Assessment of Delay Factors on Building Construction projects in South Gondar Zone, Ethiopia

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Abstract

Construction delays are widespread in the construction industry and seriously endanger the success of the project. Several factors contribute to construction delays. The intention of this study is to identify the critical delay factors on building construction projects in south Gondar Zone, Ethiopia. This study conducted on selected sites found in South Gondar Zone. For this purpose, 31 different delay factors were identified, and categorized into eight major groups namely, client related, contractor related, consultant related, material related delay, labour related, contract related, contractual related, and external related delay cause factor. Primary and secondary data were used for the accomplishment of the study. Primary data was collected using a questionnaire. A total of 80 out of 90 questionnaires were filled by different members of the selected 10 project site from different construction industries in South Gondar Zone. Secondary data collected through literature review from different books, and journals to discuss the type and causes of delay in building construction projects. The relative importance index (RII) approach was used to quantify the collected data. The results indicate that the following factors, Lack of fund to Finance the project, Frequent change orders during construction, Inflation/Price increase in materials, Shortage of construction material, and Corruption were the top five delay contributor in building construction projects. From delay categories, 20% of the delay factors is from the client related side, another 20% of the delay factors is from the materials related side, and the remaining 60% of the delay factor is from the remaining six delay categories. Although, the study is conducted building construction projects in South Gondar Zone, Ethiopia, but it can also use as a base point to other regions of Ethiopia and other countries and further study.

Keywords: 1.building construction, 2.delay, 3.relative importance index,4.cause of delay, 5.delay factors. 6.South Gondar Zone. 7.Ethiopia.

1. Introduction

Construction projects play a boundless role in the economic growth of nation. The construction industry is the instrument through which a society attain its aim of urban and rural area development. However, Ethiopia's present construction industry practices are fraught with issues, and only a small percentage of projects are completed on time, under budget, and to the satisfaction of all stakeholders. Construction projects are considered successful when they are completed on time, within budget, and at the expected quality level[1].

Delay is the slowing down of work without completely stopping it, which can result in time overruns either beyond the contract date or beyond the date agreed upon by the parties for project delivery[2].

Building construction delay is defined as a period of time that extends beyond the contract deadline or the date agreed upon by the parties for the project's completion. In both circumstances, a delay is almost always costly. Building Construction Delay was also described as an act or occurrence that extends the time required to accomplish or complete the contract's task, manifesting itself as more work days[3].

In Ethiopia, the building industry receives the greatest amount of government funding for development activities. The completion of the project in accordance with the contract remains a problem, despite the fact that Ethiopia's building construction sector is expanding and many domestic and foreign contractors are involved. There are numerous issues and conflicts that unavoidably arise, all of which contribute to the project's failure to be completed on time as specified in the applicable contract agreements. Time overruns in construction projects have become one of the most prominent issues in the industry, resulting in a slew of negative consequences for the projects and its stakeholders[4].

Delays in construction projects are considered one among the foremost common problems causing a mess of negative effects on the project and its participating parties. Along with delays, project failure, a fall in profit margins, and citizens' loss of faith in government-funded initiatives are also common outcomes. When delays do occur, they are either expedited or stretched beyond the original completion date. This does not come without some cost consequences. Delays also cause worker disruption and loss of productivity, as well as increased time-related costs, third-party claims, contract abandonment, and termination[5].

Several authors have classified construction delays in various ways, although most of these categories have a lot in common in terms of their form and basics. [6] mentioned that there are four basic ways to categorize type of delays, Critical or Non critical; Excusable or Non excusable; Compensable or Non compensable and Concurrent or Non concurrent

Critical and Non-critical Delays

Critical delays are those that affect project completion or, in some situations, a milestone date; noncritical delays are those that do not affect project completion or a milestone date[7]. The following factors influence which activities genuinely govern the project completion date: The project itself, the contractor's plan and schedule (particularly the critical path), The requirement of the contract for sequence and phasing, The physical constraint of the project, i.e., how to build the job from a practical perspective[7].

