

VALUATION OF CONSTRUCTION DELAYS, CAUSATIVE FACTORS AND EFFECTS IN SOUTHERN ETHIOPIA CONSTRUCTION PROJECTS

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ABSTRACT: The construction industry plays a significant role in a nation's social and economic development. There cannot be much progress in the national development without construction, particularly in developing countries where there is lack of infrastructure and other basic facilities. Construction projects form a bulk of construction projects in Southern Ethiopia and are paramount in the areas of housing, business and public undertakings. For the findings of this study the data were acquired using open interviews; questionnaire examination and a case study on purposively selected construction projects in Southern Ethiopia. And the study has been conducted on 102 purposively selected players in the construction industry which included private and public sector clients, contractors, consultants, suppliers and end-users of construction projects in order to stimulate data from 36 majorly identified variables of delay that were well-known through an attentive literature review. The study begins with review of the important aspects of construction process, delays and claims observed. It then took a casual analysis to establish the extent of delays in the project, the causes for the delays and the effect of the delays on the construction project. Relative Importance Index (RII) analysis was used for the ranking of causes and effects of delay. RII results of the study showed that the major causes of delay summarized from the clients, consultants and contractors point were (1) Untimely payment & financial difficulties (RII = 0.864), (2) Variations and Change orders (RII = 0.841), (3) incomplete designs and late site handover (RII = 0.780), (4) Mistakes in contract documents (RII = 0.72), (5) Lack of appropriate supervision (RII = 0.690), (6) Construction mistakes or poor workmanship (RII = 0.662), (7) Late issuance of instructions & poor communications among parties (RII = 0.590), (8) Material procurement problem (RII = 0.530), (9) Equipment management problems (RII = 0.380), and (10) Inclement weather & Unforeseen site conditions (RII = 0.320). The study also determined the major effects of delays in the construction projects, which were (1) Increase project cost, (2) Time overrun, (3) claims and dispute, (4) Arbitration, (5) Litigation, (6) Complete termination of contracts, (7) Liquidated damages, (9) Worse the quality of work and (10) Reduce productivity. Other researchers might take comparable studies in other parts of the domain and recognize major reasons or causes for delay and effects of delays in construction projects.

Index Words: Delay, Time-overrun, liquidated damages, dispute, variations, site-handover.

I. Introduction

The construction industry is controlled by small, medium and large scale contractors who face an emerging trend of distinctive challenges in the execution of projects [1]. Delay in construction is one of the biggest problems often experienced on construction project sites. Delays can originate negative effects such as increased costs, loss of productivity and revenue many complaints between owners and contractors and contract termination [2]. [3] in his study provided that delays in construction can cause a number of changes in a project such as late completion, lost productivity, acceleration, increased costs, and contract termination. The party experiencing damages from delay needs to be able to recognize the delays and the parties responsible for them in order to recover time and cost. The construction projects duration agreed between the owner and the contractor is a crucial element in the contract between the contracting parties. To ensure that the agreed construction duration is achieved, most construction contracts require the contractor to submit a planned schedule, which is then maintained and updated through the life of the project. The contraction's actual progress is normally measured against this as-planned schedule. The schedule is typically prepared by the contractor, based on the contractor's experience and knowledge. As work progresses, the as-planned schedule may be subject to revision to take into account unexpected events. These may include changes, additional work, unusually adverse weather, changed or unexpected conditions discovered at the site, and so on. All events that create delay and thus require adjustment to the as-planned schedule must be accounted for and allocated between the owner and the contractor. Most construction contracts include provisions describing how the risk of various types of delay is to be allocated between the owner and the contractor. Construction delays in general can affect production of construction projects. A productive construction project is an integrated effort by people of different qualifications ensuring its completion within the scheduled time, without exceeding the allocated budget, and within the specified quality and standards. However, for various reasons, project successes are not common in the construction industry, especially in developing countries like Ethiopia. To overcome and minimize problems associated with delay, the paper is attempting to answer the following objectives:

