.16) as the most challenging issues in managing their day to day’s activities. The result also reinforces the result obtained above in terms of project management practices since the management challenges are the consequences of poor practice of project management tools and techniques and lack of adapting appropriate project management procedures.

This result is in adequacy with the findings of many researchers [33], [12], [13], [34] who acknowledged that management of construction projects from design to disposal are difficult and accompanied with enormous challenges. Similar study by [12] in Nigeria also identified that time (scheduling), quality, cost, safety management challenges as the top management challenges facing Nigerian Construction Industry. A field study by [7] has also confirmed that traditional measures of cost, time, scope, and quality are still major challenges in Kenya.

A study by [35] also pointed out that the use of risk management in the Lithuanian construction industry is still in the range of low to moderate, with little differences between the types, sizes and risk tolerance of the organizations, and experience and risk tolerance of individuals.

Tableau 4. Response on Management Challenges

| Management Challenges | Mean Score | Standard Dev. | Rank |
|--|------------|---------------|------|
| Resources Management (Allocation and utilization) Challenges (Materials, Manpower, Money and Machine) | 3.17 | 0.68 | 3 |
| Time (Scheduling) Management challenges | 3.30 | 0.71 | 1 |
| Cost Management Challenges | 3.28 | 0.66 | 2 |
| Quality Management Challenges | 3.12 | 0.58 | 7 |
| Safety Management Challenges | 3.16 | 0.97 | 5 |
| Handling Multiple Project Management Challenges | 3.13 | 0.81 | 6 |

| | | | |
|---|------|------|----|
| Organizational Management Challenges | 3.07 | 0.75 | 8 |
| Change Management Challenges | 3.06 | 0.85 | 9 |
| Risk and uncertainty Management challenges | 3.17 | 0.95 | 3 |
| Communication Management challenges | 2.97 | 0.64 | 10 |

H. Extent of the Challenges

Following the assessment of the construction project management practice and the management challenges facing professionals in their day to day’s activity, respondents were also asked to indicate the extent of the problem in terms of the predominant requirements of a project (which is time, cost, quality and safety) together with risk and wastage to identify to what extent they deviate from plan or predetermined requirements at the initial stage (Fig. 5).

Accordingly the response on the extent of deviation from plan or set of requirements with respect to the predominant performance measurements criteria, [14] revealed that the average deviation in planned cost and time ranges between 21-40% and 61-80% respectively. And that of quality, safety and risk deviates by 21-40% from predetermined or specified requirements. In agreement with quality, cost, safety and risk, the estimated wastage in resources utilization lies in the range of 21-40%. The extent of the problem has also agreed with many other findings. . [24] identified 9 out of 10 transportation infrastructure projects costs are underestimated and for all project types, the actual costs are on average 28% higher than estimated costs. They also pointed out that the amount of waste generated in construction contributes around 30-35% of project’s production costs.

[36] identified time overrun (70% of projects), cost overrun (average 14% of contract cost), and waste generation (approximately 10% of material cost) and they further argued that the trend is more severe in developing countries where these overruns sometimes exceeds 100% of the anticipated cost of the project. This fact is witnessed by Northern-by-pass project at Kampala which faced cost overrun of more than 100% of the contract price.

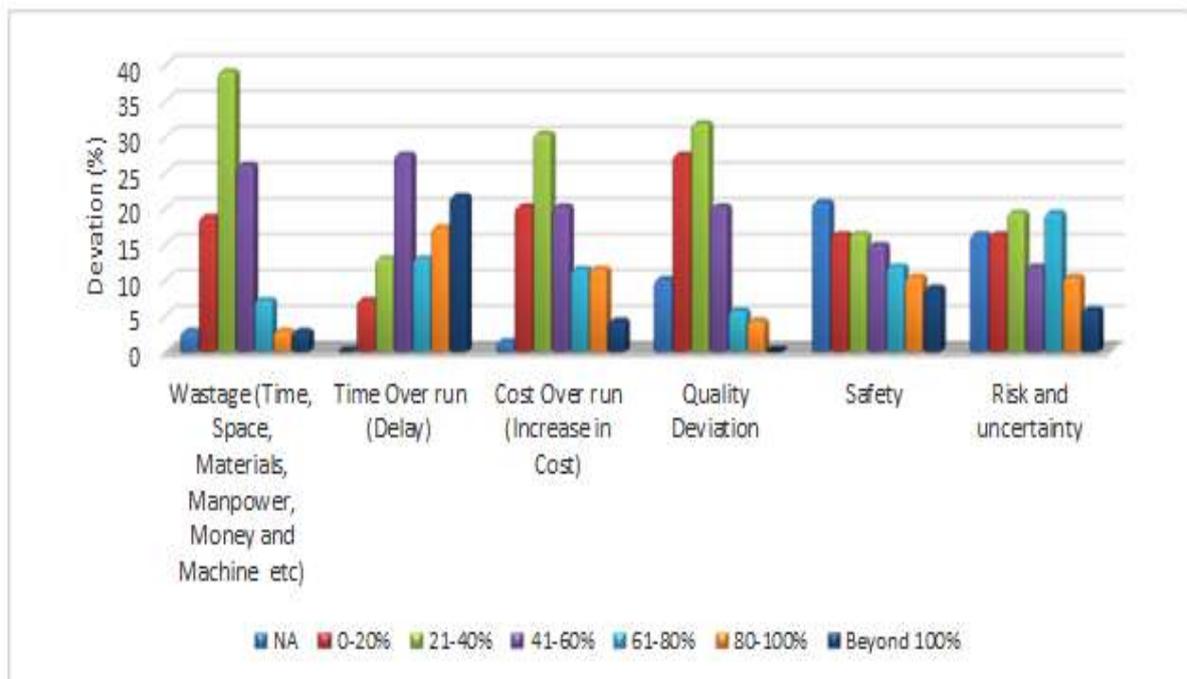


Figure 5. Range of deviation between planned (at the beginning) and actual (at completion stage) requirements.