Excusable or Non-Excusable Delays

An excusable delay is one caused by an unanticipated occurrence beyond the control of the contractor or subcontractor[7].General labor strikes, Fires, Floods, Owner-directed changes, Errors and omissions in the plans and specifications, differing site conditions or concealed conditions, Uncommon severe weather, Intervention by outside agencies, Epidemics and quarantine restrictionsare Some of theexamples of excusable delays[8].

A non-excusable delay occurs when the contractor or its suppliers cause it without the owner's fault. In most cases, the contractor is not entitled to relief and must reimburse the owner or make up the lost time through acceleration. As a result, non-excusable delays usually result in the contractor receiving no additional compensation or time[9].

Late performance of sub-contractors, Untimely performance by suppliers, Faulty workmanship by the contractor or sub-contractors, A project, specific labor strike caused by either the contractor's unwillingness to meet with labor representative or by unfair labor practices are Some of the examples of non-excusable delays[7].

Compensable or Non-Compensable Delay

A compensable delay is a delay where the contractor is entitled to a time extension and to additional compensation. Relating back to the excusable and non-excusable delays, only excusable delays can becompensable. Compensable delays are caused by the owner or the owner's agents[10].In most circumstances, a contract specifies the types of non-compensable delays for which the contractor does not earn additional compensation but may be granted a time extension[6].

Concurrent or Non- Concurrent parallel Delay

As part of various analyses of construction delays, the concept of concurrent delay has become increasingly common. The concurrency argument is made not just in terms of establishing the project's important delays, but also in terms of assigning responsibility for damages caused by delays on the critical path[11].Owners frequently cite concurrent delays by the contractor as a justification for issuing a time extension without additional compensation. Contractors also frequently cite concurrent delays by the owner as a justification for not assessing liquidated damages for their delays[7].

Causes of Delay in construction projects

Construction delays are occurring in every phase of a construction project and are common problems in construction projects in Ethiopia, and this is the major causes of project failure. Traditional contractual approaches are still prevalent in Ethiopia's construction industry, and this is expected to continue. Clients or project owners, contractors, subcontractors, suppliers, and other essential professional actors responsible for project design and supervision make up for Ethiopia's construction business. Architects, engineers, and quantity surveyors are among these specialists. Because of the diverse range of parties involved in projects, they frequently face tough conditions and are under pressure.

Different Researchers identified the cause of delay for construction industries and they are divided in to eight major categories [12][13]. The divisions are listed as follows:

Client related causes: Finance and payments of completed work, Owner interference, Slow decision making, and Unrealistic contract duration and requirements imposed

Contractor related causes: Subcontractors, Site management improper planning, Construction methods, Improper planning, Mistake during construction stage, and Inadequate contractor experience.

Consultant related causes: Contract management, Preparation and approval of drawings, Quality assurance /control, and Waiting time for approval and inspection.

Material related causes: Quality of material, Shortage of material and Inflation/Price increase in materials

Labor and equipment category causes: Labor supply, Labor productivity, and Equipment availability and failure

Contract related causes: Change order, and Mistakes and discrepancies in contract document

Contract relationships related causes: Major disputes and negotiations, Inappropriate overall organizational structure linking to the project, and Lack of communication.

External causes: Weather condition, regulatory changes, Problem with neighbors, Unforeseen site condition and corruption**.**

Due to miscommunication between contractors, subcontractors, property owners, or for any reasons, the chance of delay in construction projects are more likely to happen. They might have a significant effect on economic growth. And in terms of competitiveness and long-term sustainability in the global market, it is one of the frequent issues that upset construction organizations[14].Even in this day and age of enhanced technology and more widespread adoption of project management techniques, the issue of project delays has yet to be resolved. The extent of delay causing factors differs significantly from one project to the other project and country to country[15]. Construction delayed studies in Ethiopia showed that only 8.55% projects have been finished to the original targeted completed date and the remaining91.75% delayed 352% of its contractual time[16]. Similar kinds of problems have been encountered on the selected building construction projects in South Gondar Zone, Ethiopia building Construction projects.

Therefore, the objective of this study is to explore the major factors which will cause delays within the building construction projects within the case for construction projects in South Gondar Zone. Also. For this purpose, a survey is going to be conducted with the clients/owners, consultants and contractors operating in South Gondar Zone, Ethiopia.