1. To study and evaluate the cause that contribute to delay in constructions
2. To identify the effects of delay in construction projects
3. To make analysis on the cases related to delay and its effects

II. Review of Literature

In construction projects, a delay means a time overrun either beyond the contract date or beyond the date that the parties have agreed upon for the delivery of the project. In both cases, a delay is usually a costly situation. From the client's point of view, as most of them are government agencies in civil engineering projects, a delay generally leads to social inconvenience and loss of revenue, and to extreme affects, such on the national growth rate. It also makes contractors suffer a loss of productivity, high disruption costs, and prolongation costs (O'Brien 1976, as cited in [4]).

2.1. Causes of Construction Delays

There is a relationship between schedule, the scope of work and project conditions. Changes to any one or more of these three can affect the compensation level and time of completion. It has been argued that it is necessary to create awareness of causes of project schedule delays, their frequency, and the extent to which they adversely affect project delivery (Al-Khalil & Al-Gafly, 1999, as cited in [5]). Kaliba et al. (2009) as cited in [5] concluded from their study that the major causes of delay in road construction projects in Zambia were delayed payments, financial deficiencies on the part of the client or contractor, contract modification, economic problems, material procurement, changes in design drawings, staffing problems, equipment unavailability, poor supervision, construction mistakes, poor coordination on site, changes in specifications, labor disputes, and strikes. Agaba (2009), as cited in [5] attributes delays in construction projects to poor designs and specifications, and problems associated with management and supervision. In their study, El-Razek et al., (2008), as cited in [5] found that delayed payments, coordination difficulty, and poor communication were important causes of delay in Egypt. Sambasivan and Soon (2007), as cited in [5] established poor planning, poor site management, inadequate supervisory skills of the contractor, delayed payments, material shortage, labor supply, equipment availability and failure, poor communication and rework, were the most important causes of delays in the Malaysian Construction Industry. Kouskili and Kartan (2004), as cited in [5] identified the main factors affecting cost and time overrun as inadequate/inefficient equipment, tools and plant, unreliable sources of materials on the local market, and site accidents. Odeyinka and Yusif (1997), as cited in [6] and studied the causes of delays in Nigeria housing projects. The main categories evaluated include: client, consultant, and contractor - caused delays, and extraneous factors. Client - caused delays were found to arise from variation orders, slow decision making, and cash flow problems while contractor-caused delays were from financial difficulties, material management problems, planning and scheduling problems, inadequate site inspection, equipment management problems, and shortage of manpower. The causes of consultant - caused delays identified include: incomplete drawing, slow response by consultant, variation orders, late issuance of instruction, and poor communications. Inclement weather, acts of God, labor dispute, and strikes were found to be extraneous factors responsible for delays. Hence, it can therefore be realized that the most significant causes of delay in construction projects differ from one county to another. [7] Conducted a survey on time performance of large construction projects in Saudi Arabia. He studied the importance of various causes from the viewpoint of contractors, consultants, and owners. The most common cause of delay identified by all the parties was "change order".

2.2. Effects of Delays in Construction Projects

Delays can instigate negative effects such as increased costs, loss of productivity and revenue many lawsuits between owners and contractors and contract termination [2]. On the hand, [8] in their study agreed with six main effects of delays which are time overrun, cost overrun, disputes, arbitration, litigation, and total abandonment as effects of delays in Malaysian construction industry. [7] In his study found that about 70% of the projects experienced time overruns.

III. Research Methodology

The studies of this research were collected based on the literature reviewed, interviews and questionnaires. Open conversations at that time were held with the clients of private and public projects, contractors, consultants working on private and public projects, and on personal understanding with public construction projects. The interviews and questionnaire were divided into two portions. The first portion focused on causes of construction delays and the second portion focused on the effects of construction delays in Southern Ethiopia construction projects. The delays and its effect considered in this study were those that occur during the execution stages of construction projects. To authorize the findings of this study the data were acquired using open interviews; questionnaire examination and a case study on purposively selected construction projects in Southern Ethiopia were used.

