

# Significant Factors that Affect the Construction Project Performance: A Review

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## ABSTRACT

*Construction industry has complexity in its nature because it contains a large number of parties such as clients, contractors, consultants, stakeholders, shareholders, regulators and others. It makes significant contributions to the socio-economic development process of a country. But due to some factors the construction project progress affected in different countries. Therefore this study focused on the reviewing and ranking of the different factors that affect the construction of project progress in different areas.*

**Keyword:** - Construction performance, Factors, Ranking

## 1. INTRODUCTION

Many definitions for a project can be found in the literature. A well-known definition of the project is that which Project Management Institute (PMI) had presented in the Project Management Body of Knowledge guide and it stated that a project is a temporary endeavor undertaken to create a unique product, service, or result. The temporary nature of projects indicates that a project has a definite beginning and end. The end is reached when the project's objectives have been achieved or when the project is terminated because its objectives will not or cannot be met, or when the need for the project no longer exists [1]

[2] defined construction project as "An endeavor in which human, material and financial resources are organized in a novel way, to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives."

Construction industry plays foremost role in improvement and accomplishment of the target of society. Construction industry is one of the largest and it adds to about 10% of the gross national product (GNP) in industrialized countries [3]. Performance is associated with several factors such as time, cost, quality, client satisfaction, productivity and safety. There are other genuine reasons like closures, modification of drawings and changes of the design. Other grounds affecting construction projects performance are poor management and guidance; inapt participants; poor relations and coordination; lack of motivation, insufficient infrastructure, political problems, cultural problems and economic conditions [1].

The subject of completion of project is therefore a universal concern that affects all parties to a construction project. It is thus in the interest of the project management as an emerging profession to address all the factors that affect completion of construction project [2]

According to the study conducted by [6] a conceptual framework is developed to reflect key factors which affect the performance and outputs of projects. Generally there are many factors that affect project performance and outcome, namely organizational culture, project management culture, and the project manager, time related factor, cost related factor, material related factor.

## 2. LITERATURES REVIEW

Various literatures were referred and summary was carried out.

[7] Identified the major cause for construction project delay in private construction projects in Jordan. The study considered a field survey considering 50 consultants, 50 contractors, and 20 owners and 45 causes of delay were identified during the study time. The identified causes are combined into three categories. Data then collected were analyzed by frequency and importance. The result of the study indicated that Shortage of manpower (skilled, semiskilled, unskilled labor), Delay in the approval of contractor submissions by the engineer, Shortage of materials

and the relationship between different subcontractors' schedules were the major causes of delays in private projects in Jordan. Owners specified that causes of delay are related to consultant and contractor; the consultants specified that the causes of delay are related to the contractor and the owners, and the contractors specified that the causes of delay are related to the consultants and owners. Finally the study recommended that Consultants should look to the following points (Avoid delay in reviewing and approving design documents, avoid the delay in giving the approval for the contractor to precede the work), Contractors should consider the following factors (Shortage and low productivity of labor, enough number of labors should be assigned and be motivated to improve productivity, Do some more coordination between subcontractors' schedules, Avoid insufficient coordination among the parties by the contractor, Financial and cash flow problems, contractor should manage his financial resources and plan cash flow by utilizing progress payment) and Owners should give special attention to the following factors: Avoid too many changes in orders in the project after the bidding period, Be faster in his decision making so he won't delay the project, Avoid the delay in payments for each of the contractor and consultant, Check for resources and capabilities, before awarding the contract to the lowest bidder).