2. Materials and Method

2.1. Research approach

This study takes a quantitative approach, relying on questionnaires collected from projects take holders. Quantitative analysis techniques helping us to explore, present, describe and examine relationships and trends within our data[17]. Questionnaires are found to be effective due to the relative easiness of obtaining standard data appropriate for achieving the objectives of this study. Questionnaires were framed for the surveybased on the identified delay cause factors.

2.2. Target Population

A Target population defined as "a set of all elements that belong to a certaindefined group to be studied and used to generalize the result of the study." [18]. As the purpose of this study is to assess thefactors of delay in selected building projects, the target population of the study is technical managers, site engineer, office engineer, and residential engineers of the project participating inand carrying out the projects at the time of the study.To identify the critical delay factors in building construction, the respondents should beskilled and should directly involve on the projects.The researcher used a small target groupbecause there were a limited number of skilled laborers on all projects. In south Gondar Zone there are many projects that are under construction and many more had been constructed.The research focused only on Ten projects that are being carried out in South Gondar Zone and the totalpopulation is 80. The reason the researcher chose those projects is that none of them will be finished by the deadline and are still in the construction phase.With the aid of nonprobability purposive sampling, the researcher specifically chooses those projects because their geographic location and data availability suit the researcher.Purposive or judgmental sampling allows the researcher to usehis/her judgment to select cases that will best response the research questions [17].

2.3. Data Collection

The study assessed the factors of delay in building construction project in south Gondar Zone. The researcher uses primary and secondary data collection methods. Secondarydata collected through literature review from different books, and journals to discuss the type and causes of delay in building construction projects. Thenprimary data gathered through questionnaires. Questionnaires was used as a primarily datacollection instrument. Questionnaires are recommended for its potential to reachout to a large number of respondents within a short time; ability to accord respondent's adequatetime to respond; offers a sense of privacy and confidentiality to the respondent[19].To achieve the purpose of the study90 questionnaires were disseminated, and only 80 werereturned, leading to 88.88% response rate.

2.4. Respondent's profile

Respondents are selected from a wide range of professionals engaged in the Ethiopian construction sector, South Gondar Zone, (contractors, clients and owners). All the respondents identified had experience in relativelylarge engineering construction projects in the Ethiopian context. The sample consisted of Technical Managers, Office Engineers, SiteEngineers, and Resident Engineers. Table 1 shows a brief description of respondents' profile in terms of professional role and experience who participated in the study. As seen, the mix of disciplines was well proportioned in the sample. A total of 90 questionnaires were distributed by hard copy, out of which 80 valid responses were obtained with a response rate of 88.88%. This percentage is adequate for analysis and reporting of the results of this study[20]. However, the sample size is relativelysmall, the quality of the responses was considered to be highly reliable for the analysis due to relevant industry experiences, personal level interactions and clear understanding of the questionnaires among the respondents [21]. Amongst the respondents, the highest proportion (35%) was from the contractors involved in construction activities followed by the consultant (33.75%) and owner/client(31.25%). The experience of the respondent's proportion 37.5%, 30%, 27.5%, and 5% was from 16-20, 11-15, 6-10 and $\leq$ 5 year respectively.

Table 1: Respondent's profile.

Nature of Work	Experience (years)					Total	% By Professional Role
	≤ 5	6-10	11-15	16-20	>20		
Owner/client	-	7	8	10	-	25	31.25
Contractors	2	8	6	12	-	28	35
Consultants	2	7	10	8	-	27	33.75
Total	4	22	24	30	-	80	100
% By Experience	5	27.5	30	37.5	-	-	-

The amount of delay suffered by large public projects

Table2 shows that the vast majority of the respondents agreed that large public construction projects in Ethiopia/South Gondar Zone suffered of delay. Also, the table presents results of the survey with respect to the amount of delay. It can be seen that 50% of the project suffered 2-4 year of delay in the selected ten projects.

