

Study of Delay in Project Planning and Design Stage of Civil Engineering Projects

Enas Fathi Taher, R.K. Pandey

Abstract— As we know that delay occurs in every phase of construction project. One of the key characteristics of the construction projects is executing the scope of work in a specific amount of time. As project time overrun may have bad consequences for the project performing organization such as cost overrun, damage of company's reputation, etc. it is important to clarify between causes of excusable delays and causes of non-excusable delays. While most previous studies have focused on finding causes or overcoming delays in the construction phase, few studies have analyzed delay problems in the planning and design phases. The main purpose of proposed research work is to identify and rank delay causes in the planning and design phases. A structured questionnaire was sent to engineers at the A/E companies for public construction projects in INDIA. Based on 95 valid responses, this study identified the delay causes and analyzed the importance and frequency of delays using the relative importance index. Analytical results reveal that "changes in client's requirement" are the main causes of delays in both planning and design phases. The finding is good justification for many public clients who usually change their requirements during the planning and design phases that really delay construction projects.

Index Terms— Civil construction projects, delay, executable delays, non-executable delays, delay factors.

I. INTRODUCTION

Recently several analysis studies are bestowed over the causes of delays in construction comes. Delay may be a scenario during which a project as a result of some causes associated with the contractor, client, client's authority or alternative causes has not been finished in written agreement or in agreement amount. Delays are insidious typically leading to time overrun, cost, disputes, litigation, and complete abandonment of comes [1]. Few comes are often found that the worry of not finishing the project on time isn't the most important concern of the relevant project manager. Thus time performance is one in every of the key measures of the project success. As a number of the causes of the development delays are often controlled throughout the life cycle of the project, a big resource saving are often achieved by distinguishing and managing higher these causes. This analysis is somehow a little completely different with alternative researches as in several of those researches there's

no distinction between causes of excusable delays and causes of non-excusable delays. Excusable delays are those not due to the contractor's actions or inactions, and generally embody unforeseen events. These events are on the far side the contractor's management and are while not fault or negligence on his/her half. Excusable delays are often any classified into excusable with compensation and excusable while not compensation. On the opposite hand, non-excusable delays are ones that aren't accepted by the shopper and should result some written agreement liquidated injury for the acting organization [2] [3].

Thus as the stated problem above, in this project we have to find out the key causes of non-excusable delays in project planning and design stage of construction projects. Analysis scope includes thermal power station, steam and power and utility comes that are completed or being dead by government firms MD-1, MD-2, and MD-3, acting organizations attached to the Mapna cluster. In this concern this identification will be done from performing organization point of view.

II. PROBLEM DEFINITION

The main purpose of planned analysis work is to spot and rank delay causes within the designing and style phases. Delay may be a scenario during which a project as a result of some causes associated with the contractor, client, client's adviser or different causes has not been finished in written agreement or united amount. Delays are insidious usually leading to time overrun, cost, disputes, litigation, and complete abandonment of comes. Few comes will be found that the worry of not finishing the project on time isn't the foremost concern of the relevant project manager. Therefore time performance is one among the key measures of the project success. As a number of the causes of the development delays will be controlled throughout the life cycle of the project, a big resource saving will be achieved by characteristic and managing higher these causes.

III. RESEARCH OBJECTIVES

- I. To identify the issue that contributes to the delay in project arising with and elegance of engineering comes.
- II. To see the results of delays in construction in project arising with and elegance of engineering comes.

The scope of the study will cowl the event project. This study is needed to evaluate the extent of understanding and applying these delay concepts in arising with, vogue and field operation. The shape area unit distribute to the management team embrace computing device engineer, project manager, safety officer, supervisor et al [4].

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This analysis was in serious both the aim to satisfy several of nice that thought of significant to refer for the parties which will involve in construction significantly the contractor. These important involve:

- I. To see the difficulty that cause delay in construction project and manufacture the math result. The results of the study area unit the rule to the parties that involve, so as that it will avoid any provide which will happen in their project.
- II. To counsel several factors which will avoid the delay in construction project? The difficulty area unit typically study for the parties that involve in construction to chop back the possibility of delay in construction project.
- III. To recommend many factors which will avoid the delay in construction project? The issue is study for the parties that involve in construction to cut back the chance of delay in construction project.

To check the impact of the delay in construction project. The results of the study can provide sensible data to the involve parties to organize fulltime work and responsibilities to make sure each activities are going to be done in line with arrange.