3.1. Sampling Frame of the Study

The study was conducted in Southern Ethiopia including Southerly located University expansion projects. The study has been conducted on 102 purposively selected players in the construction industry which included private and public sector clients, contractors, consultants, suppliers and end-users of construction projects in order to stimulate data from 36 majorly identified variables of delay that were well-known through an attentive literature review. In the study of this research, to rank the major causes and effects of delays in Southern Ethiopia construction projects, the relative importance index (RII) method were used to determine the relative importance of the various causes and effects of delays. And the analysis of RII for each factor used the following Equation [8]:

$$RII = \left(\frac{\sum(W)}{A*N} \right) \dots\dots (1)$$

Where: W = the weight given to each factor by the respondents, A = the highest weight = 5, N = the total number of respondent.

The response for the questionnaire was valued based on five ordinal measures of agreement on each contributed factors to identify potential causes and effects. For each contributing factor of delays and their effects, the respondents rate the most repeated cause and effects based on their experience. The evaluation was carried based on the following scale of measurements. For degree of importance: [1 for "Strongly Disagree(SD)", 2 for "Disagree (DA)", 3 for "Neutral (N)", 4 for "Agree (A)" and 5 for "Strongly Agree (SA)"].

IV. Results and Discussions

The study results from the respondents and researchers point of understanding showed the top ten mainly identified causes of delays of construction projects in the study areas were:

Table 1: Top ten Causes of delays in construction projects from the major parties point:

No	Causes of delays	RII	Rank
1	Untimely payment & financial difficulties	0.864	1
2	Variations and Change orders	0.841	2
3	Incomplete designs and late site handover	0.780	3
4	Mistakes in contract documents	0.720	4
5	Lack of appropriate supervision	0.690	5
6	Construction mistakes or poor workmanship	0.662	6
7	Late issuance of instructions, and poor communications among parties	0.590	7
8	Material procurement problem	0.530	8
9	Equipment management problems	0.380	9
10	Inclement weather, and Unforeseen site conditions	0.320	10

Study results on the above table 4.1 showed that, Untimely payment & financial difficulties, and Variations and Change orders which comprise the highest RII value respectively were the primary causes of delay for the construction projects in the study areas. The reasons behind the first two causes were due to lack of awareness and judgments from designers' side, and lack of awareness for additional work as well as work modification from clients' side. Mistakes in contract documents, Lack of appropriate supervision, and Poor workmanship in construction respectively take the highest to medium level of important and the second most factor of delay in construction. These emerged factors were due to consultant's deficiency of attention for the proposed works, and the human errors or poor workmanships occurred because of poor performance during construction for every tasks being undertaken. The other factor which takes as the middle important factors for happening of delay in Southern Ethiopia construction were: Late issuance of instructions, and poor communications among parties, and Material procurement problem. And these were due to consultants and clients bureaucracy for the response of instructions and problem related with foreign currency interchange for procuring materials. The last two cause equipment management problems and inclement weather, and unforeseen site conditions were also the further causes for the held investigation.