Table 2: Magnitude of Delay

Magnitude of delay	Considered Projects in the study										% Of delay by year
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	
< 1			√								10
1-2		√			√				√		30
2-4	√			√		√	√	√			50
>4										√	10

Table 3: Distributed questionnaire and response rates

Parties in the construction industry	Questionnaire distributed	Questionnaire returned	Percentage of responses
Owner/client	30	25	83.3
Contractors	30	28	93.33
Consultants	30	27	90
Total	90	80	88.88

Table 4: Professional's questionnaire returned and response rate

Stakeholders	Under owner	Under Contractor	Under Consultant	Number of Respondents	Percentage of responses
Technical Manager	8	9	9	26	32.5
Office engineer	9	10	8	27	33.75
Site engineer	8	9	-	17	21.25
Resident Engineer	-	-	10	10	12.5
Total	25	28	27	80	100

Results: The aim of this study is to explore the delay factors and their rankings in building construction projects as shown in table 5, This section summarizes the study's findings. Specifically, the severity of delay factors.

Table 5: Delay Analysis Using Relative Importance Index (RII) Method

Delay Cause Factors Category	ID	Delay cause Factors	RII	Category Rank	General Rank	Importance Level
Client Related factors	D1	Slow decision making	0.828	4	14	High
	D2	Lack of fund to Finance the project	0.895	1	1	High
	D3	Owner interference	0.855	2	9	High
	D4	Unrealistic contract duration imposed by owners	0.840	3	11	High
Contractor related factors	D5	Poor site management and performance of the contractor	0.865	1	6	High
	D6	Improper planning	0.838	2	12	High
	D7	Inadequate contractor experience	0.690	5	26	High-Medium
	D8	Mistake during construction	0.658	6	30	High-Medium
	D9	Inappropriate construction method	0.760	4	21	High-Medium
	D10	Delay caused by subcontractor	0.825	3	15	High
Consultant related factors	D11	Poor contract management	0.790	2	19	High-Medium
	D12	Inadequate experience of consultant	0.680	4	27	High-Medium
	D13	Mistakes and discrepancies in design documents	0.858	1	8	High
	D14	Long waiting time for approval of tests and inspections	0.718	3	24	High-Medium
Material related factors	D15	Lack of quality materials	0.778	3	20	High-Medium
	D16	Shortage of construction material	0.873	2	4	High
	D17	Inflation/Price increase in materials	0.875	1	3	High
Labour and Equipment related factors	D18	Labor supply and productivity	0.745	2	22	High-Medium
	D19	Equipment availability and failure	0.848	1	10	High
Contract related factors	D20	Frequent change orders during construction	0.893	1	2	High
	D21	Mistakes in design documents	0.793	3	18	High-Medium
	D22	Discrepancies in contract document	0.813	2	16	High
Contractual relationship related factor	D23	Major disputes	0.800	3	17	High
	D24	Negotiations during construction	0.710	4	25	High-Medium
	D25	Inappropriate organizational structure linking all parties involved in the project	0.830	2	13	High
	D26	Lack of communication between parties	0.863	1	7	High
External related factor	D27	Poor weather condition	0.660	4	29	High-Medium
	D28	Changes in regulation	0.650	5	31	High-Medium
	D29	Problem with neighbors	0.735	2	23	High-Medium
	D30	Corruption	0.868	1	5	High
	D31	Unfavorable site condition	0.668	3	28	High-Medium

Source: own survey (2022)

The delay factor ranks are attained from the analysis done by using Relative Importance Index (RII) method, based on the obtained responses via the Questionnaire survey. The ranks of the delay factors are based on how much delay the project behind the schedule. The importance of the delay factors is based on the obtained ranks. In this analysis, according to 31 delay factors survey, the obtained top ten major risks analysis are D2, D20, D17, D16, D30, D5, D26, D13, D3 and R19 respectively.

3. Discussion

The general ranking considers the average relative important index (RII) of the whole categories So, the analysis from Table 5 shows the top ten delay factors that affect building construction projects in South Gondar Zone, Ethiopia. and consecutively described and listed as;

(1) Lack of fund to Finance the project: - financial related factor is the primary critical cause of project delay in this study. The study is supported by different researchers[27][28][29].
This occurs as a result of the numerous modifications that project clients make throughout construction. Contractors are forced to purchase materials and equipment outside of their typical price range, which raises the cost of building. Additionally, paying contractors later will negatively impact their cash flow. Due to the financial delay in payment caused in the slow progress on site, as many sub-contractors and suppliers are exposed to financial complications; hence, no material is carried to the site.