[3] Investigated on the major factors affecting the performance of the construction projects in Chennai, Kerala and Bangalore industries. The percentage response showed that about 53% of respondents were from the consultants firm, 34% from the owner firms and 13% from the contractor firm. With reference to the response obtained 87% were from firms dealing with building projects, and job title of the response chart showed that 63% were project managers, 23% from the site engineers, and 7% from the organization managers. Relative importance index was used to determine the relative significance and ranking of the causes. The main factors considered were Cost, Time, Quality, Productivity, Client satisfaction, Community Satisfaction, Environment Factors, Health and Safety, Innovation and learning Factors. From the Cost factors: Increase in material cost have been ranked one in the category of cost with RII 0.933. From the time factors delay occurring due to material shortage stay as most important factor in time factor and it has an RII of 0.720. From the Quality factor: Need for a proper quality system in the organization have most importance in quality category and has an RII of 0.740. On behalf of Productivity side: Sequencing of work according to schedule leads in productivity the top identified factor with RII of 0.753. On behalf of Client satisfaction: Leadership skills of the concerned person's ranks first in this group with an RII of 0.680. On behalf of Community Satisfaction: Quality of regular documents has very high importance and it ranks top with RII of 0.707. Environment Factor: Wastes in and around the site the top identified factors that affects the performance of the projects with RII value of 0.660. And climatic factors with no doubt stand right. Application of health and safety factors in industry has been ranked as of high importance in health and safety factors with an RII of 0.700 and Coordination among different work groups stands first in innovation and learning factors with the RII of 0.773. As a result, the author's recommended that Consultants should focus more on design cost by using multi criteria analysis and most economical criteria should be adopted so as to improve their performance and also to increase owner's satisfaction. Contractors should be aware of the business environment risks in their cost estimation, there should be Enough contingency allowances to guard against the increasing material prices and the contractors should see that minimum amount of waste should be produced. And additionally quality trainings and meetings should be done in order to improve cost time and quality performance.

[8] Identified the major factors that affect timely performance of construction industry in Western Australia. The study used questionnaire survey and identified ten important factors. Such as Shortage of skills, Financial difficulties, Shortage of labour, Unrealistic deadlines for project completion, Unforeseen ground conditions, Poor organization of the contractor or consultant, Poor communication, Underestimation of time of completion, low speed of decision and Design errors made by designers to identify the factors on behalf of contractors, clients and consultants side. The relative importance index (RII) ranking method had been applied to determine the ranks of the different delay causes. According to the data analyzed, Skill shortages was noted as the most critical delay factors affecting construction industry in Western Australia ranked by all respondents with RII value of 0.8375, Financial difficulties ranked second in the overall results, with a relatively high RII value of 0.8313 compared to the other delay factors and Shortage of labour ranked second in the overall results, with a relatively high RII value of 0.8313 compared to the other delay factors.

[9] Studied about the success factors for construction projects. The author categorized the success factor in general and specific to the project sizes. Project team motivation and commitment is the most important factor when success in general considered Project manager's experience and leadership is the second important factor and followed by communication among all project participants, project manager commitment to project goals, and having good control over time, cost, and quality. On the other hand, when sizes were considered, the most important factors were top management support, the project manager's experience and leadership, and the project manager's commitment to project goals. It should be noted that the last two factors are among the most important factors for construction project whether the size was considered or not, which emphasizes its importance. Concerning the correlation

between success factors, the result showed that the strength of the linear relation between the success factors ranges from weak to medium. This correlation could be used to couple two factors or more while considering choosing success factors for a project. Lastly the author concluded that the size of the project has a minor effect on the related success factors, which means that the same factors have almost the same importance in different project sizes. Some factors such as appropriate organizational structure have a crucial importance in large projects, whereas, it has less importance in medium and small size projects. Therefore, having a set of factors that are important regardless of the project size, and another set of factors that have different importance in different project sizes is the best way to interpret the relation between success factors and project size.

[10] Studied about factors effecting performance of projects and developed conceptual frame work to show different aspects and factors that affect the project out come and performance. The conceptual frame work developed by considering what influences project performance and outcome. The model showed that project's outcomes are influenced by three aspects, namely project manager, organizational culture, and project management culture. Generally the authors concluded that the project manager, project management culture, and organizational culture affect project performance and output (time, cost, quality and others).

[11] Investigated critical success factors the contractor's performance Cambodian construction industry. The findings showed that that the complexity, size and planning of a project influences contractor's performance, which is perhaps due to the requirement of highly skilled workforce including design experts and experienced construction managers. Due to the labor-intensive nature of the construction projects, the culturally influenced attitudes affect overall performance of a contractor. The findings reveal that the construction client's influence is also significant. Client is considered to be a significant stakeholder, particularly in the decision making process, which consequently affects contractor's performance and ability to make timely decisions on a project's progress. Additionally, being experienced in specific type of construction projects is perceived to be critical for contractor's success for an ongoing or future projects. As a result the authors recommended that contractors have invest their available resources and efforts into the improvement of skills of workforce at various levels. Further, construction clients should proactively act in the project planning to provide positive input to contractors.