IV. LITERATURE SURVEY

4.1 Introduction to Waste Management System

Waste management system differs for developed and developing nations, for urban and rural areas, and for residential and industrial, producers. Management for non-hazardous residential and institutional waste in metropolitan areas is typically the responsibility of authorities, whereas management for non-hazardous industrial and industrial waste is typically the responsibility of the generator (firm whose activities prove the waste).

4.1 Introduction to Construction Delays

Construction delays are delays ongoing compared to the baseline construction schedule. Construction delays in residential and light-weight construction are usually the results of miscommunication between contractors, subcontractors, and property homeowners. These kinds of misunderstandings and surrealistic expectations are sometimes avoided through the utilization of careful vital path schedules that specify the work, and timetable to be used, however most significantly, the logical sequence of events that should occur for a project to be completed. [5]

Refer to A.A. Aibinu et al (2002) delay may be a state of affairs once the contractor and also the project owner together or severally contribute to the non-completion of the project at intervals the in agreement contract amount. Delays in construction comes are oftentimes overpriced, since there's sometimes a construction loan concerned that charges interest, management workers dedicated to the project whose prices are time dependent, and in progress inflation in wage and material costs [6].

According to Chabota et al (2008) delays on construction comes are a universal development and construction comes are not any exception. They're sometimes in the middle of price overruns. These have a debilitating impact on shoppers, contractors, and consultants in terms of, litigation, arbitration, income issues, and a general feeling of dread towards one another.

4.2 Construction Delay Types

The type of delay can even have a sway on non-critical activities which require an additional elaborated analysis to work out whether or not beyond regular time extension is guaranteed, or if the reduction of float time is even. Excusable delays are any classified into excusable with compensation and excusable while not compensation. Terry Williams (2003) discovered that there are a unit 3 basic ways that to classify delays:

- i. Excusable delay with compensation
- ii. Excusable delay while not compensation
- iii. Non-excusable delay

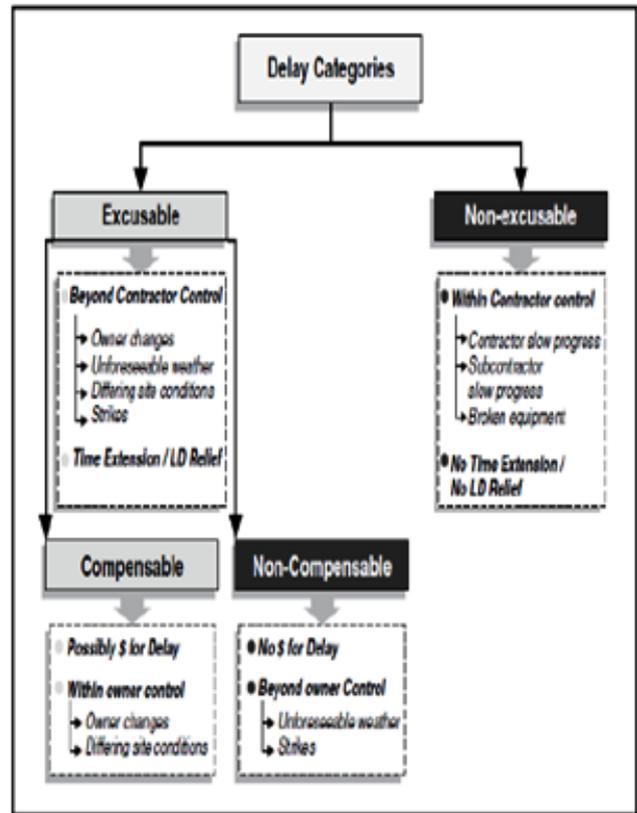


Figure 1: Types of Delays

In following section we will describe them in detail:

4.2.1 Excusable Delay with Compensation

Excusable with compensation are caused by the client's actions or inactions. Once contractors encounter this sort of delay, they're entitled to time extension moreover as financial compensation as a result of the delays. Associate in nursing example of Associate in nursing excusable delay with compensation would be once Associate in nursing owner denies access to the positioning once the notice to proceed is given. This delay is as a result of comeback someday sudden scenario and it not from mistake of the contractor. The external issue is some things arduous to create certain as a result of it sit down with the longer term and event [9].