(2) Frequent change orders during construction: -change orders will happen at some point on the building construction projects that will cause the project dreaded from moving forward. Frequent change orders during construction as one of the major causes of project delay in other study also [30]. The researcher recommends a streamlined change order process for the construction industry, will reduce the frustration of the dreaded change order and be able to work more efficiently in the event of the unexpected and keepsthe project moving forward as a result.

(3) Inflation/Price increase in materials: - Inflation or price increases in materials also identified as a major cause of project delay in other studies, such as[31][32][33]. The researchers described inflation or price increases in construction materials occur due to exchange rate increases from imports, and Covid 19 related problems and recommends construction industry parties in developing country like Ethiopia should explore construction materials from local sources.

(4) Shortage of construction material: Since South Gondar Zone, is very far from the capital Addis Ababa, shortage of construction material is one of the top delay factors in building construction projects. Shortage of construction material as one of the major causes of project delay in other study also[27][34].

(5) Corruption: -In South Gondar Zone /Ethiopia corruption investigated as one of the most critical cause of delays in building construction projects. Corruption has not frequently identified as a main cause of project delay in earlier studies. Therefore, this factor considered as unique in South Gondar/ Ethiopia construction projects.

(6) Poor site management and performance of the contractor: - Poor site management and performance of the contractor is the rank 6^{th} delay factor in this study, and identified as one of the causes of project delay in other studies,including[35][36][37]. According to [38] investigates Poor site management can lead to defects, disputes, and cost overruns in addition to delays. Additionally, it is advised that underperforming sites be managed and performed better by integrating knowledge management procedures, hiring qualified site managers, and allocating the right number of supervisors.

(7) Lack of communication between parties: -Lack of communication between parties is rank 7^{th} delay factor in this study, and identified as one of the causes of project delay in other studies, including[27][39]. Effective communications between concerned stakeholders are crucial role in the success of the construction industry, since it influences project implementation from the planning stage to the handover stage[40].

(8) Mistakes and discrepancies in design documents: - Mistakes and discrepancies in design documents is rank 8th delay factor in this study. In building construction project Architectural features, structural details, material choices, and construction quality differences between the design and construction of a structure occur regularly. According to [41][42], Building and engineering infrastructure failures, as well as project time and cost overruns, are still mostly caused by design discrepancies.

(9) Owner interference: - Owner interference is rank 9th delay factor in this study. This cause of building construction project delay is also verified by in other studies, such as[43]

(10) Equipment availability and failure: - Equipment availability and failure are rank 10th delay factor in this study. Since the study area (South Gondar Zone) is located very far from the capital Addis Ababa, getting Equipment and necessary accessory is difficult and this makes the building construction project delayed. This building construction project delay is also verified by in other studies, such as [44].

From the top ten major delay factors, 20% of the delay factors to the building construction project is from the Client's/owner's related side, another 20% of the delay factors is from the materials related side, and the remaining 60% of the delay factors is divided equally for the remaining six delay factors listed as: - Contractor's related, consultant's related, Labor and equipment related, Contract related, Contractual relationship related, and External related.

4. Conclusion

This study is undertaken to identify the critical delaying factors in Building construction projects in South Gondar Zone, Ethiopia. From the above findings, it was identified that all the factors fairly influence the successfulcompletion of projects. And of these factors,Lack of fund to Finance the project, Frequent change orders during construction, Inflation/Price increase in materials, Shortage of construction material, and Corruption were identified to be the top five ones.Although the survey participants gave high ratings to all delay factors, Inadequate experience of consultant, Unfavorable site condition, Poor weather condition, Mistake during construction, and Changes in regulation are also found to be minimumimportance level of delay causing factors.This suggests that every delay factors were taken into account, and the chosen buildingconstruction projects should put the items related to those factors to varied levels of practice.Delays can't be eliminated fully however will be reducedto larger extent by taking care at every construction stage.Additionally, delays will be decreased once the primary delay factors are determined

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