[12] Studied the factors affecting the performance of contractor in public construction projects. The study used open conversion system to identify the affecting factors. The ranking of the contractor performance factors was determined by taking the average scores of the reported data for all respondents. As a result, Most correspondents agreed that financial difficulties faced by the contractor, manpower shortages (of skilled, semi-skilled, or unskilled labor), and excessive owner change orders are the leading factors directly affecting contractor performance on construction projects and Changes in government regulations and laws, contractor violations of safety rules, and modifications to materials specifications ranked among the least important factors.

[13] Identified ninety nine delay factors for late completion of construction projects after Egyptian revolution. For analysis the factors were categorized into nine (9) major categories and ranked using Relative importance index method. (1) Consultant related delay factors (Delay in approving major changes in scope of work by consultant, RII=77.304, the most top ranked factor); (2) Contractor related delay factors (Ineffective project planning and scheduling RII=83.912, the most top ranked factors); (3) Design related delay factors (Design changes by owner or his agent during construction, RII=76.769, the ranked factor); (4) Equipment related delay factors (Shortage of equipment, RII=84.256, the top ranked factor); (5) External related delay factors (RII= Different tactics patterns for bribes, RII=85.688, the top ranked factor); (6) Labor related delay factors (Unqualified/inadequate experienced labor, RII=77.48 which is the top ranked factor); (7) Material related delay factors (Shortage of construction materials RII=76.432, top ranked factor); (8) Owner related delay factors (Delay in progress payments (Funding problems), RII=85.880 which is the top ranked factors); and (9) Project related delay factors (Complexity of project (project type, project scale, etc.) RII=78.368, which is the top ranked factors).

[14] Investigated that factors affecting the performance of construction projects in the Gaza Strip. A total of 120 questionnaires were distributed to 3 key groups of project participants; namely owners, consultants and contractors. The survey findings indicate that all 3 groups agree that the most important factors affecting project performance are: delays because of borders/roads closure leading to materials shortage; unavailability of resources; low level of project leadership skills; escalation of material prices; unavailability of highly experienced and qualified personnel; and poor quality of available equipment and raw materials. Based on these findings, the paper recommends that: 1) project owners must work collaboratively with contractors and facilitate regular payments in order to overcome delays, disputes and claims; 2) project participants should actively have their input in the process of decision-making; and 3) continuous coordination and relationship between project participants are required through the project life cycle in order to solve problems and develop project performance.

[15] Investigated on the factors affecting the construction projects in the Gaza Strip. The study adopted a questionnaire survey to identify the major factors that affect the construction project and used RII for ranking of

factors in all group of project participants. The survey findings indicated that all 3 groups agree that the most important factors affecting project performance were: delays because of borders/roads closure leading to materials shortage; unavailability of resources; low level of project leadership skills; escalation of material prices; unavailability of highly experienced and qualified personnel; and poor quality of available equipment and raw materials. According to owners, consultants, and contractors, it seems that the average delay because of closures leading to materials shortage was the most important performance factor as it has the first rank among all factors with relative index (RII) = 0.941 for owners, 0.896 for consultants, and 0.943 for contractors. The quality group has been ranked by the owners' respondents in the second position with RII equal to 0.792. It has been ranked by the consultants' respondents in the first position with RII equal to 0.787 and has been ranked by the contractors' respondents in the third position with RII equal to 0.794. This group is the most important one for consultants because consultants are interested in clients and technical factors. Consultants observed that quality of equipment and raw materials in project and availability of personnel with high qualifications strongly affect the quality performance of a project. The people group has been ranked by the owners' respondents in the third position with RII equal to 0.759. It has been ranked by the consultants' respondents in the 7th position with RII equal to 0.712 and has been ranked by the contractors' respondents in the first position with RII equal to 0.812. As a result the study concluded that: 1) project owners must work collaboratively with contractors and facilitate regular payments in order to overcome delays, disputes and claims; 2) project participants should actively have their input in the process of decision-making; and 3) continuous coordination and relationship between project participants are required through the project life cycle in order to solve problems and develop project performance.