4.2.2 Excusable Delay without Compensation

Excusable while not compensation are delays wherever neither the consumer nor the contractor is deemed accountable. Once this kind of delay is encountered, solely a time extension are bonded since there aren't any grounds for damages This delay is enable to the extends of your time to end construction while not offer any compensation to the contractor. The issue that embraces of this delay is:

- i. Protest from the labor
- ii. Sudden whether or not
- iii. Sudden currently delivery instrumentality
- iv. Sudden currently delivery material

4.2.3 Non-Excusable Delay

This delay cause by avoid the contract agreement by contractor and it had been establish by construction contract. Shopper will claim their loss if had within the contract agreement. These delay had to spot by shopper as a result of they seldom to see the schedule of the development. The issue that contribute to the non-excusable delay:

- i. The standard weather as we as expected Whether or not
- ii. Delay cause by contractor
- iii. The inefficiency of contractor to manage the development web site.
- iv. The money of contractor.
- v. the shortage of labor.
- vi. Failure to manage their work in line with the contract schedule.
- vii. Continuously create mistake or failure to satisfy of owner specification.

4.3 Factors that Affecting Delays

Based on the contractors surveyed the foremost vital delay factors were: preparation and approval of look drawings, delays in contractor\'s progress, payment by house owners and style changes. From the rear of the architects and engineers the money issues throughout construction, the link between subcontractors and therefore the slow deciding} process of the owner was the most causes of delay. However, the house owners united that the planning errors, labor shortages and inadequate labor skills were vital delay factors [10].

To work out and judge the relative importance of the numerous factors inflicting delays in construction comes. They analyzed and graded main reasons for delays and classified them into 2 teams the role of the parties within the native industry (clients, consultants or contractors) and therefore the variety of come. The causes of cost-time performance of public sector housing come. They classified the causes of delay as project participants and extraneous factors. Client-related delays enclosed variation in orders, slow decision-making and income issues. Contractor-related delays known were: money difficulties, material management issues, designing and planning issues, inadequate website review, instrumentation management issues and absence of force. Extraneous causes of delay known were inclement acts of nature, weather, strikes and labor disputes. The results of study indicated that the most causes of delay in construction of public comes were associated with designers, user changes, weather, website conditions, late deliveries, economic conditions and increase in amount. Similarly, a survey aimed toward characteristic the foremost vital causes of delays in construction comes with ancient variety of contracts from the point of view of

construction contractors and consultants. Results of the survey indicated that consultants and contractors united that owner interference, inadequate contractor expertise; funding and payments, labor productivity, slow higher cognitive process, improper designing, and subcontractors were among the highest 10 most vital factors. A form with twenty six factors was fastidiously designed from preliminary investigations conducted in comes. The form was directed towards 3 teams in each public and personal organization: house owners of the groundwater come, consulting offices, and contractors operating within the groundwater works. The form was distributed to a random sample of fifty five house owners, forty contractors and thirty consultants. The results of the study disclosed the most causes of delay and price overruns in construction of groundwater projects: monthly payment difficulties from agencies; poor contractor management, material acquisition, poor technical performance, and step-up of fabric costs [11].

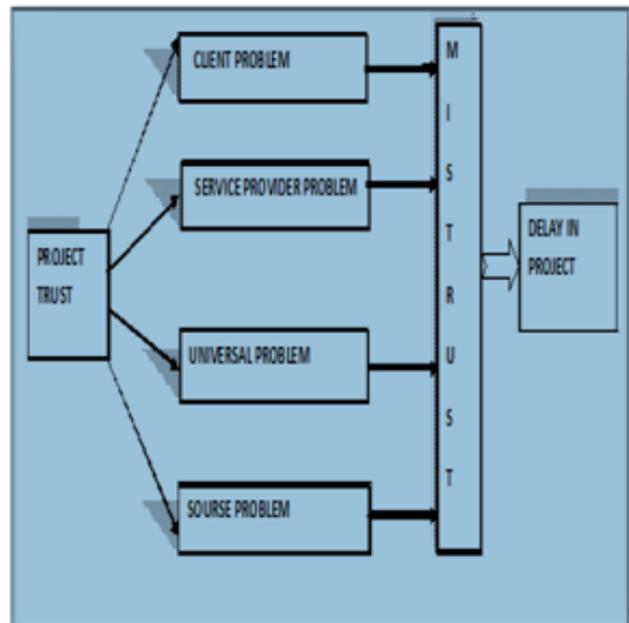


Figure 2: Factors affecting delay

4.4 Identification of Factor and Group in Delays in Construction

The literature review was done through books, conference proceedings, the net and engineering journals. The cluster are includes the contractor, client, consultant, material, labor, equipment, external and money.