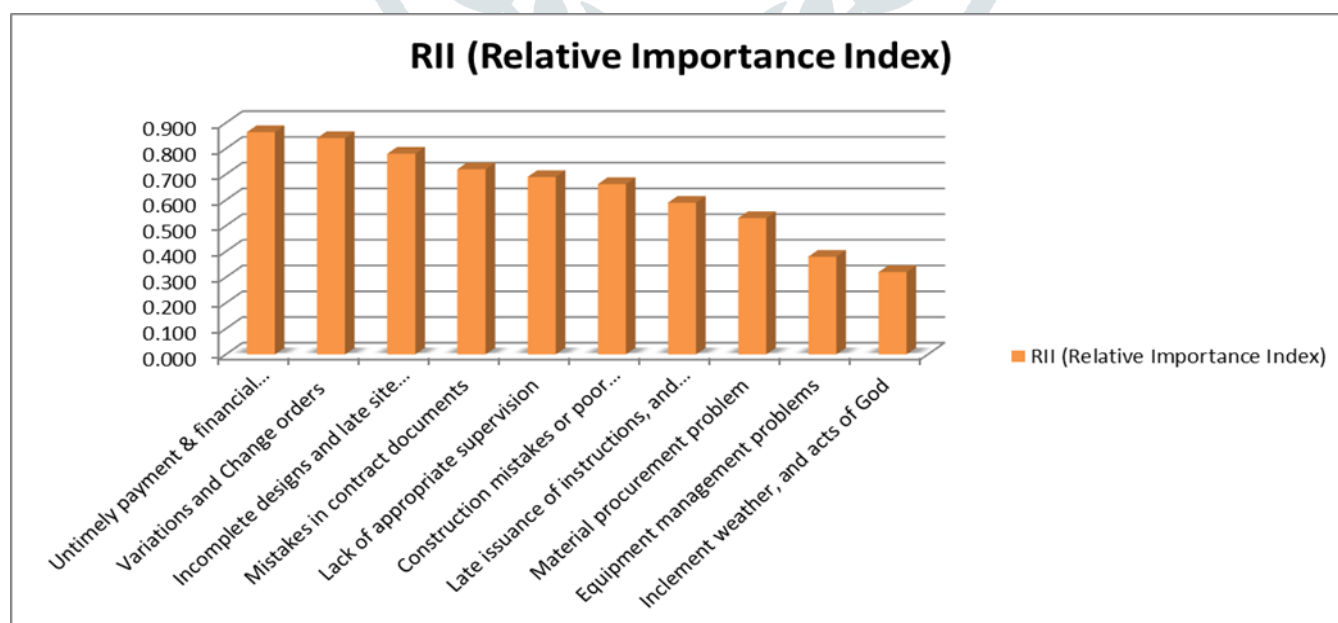


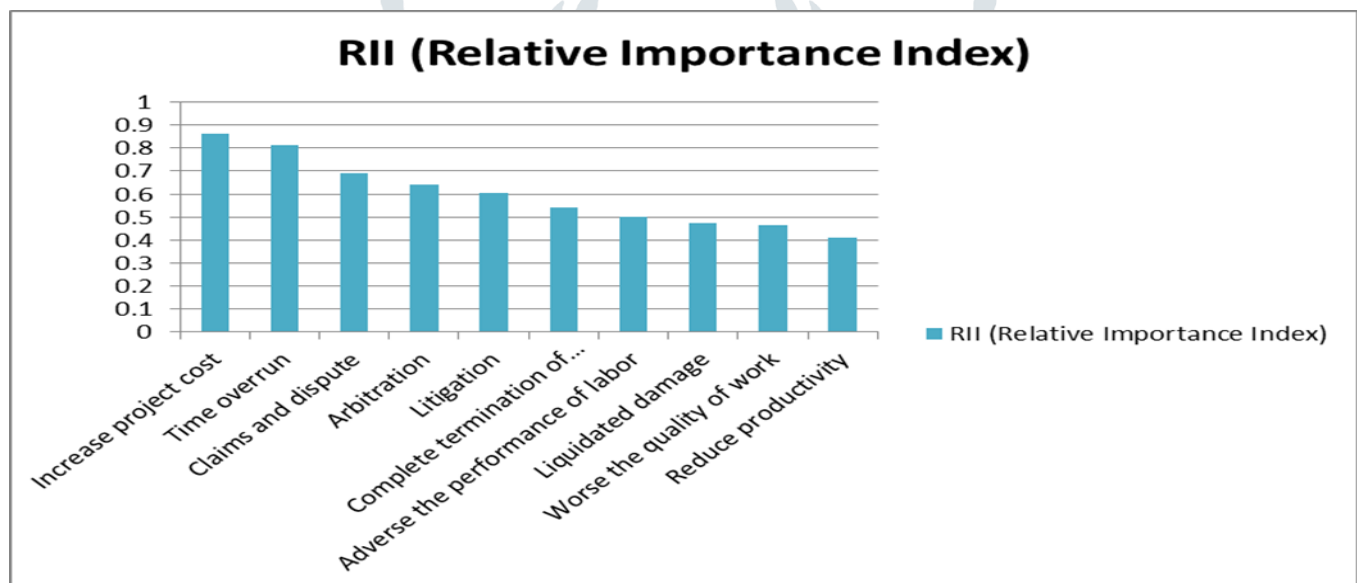
Chart 1: Factors of delay and the level of importance