[16] Studied about the Factors Affecting the Performance of Construction Projects in the Coastal Region of Kenya. The study adopted a cross sectional survey design questionnaire survey, interviewing, case studies & modeling and identified fourty factors on behalf contractor, consultant and client side. The study used Statistical package for social scientists (SPSS) version 21.0 for data entry and analysis, Pearson' correlation coefficient to establish the relationship between project performance in relation to project related factors, external environment, project related procedures and project management related actions and Multiple regression analysis to determine variance in the dependent variable. The authors categorized the factors into the following terms. Such as cost, time, quality, productivity, client satisfaction, regular & community, people and environmental factors. Lastly the study ranked the 10 most important factors using RII value. Such as Average delay in claim approval and payment approval owner to contractor (RII=0.942), Availability of resources as planned through project duration (RII=0.893), Leadership skills for project Manager /Owner (RII=0.877), Availability of personals with high experience and qualification (RII=0.872), Escalation of material prices(RII= 0.871), Quality of equipment's and raw materials in project(RII=0.860), Conformance to specification(RII=0.852), Differentiation of coins prices (RII=0.838), Sequencing of work according to Schedule (RII=0.818) and Material and equipment cost (RII=0.815).

[17] Assessed the factors that affect the quality of the project performance. The study adopted standardized questionnaires to identify the most important factors and Mean item score (MIS) to calculate the total weighted responses and further used to rank the order of importance of highlighted variables in conjunction with Standard Deviation. The study discovered that major factors affecting performance quality of construction projects in the study area were related to the use of unskilled and incompetent trade contractors, poor on-site supervision and lack of commitment by supervising team shouldered with the responsibilities of ensuring compliance to approved standard, poor planning and scheduling as well as inadequate knowledge, training and skills of construction workmen. The study identified and ranked both factors influencing project performance and performance quality improvements factors using MIS and SD methods. Use of unskilled trade subcontractors(MIS= 4.16,SD=7.467 1<sup>st</sup> in rank), Poor on-site supervision( MIS=4.16,SD= 7.884 2<sup>nd</sup> in rank), Construction labor skills and induction(MIS= 4.11,SD= 7.414 3<sup>rd</sup> in rank), Commitment by the Supervising team (MIS=4.05,SD=6.554 4<sup>th</sup> in rank), Poor planning and scheduling (MIS=4.05,SD=6.911&5<sup>th</sup> in rank), Lack of communication(MIS=3.93,SD=6.969 6<sup>th</sup> in rank), Project Manager's ignorance and lack of knowledge (MIS=3.89,SD=6.046&7<sup>th</sup> in rank),Scarcity of resources(MIS=3.84,SD=6.431 8<sup>th</sup> in rank), Poor material and plant management (MIS=3.82,SD= 5.741 9<sup>th</sup> in rank), Average delays in decision making (MIS=3.45 SD=4.118, 10<sup>th</sup> in rank), Number of projects at hand(MIS=3.45,SD= 5.913 11<sup>th</sup> in rank), Design changes (MIS=3.41,SD= 4.069 12<sup>th</sup> in rank), Conforming with specifications (MIS= 3.27,SD= 5.671 13<sup>th</sup> in rank), Involvement of End-User client (MIS=3.14,SD=3.311& 14<sup>th</sup> in rank), Assurance with client's funding (MIS=3.11,SD=6.493, 15<sup>th</sup> in rank) and Inclement weather conditions (MIS=2.52,SD=3.868 & 16<sup>th</sup> in rank). The Performance Quality Improvements factors were ranked as follows. Use proper and modern construction equipment (MIS=4.45,SD= 9.600 1<sup>st</sup> ranked), Allocation of adequate project duration (MIS=4.45,SD=9.724,2<sup>nd</sup> ranked),Use suitable construction methods to suit specific project (MIS=4.43,SD= 9.495 3<sup>rd</sup> ranked), Proper structured site management and supervision MIS=4.43,SD= 9.988 4<sup>th</sup> ranked), Conformance with construction drawings and specification (MIS=4.41 SD=9.389 5<sup>th</sup> ranked), Clear information and

communication channel (MIS=4.41,SD=9.389 6<sup>th</sup> ranked), Proper coordination between the construction team (MIS=4.39,SD=9.282 7<sup>th</sup> ranked), Appointment of experienced contractors (MIS=4.36,SD= 9.683 8<sup>th</sup> ranked ), Adequate planning and organizing (MIS=4.30, SD=8.518 9<sup>th</sup> ranked ), Have complete and suitable design at the right time(MIS= 4.30 9.282 10<sup>th</sup> ranked ), Proper and up-to-date project planning and scheduling (MIS=4.16,SD=8.085,11<sup>th</sup> ranked ), Effective strategic planning (MIS=4.16,SD= 8.518,12<sup>th</sup> ranked), Appointment of high experience technical team (MIS=4.14,SD=7.222,13<sup>th</sup> ranked),Use of appropriate construction methods (MIS 4.14=SD=7.250 14<sup>th</sup> ranked ), Ensure proper material procurement (MIS=4.07, SD=7.250 15<sup>th</sup> ranked), Having frequent progress meeting (MIS=4.02,SD=7.139,16<sup>th</sup> ranked ), Efficient and timely supply of materials (MIS=4.00 & SD= 7.756,17<sup>th</sup> ranked), Allowance of material price escalation in original tender document (MIS=3.98,SD= 6.675, 18<sup>th</sup> ranked ), Ensure up to date technology utilization (MIS=3.84,SD= 5.636, 19<sup>th</sup> ranked), Decrease number of variation order (MIS=3.66,SD= 4.534, 20<sup>th</sup> ranked) and Proper project feasibility study (MIS=3.52 SD=4.261 21<sup>th</sup> Ranked).