The shopper connected factors are involved with client's sort, individuality, experience, money standing, awareness, organization, construction complexness, confidence, extent and risk dealing. The contractor connected factors are involved with the contractor's income, website management, experience, subcontractors, supervising, data flow and system. Resource downside are additional usually connected with dealer, late delivery of equipments, deficiency of staff, non economical instrumentality use throughout construction, late delivery of materials, inflation, caliber material etc. General downside that Janus-faced throughout the project are environmental downside, weather downside, ground downside, natural disasters like flood, earthquake etc. The owner makes some changes throughout the project delaying the project.



Construction plans may be modified by amendment of segmentation laws inflicting the delay. The contractor will stop the work attributable to late delivery of payments or payments don't seem to be on time.

4.4.1 Category of Contractor Related Delays

There are many studies by various researchers known the factors of contractor connected delays. Refer by Murali et al (2007) known the improper designing contractor, poor web site management and inadequate contractor expertise issues with subcontractors contribute to causes of delays. The delay in interior finishes (tiles, painting, ceiling), delay in transfer of plant room/plinth/water tank, improper electrical and mechanical coordination and management contribute to causes of delays. The subcontracting issues, contractor isn't well organized; contractor money issues and dangerous quality of contractor's work contribute to causes of delays. The conflicts in subcontractors schedule in execution of project, work on as a result of errors throughout construction, conflicts between contractor and alternative parties (consultant and owner), poor web site management and oversight by contractor, poor communication and coordination by contractor with alternative parties, ineffective designing and programming of project by contractor, improper construction strategies enforced by contractor, delays in subcontractors work, inadequate contractor's work, frequent amendment of subcontractors attributable to their inefficient work, poor qualification of the contractor technical employees, delay in web site mobilization contribute to causes of delays. Designing and programming deficiencies, deficiencies in value estimates ready, awaiting data, mistakes throughout construction contribute to causes of delays. The contractor, web site management, construction technique, improper designing and inadequate contractor expertise contributes to causes of delays. The dearth of contractor body personnel, shortage of technical professionals within the contractor organization, short coordination among the parties by the contractor, delay in mobilization, safety rules and rules don't seem to be followed at intervals the contractor's organization, incompetent technical employees allotted to the project, improper technical study by the contractor throughout the bidding stage, poor designing and programming of the project by the contractor, improper handling of the project progress by the contractor, ineffective internal control by the contractor, use of unacceptable construction techniques by the contractor, money difficulties featured by the contractor, delay in contractor payments to subcontractors contribute to causes of delay. There are lots of issue that were get from previous study concerning the issue cause the delay in construction project. Most of the researchers agree that are the issue that continuously happen relate to the contractor:

- i. Inadequate contractor expertise issues with subcontractors.
- ii. Ineffective designing and programming of project progress by contractor.
- iii. Mistakes throughout construction.
- iv. Delay in mobilization.
- v. Incompetent technical employees allotted to the project.
- vi. Poor web site management and oversight by contractor.
- vii. There are alternative factors that additionally vital that causes the delays construction:
- viii. Improper electrical and mechanical coordination and management.
- ix. Conflicts between contractor and alternative parties.

- x. Delays in sub-contractors work.
- xi. Improper technical study by the contractor throughout the bidding stage.

4.4.2 Category of Client Related Delays

There are many studies by various researchers known the factors of consumer connected delays. Initial known the economic issues, contract modification contribute to causes of delays. Second known the owner interference, slow higher cognitive process, surrealistic contract period and needs obligatory contribute to causes of delays. Third known the consumer sort, lack of timely creating call, surrealistic obligatory contract and consumer initiated variations contribute to causes of delays. Fourth known the modification or variation orders, delay caused by owner, oral modification orders by owner contributes to causes of delays. Fifth known the delays to furnish and deliver the location to the contractor by the owner, modification orders by owner throughout construction owner, late in rewriting and approving style documents by owner, delay in approving search drawings and sample materials, poor communication and coordination by owner and alternative parties, slowness in deciding} process by owner, conflicts between joint-ownership of the project, inaccessibility of incentives for contractor for finishing prior schedule, suspension of labor by owner contribute to causes of delays. The owner interference, slow higher cognitive process by owner, surrealistic impose contract period contribute to causes of delays. The delays in website preparation, delay in contractor's claims settlements, work suspension by the owner, too several modification orders from owner, slow higher cognitive process from owner, illation by the owner within the construction operations, delay ongoing payments by the owner.