To identify effects of delays in construction projects the similar technique as seen above was used to determine the rank of each effect. The table below shows Relative Importance Indices (RII) value for each item which were considered and observed in the study area.

Table 2: The Leading 10 effect of delay in construction projects from the major parties point:

No	Effects of Delay	RII (Relative Importance Index)	Rank
1	Increase project cost	0.862	
2	Time overrun	0.811	
3	Claims and dispute	0.692	
4	Arbitration	0.643	
5	Litigation	0.607	
6	Complete termination of contracts	0.542	
7	Adverse the performance of labor	0.501	
8	Liquidated damage	0.472	
9	Worse the quality of work	0.464	
10	Reduce productivity	0.411	

As shown on the table 4.2 above, the study revealed increase in project cost and time overrun as the main impacts of delay in construction projects. This is because of previously identified causes of delay that is Untimely payment, financial difficulties, Variations and Change orders from the client's side. Claims and dispute, Arbitration and Litigation shared the highest to medium level of importance and were considered as the second most effect of delay in construction. These were manifested due to inappropriate response from the consultants and clients for the requests initiated by the contractors. Whereas others including Complete termination of contracts, Adverse the performance of labour, Liquidated damage, Reduce productivity, and Worse the quality of work in combination were taking the medium level of importance and determined as the third best effect of delay. Which were due to poor workmanship, late issuance of instructions, and poor communications among parties and material procurement problem of the contractor in case of these listed effects were frequently occurred in the study areas.

**Chart 2:** Effect of delay and the level of importance

V. Conclusions and Recommendations

Construction delays are inevitable; though, they can be avoided or minimized when their causes are effectively identified and analyzed. The important issues focused on in this study were the causes of delay and its effect in the Southern Ethiopia construction projects. To achieve the objectives this paper, study was mainly conducted on 102 purposively selected players in the construction industry which included private and public sector clients, contractors, consultants, suppliers and end-users of construction projects in order to stimulate data from 36 majorly identified variables of delay that were well-known through an attentive literature review. The study result showed that the major causes of delay summarized from the clients, consultants and contractors point are (1) Untimely payment & financial difficulties, (2) Variations and Change orders, (3) incomplete designs and late site handover, (4) Mistakes in contract documents, (5) Lack of appropriate supervision, (6) Construction mistakes or poor workmanship, (7) Late issuance of instructions & poor communications among parties, (8) Material procurement problem, (9) Equipment management problems, and (10) Inclement weather & Unforeseen site conditions. The other important objective of the study was concentrated to evaluate the major effects of delay. The finding showed the most important effects of delay (1) Increase project cost, (2) Time overrun, (3) claims and dispute, (4) Arbitration, (5) Litigation, (6) Complete termination of contracts, (7) Liquidated damages, (9) Worse the quality of work and (10) Reduce productivity. Other researchers might take comparable studies in other parts of the domain and recognize major reasons or causes for delay and effects of delays in construction projects.

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