[18] Studied the Influencing Factors in Construction Project Scheduling. The top 5 factors with high mean value are inspection of major activities at time of execution (3.80), Technical support by workers and engineers (3.72), Communication among the stakeholders (3.72), Provision on proper designation based on education (3.70), and Resource documentation (3.6). However, In case of mode value the topmost factors opted by the engineers are provision on proper designation based on education (4), Recourse documentation (4) and planned resources obtained at the time of project could influence the scheduling of the project. Consequently the 53 critical factors were created as seven groups such as Socio Project Contribution, Environmental and Safety, Supportive Role of Owner and Management, Technical Competence of the Project, Management Efficiency, Financial Management Capability and Resource Management based on the questions on factors influencing the construction project scheduling in survey.

[19] Identified the major factors influencing the performance of construction Projects in Akure, Nigeria. A structured questionnaire survey approach was used to study the impact of various attributes and factors affecting construction projects performance in Akure, and the attitude of project clients, consultants and contractors in the Nigerian construction industry and used Average index method to identify the most important factors that affect the construction project in the study area. As a result the study identified ten important factors that affect the construction project such as Escalation of material prices (A.I=4.85), Insufficient supply of materials (A.I=4.70), Motivating skills of the project team leader (A.I=4.65), Quality control of materials (A.I=4.60), Consultants commitment to ensure construction work is done according to specification (A.I=4.60), Delay of progress payment (A.I=4.60), Project team leaders experience(A.I=4.60), Technical skill of the project team leader (A.I=4.55), Overall management actions(A.I=4.50) and Economic environment(A.I= 4.50). The authors used multiple linear regression and calibrated model to determine the contributing factors to the improvement of construction projects & the reliability of the model respectively.

[20] Identified the coordination factors affecting building projects performance. Coordination process is proposed as an efficient solution for the weak performance of construction projects. Study aimed to identify and prioritize coordination factors that influence the performance of building projects in Malaysian context. The study find out 53 coordination factors and used Relative Importance Index-II to rank the coordination factors and Cronbach's coefficient alpha to examine the internal consistency. The internal consistency scales ranges 0.87–0.88 which is greater than 0.7 and okay. The study lastly merged the coordination factors to five groups such as Planning and Scheduling, Resource management, Records and documentation, Contract Implementation, Quality and value engineering. According to the RII Value the top most effective coordination factors as follows. Scheduling (RII = 0.97), Quality assurance plan (RII= 0.93), and all parties' participation in plans (RII =0.89).

[21] Investigated the success factors for performance of construction projects in India. A structured questionnaire survey approach were considered to study the impact of various attributes and factors affecting success. The relative importance index method (RII) was used here to determine owners, consultants and contractors perceptions. The study identified 63 factors affecting the success of construction projects are selected. The top significant factors affecting the success of construction projects according to the perception of owner, consultant, and contractor were: Average delay because of closures leading to materials shortage, Unavailability of resources, and Leadership skills for project manager. According to owners, consultants, and contractors, it seems that the average delay because of closures leading to materials shortage was the most important success factor as it has the first rank among all factors with relative index (RII) = 0.941 for owners, 0.896 for consultants, and 0.943 for contractors. The authors recommended to develop human resources in the construction industry through proper and continuous training programs about construction projects performance.

### 3. CONCLUSION

From the review on literatures on identifying the major factors that affect the construction project performance, the following conclusions are drawn: Most of the factors were

- ✓  Categorized under contractor related, consultant related and client related factors
- ✓  Categorized under project management related
- ✓  Categorized under time related, cost related, material related, knowledge of project management related and the likes.

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