There are lots of issue that were get from previous study regarding the issue cause the delay in construction project. Most of the researchers agree that are the issue that forever happen relate to the client:

- i. Illation by the owner within the construction operations modification orders by owner throughout construction owner.
 - ii. Poor communication and coordination by owner and alternative parties.
 - iii. Slow higher cognitive process from owner.
- There are alternative factors that conjointly necessary that causes the delays construction:
- i. Late to furnish and deliver the location to the contractor by owner.
 - ii. Delay in contractor's claims settlements.
 - iii. Suspension of labor by owner.
 - iv. Inaccessibility of incentives for contractor for finishing prior schedule.
 - v. Late in rewriting and approving style documents by owner.

4.4.3 Category of Material Related Delays

Several studies known the factors of fabric connected delays. In keeping with the fabric delivery were known as factors to causes of delays in construction project. The standard of fabric and absence in material contributed the cause. One disclosed that the fabric choice period contribute to causes of delays.



Then determine the shortage of materials, delay in materials delivery contribute to causes of delays. Later determine the fabric management issues that contribute to causes of delays. Once notice that the poor quality of fabric and absence having high influence to causes of delays. The shortage of construction materials in market, changes in material sorts and specifications throughout construction, delay in material delivery, harm of sorted material whereas they're required desperately, delay in producing special building materials, late acquisition of materials and late in choice of finishing materials thanks to accessibility of the many sorts in market that contributes to causes of delays. Last determine the delay in materials delivery, shortage of materials, modifications in materials specifications that contribute to causes of delays. There is plenty of issue that was gets from previous study concerning the issue causes the delay in construction project. Most of the researchers agree that are the issue that continually happen relate to the material:

- i. Shortage of construction materials in market.
- ii. Unpunctually material delivery.
- iii. Poor quality of fabric in construction.

There are different factors that additionally necessary that causes the delays construction Project:

- i. Modifications in materials specifications.
- ii. Changes in material sorts and specifications throughout construction.
- iii. Determine the fabric management issues.

4.4.4 Category of Labor Related Delays

Group of labor connected delays, one in every of the teams of causes known earlier, was normally cited within the literature that caused of delays. Many factors that associated with labor may be distinguished and categorized beneath the principle cause. The methodology of building the factors of this cluster of causes was the same as that of the fabric connected delays. Many studies known the factors of labor connected delays. Initial establish the labor offer and labor productivity that contribute to causes of delays. Second establish the labor offer and labor productivity that contributes to causes of delays. Third establish the labor shortages that contribute to causes of delays. Fourth establish the shortage of labors and low productivity level of labors that contribute to causes of delays. Fifth establish the shortage of hands (skilled, semi-skilled, unskilled labor) and presence of unskilled labor that contribute to causes of delays. There are lots of issue that were get from previous study concerning the issue cause the delay in construction project. Most of the researchers agree that are the issue that continuously happen relate to the labor:

- i. Labor offer.
- ii. Labor productivity.

There are alternative factors that additionally necessary that causes the delays construction:

- i. Shortage of Manpower (skilled, semi-skilled and unskilled labor).
- ii. Presence of unskilled labor.

4.5 Effect of Delays in Construction

The six effects of delay that were known includes: time overrun, cost, dispute, arbitration, total abandonment and proceedings. The time and price overrun were the impact of the fabric choice time, their availableness within the native market and therefore the presence of the oversight engineer. It's necessary to enhance the calculable activity length consistent with the particular skills levels, sudden events, and

potency of labor time, mistakes and misunderstanding. Delays influence negatively on the contractors performance and contribute to adverse impacts in construction comes like contract disputes increase and low productivity in construction prices which will additionally influence on the pre determined of construction project objectives.