Another study by [25] in Tanzania also demonstrates the same fact, the total cost and time overrun rates on average to be 44% and 26% respectively by considering seven projects. The result also agreed with the finding of many other researchers cited by [36] whose findings are summarized as follows; In Nigeria, out of 3,407 projects only 24 projects were completed on time, while 1517 were delayed and 1812 were even abandoned and they reported that the minimum average percentage escalation period of projects in Nigeria was found to be 188%. Similar research in Bosnia and Herzegovina on 177 projects found that the contracted date was not met in 51.40 % of the projects.

On top of identifying the degree of extent for each challenge, a ranking analysis was done using mean score and the result (Fig. 6) revealed that time (3.93) and cost (2.94) as major challenge in Ethiopian construction industry followed by risk with a mean score of 2.90.

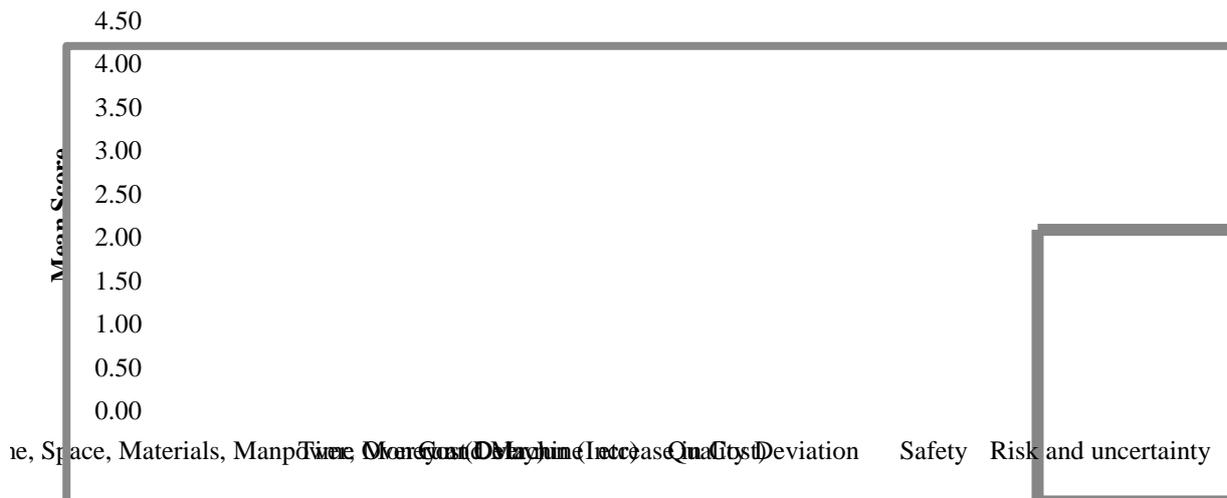


Figure 6. Ranking Based on Extent of Deviation for each challenge in the Ethiopian construction industry.

The obtained results also agrees with [12] who has identified that time; cost, quality, and safety remain the top management challenges facing construction managers in Nigeria. Similarly, [36] pointed out that the construction industry always faced serious and chronic problems likes time overrun, cost overrun, waste generation, imposing negative impacts to the environment and excessive resource consumption. Other studies by many researchers in various developing country also witnessed the same [29], [26], [37], [25], [38].

I. Potential solutions

Finally, we asked respondents to enter some potential solutions to fill the gap in the Ethiopian construction context. Each respondent were given 3 entries for writing his own view of the solution. With a total collected solutions of 151, 9 were recurrent:

- Apply modern project management.
- Stakeholders' collaboration.
- Experience sharing and information capitalization.
- Enhance project finances.
- Training.
- Application of construction management practices.
- Modify regulations set by the government.
- Allocate sufficient time for design and planning.
- Build capacities of all stakeholders.

Those results are in line with the previous research done in the context of developing countries. [39] stressed the predominance of human issues in construction for developing countries.

[40] investigated the forms of construction project governance mechanisms in developing mechanisms and highlighted the prevalence of informal exchange and collaboration between stakeholders. The same informal collaboration was highlighted by [41] who stressed a lack of frameworks for construction project in developing countries. From that point of view, a great amount of restructuring projects are ongoing to enhance construction project of developing countries in Africa. [42] for instance found that international investors lacks visibility when contracting construction work in developing countries. He developed in his research a risk mitigation framework to enter such markets.

V. CONCLUSION

This study demonstrated that the level of construction project management practice in terms of adapting general project management procedures, project management functions, tools & techniques to be unsatisfactory. Particularly the level of practice in terms of safety, risk and time management was found to be very low.

Regarding challenges, the study identified that time, cost and risk management as the most challenging issues for professionals in managing their day to day's activities. The assessment on the extent of deviation from plan or predetermined requirements on these issues also reinforce this result. The amount of schedule slippage ranges between 61-80% and that of planed costs and other variables such as risk, quality, resources utilization and safety deviates in the range of 21-40% from predetermined requirements, planned or anticipated at the beginning.

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