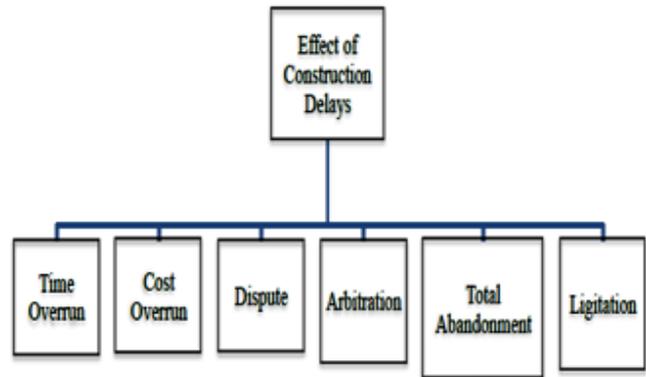


Figure 3: Effects of Construction Delays

V. RESEARCH METHODOLOGY

A third-round Delphi form survey was applied because the analysis technique. because the MD-1, MD-2, MD-3 use matrix structure for managing their comes, middle and prime matrix managers, some discipline engineers in designing, engineering, and procures, and project managers of those organizations additionally to alternative another} specialists from other related firms of Mapna cluster were elect because the applied math population. Supported literature structure expertise and review in capital punishment construction comes; AN initial list of forty causes of non-excusable construction delays was developed. Causes of excusable delays and a few of the causes of non-excusable delays, within which playing organizations don't have any management over them, were deleted from the list.

The form was reviewed by five specialists to ascertain the validity (do the form things seem to live what the instrument purports to measure?). The aim of a review is to boost the queries, format, and therefore the scales. There are several rounds we are able to take assess the performance over sensible works exploitation the ideas of questionnaires.

VI. CONCLUSION

In this paper the key causes of delays in construction come are known through a form survey. We tend to given the elaborated survey over the delays in construction comes. By a good management and management of those causes, the time of non-executable delay of the project may be minimized. Extension of contract period, if it's as a result of poor management of the project, despite written agreement liquidated harm, will increase website indirect value and name harm of the playing organization. The foremost vital reason behind no feasible delay, a minimum of within the scope of these analyses, is "not choosing competent subcontractors". We tend to keep these points as future work for the highest 3 causes so as to enhance time performance of the project.

REFERENCES

- [1] Sambasivan, M. and Soon, Y.W. "Causes and effects of delays in Malaysian construction industry", *International Journal of Project Management*, 25(5) (2007) 517-526.
- [2] Odeh, A. M. and Battaineh, H.T., "Causes of Construction Delay: Traditional Contracts", *International Journal of Project management*, Elsevier, 20 (2002) 67-73.
- [3] Long, D. N., Ogunlana, S.O., Quang T. and Lam, K.C., "Large Construction Projects in Developing Countries, a case study from Vietnam", *International Journal of Project Management*, Elsevier, 22 (2004) 553-561.
- [4] Ogunlana, S.O., Promkuntong, K. and Jearkijrm, V., "Construction Delays in a Fast-Growing Economy: Comparing Thailand with Other Economies", *International Journal of Project Management*, Elsevier, 14(1) (1996) 37-45.
- [5] Assaf, S.A. and Al-Hejji, S., "Causes of delay in large construction projects", *International Journal of Project Management*, 24 (2006) 349-357.
- [6] Belassi, W. and Tukel, O.I., A new framework for determining critical success/failure factors in projects, *International Journal of Project Management*, 14(3) (1996) 141-51.
- [7] Hatush, Z. and Skitmore, M., "Evaluating contractor prequalification data: selection criteria and project success factors", *Construction Management and Economics*, 15(2) (1997) 129-47.
- [8] Walker, D.H.T., "An investigation into construction time performance", *Construction Management and Economics*, 13(3) (1995) 263-74.
- [7] Chan, D.M.W. and Kumaraswamy, M.M., "A Comparative Study of Causes of Time Overruns in Hongkong Construction Projects", *International Journal of Project Management*, Elsevier. 15(1) (1996) 55-63.
- [8] Mezher T.M., and Tawil W., "Causes of Delays in the Construction Industry in Libanon", *Engineering Construction and Architectural Management Journal*, Emerald, 5 (3) (1998) 251-60.
- [9] Frimpong, Y., Oluwoye, J., and Crawford, L., "Causes of delay and cost overruns in construction of groundwater projects in developing countries: Ghana as a case study", *International journal of project management* 21.5 (2003) 321-326.
- [10] Alaghbari, W., Kadir, M.R.A., Salim, A., and Ernawati "The significant factors causing delay of building construction projects in Malaysia", *Engineering, Construction and Architectural Management*, 14 (2) (2007) 192-206.
- [11] Fugar, F D K and Agyakwah-Baah, A B "Delays in building construction projects in Ghana", *Australasian Journal of Construction Economics and Building*, 10 (1/2) (2010) 103-116.