

# Causative Factor Analysis of Construction Delays on Sports Infrastructure Projects. Case Study: PT. ABCD, Indonesia

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## ABSTRACT

Infrastructure development is the main priority of government's objectives in recent years in Indonesia. The budget is growing significantly, and one of the biggest projects is the infrastructure of Asian Games 2018. The development involves a lot of contractors under the Ministry of Public Works, and PT. ABCD is one of the subcontractors involved in certain numbers of projects. Because of the complexity and limitation of time and resources, most of the projects managed by contractors are delayed, including the subcontractor's projects. This paper wants to find out the main factor that causing delay in sports construction and what the variables are and how to deal with it. This research involved PT. ABCD as a case study by conducting a survey to 35 employees involved in the project management at PT. ABCD and testing 30 variables that causing delay from previous study. The data collected were analyzed, and the quantitative analysis with the qualitative analysis were combined to see the managerial implication by analyzing literature and PMBOK. It was found out that the main factor that causing a delay is because of the multiple changes in contracts. The output of this paper is to give PT. ABCD and other companies in common, a preventive action and recommendation.

**Keywords:** *causative factor, construction delays, sports infrastructure projects.*

## 1. INTRODUCTION

### 1.1. Background

The Indonesian government for the 2014-2019 period has declared infrastructure development to be one form of utilization of priority budgets, both from budget financing and investment financing outside the State Budget. The increase in the infrastructure development budget in 2016 and 2017 was accompanied by a decrease in the energy subsidy budget by the government. This confirms that the government has a focus on converting energy subsidy financing into a productive asset in this case infrastructure, which has a long-term investment value [1].

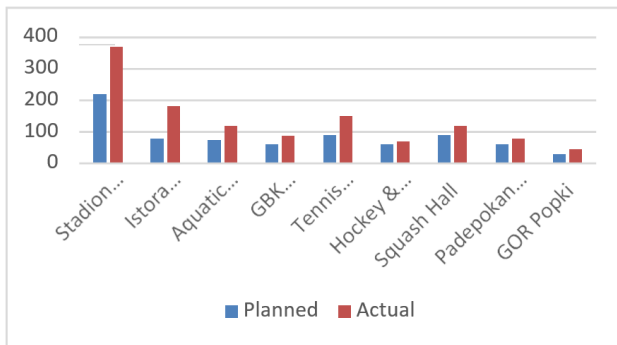
One form of infrastructure development that is a priority is the construction of facilities and infrastructure for the XVIII Asian Games 2018, where Indonesia would host the largest sports competition in Asia. In order to support the success of the event, the government issued Presidential Decree No. 15 of 2017,

concerning the National Committee for the Implementation of the XVIII Asian Games 2018, where the Ministry of Public Works and Housing became responsible for implementing the construction of facilities and infrastructure. Basuki Hadimuljono, Minister of PUPR, said that the Asian Games infrastructure development budget amounts to around 5.5 trillion rupiah [2]. With this budget, the government must be able to build various sports venues, in various provinces such as South Sumatra, DKI Jakarta, West Java and Banten.

### 1.2. Company Background

The Ministry of Public Works and Public Housing as the project owner has conducted an auction process for contractors who has interest in working on revitalization of sports facilities. The project is categorized in several work packages, and is participated by various main contractors from BUMN and several other main contractors. Looking at the

diverse scope of work in each 2018 Asian Games infrastructure work package, the main contractors redistributed the work according to the subcontractors' qualifications and expertise. PT. ABCD, as one of the subcontractors of sports construction specialists who were trusted in the infrastructure development of the 2018 Asian Games, got contracts from various main contractors in various sports venues such as the Bung Karno Main Stadium, Istora Senayan, Hockey and Archery Fields, Basketball Courts, Training Facilities Gelora Bung Karno, and several other sports venues. Figure 1 show construction delays of PT. ABCD in nine seating installation and procurement projects.



**Figure 1.** Construction Delays of PT. ABCD in nine seating installation and procurement projects. (Contract Document of PT.ABCD).

The main challenge for subcontractors such as PT. ABCD, is a multi-project implementation that takes place simultaneously, with varying levels of difficulty and employment, limited work capacity and human resources, financial constraints, and relatively short work schedules requiring good, effective and efficient project management. The effective and efficient project management is an important goal in order to maintain the work quality, timeliness of work, and cost efficient and effective.

**1.3. Project Management**

Project management is an application of organizational governance science that specifically occurs in project activities to achieve project goals or end results, according to time constraints and budget. Management includes initiation, planning, execution, leadership, and resource allocation control [3]. Reference [4] said that in broad outline, the success of a project management can be seen from four dimensions, namely project efficiency, impact on customers, business impact for internal organizations, and the last is opening up new opportunities in the future.

Project management has three objectives or often referred to as The Triple Constraint, which has specific deliverables or often referred to as scope of work, second is to have a specific period of time or have a

deadline, and the third is to have a budget. These three things are often referred to as the objective of a project [5].

The Triple Constraint is too general and irrelevant in controlling the possibility of errors in qualifying the results of a job whether the results are good or not. Consequently, the performance of a project must be measured thoroughly from the objective or ultimate goal of the project, and not only measured based on traditional measurements of cost, quality, and time [6].

Projects generally have three fundamental characteristics. The first characteristic is that each project is unique or not identical. Unique means having specific characteristics of each project, such as risk, results, and implementation. The second characteristic is a project that occurs once with objective elaboration or specific results. The third characteristic is that a project has a certain duration of work. There is a clear time or date when the project starts, and when the last time the project is to be completed. Projects also have a general life cycle, such as a slow start, then have significant progress, then begin to slow down towards the end of the project period [5].

Reference [7] found that project completion on time is often seen as the main criterion for the success of a project. Often criticism arises in the construction industry, if time exceeds a predetermined limit to build a construction [8].

Reference [9] through its research in Australia found that only one of the contracts for the construction of a building could be completed according to a predetermined schedule and time, while the average completion of a construction project was 40% longer than the specified schedule.

Research by Indian governments, through the Ministry of Statistics and Program Implementation (2013), found that costs that exceeded the limit were often caused by delays in project implementation or execution, which should be minimized. This analysis was then developed, and found that there were two dimensions which resulted in a project delay, namely the occurrence of late licensing processes such as land acquisition, environmental licensing and others, and delays in project execution carried out inefficiently during the planning and construction process. Looking at these two dimensions, this second dimension must be able to be investigated further. Research in a theoretical approach related to delays in large project executions and gaps in governance need to be identified that produce unsatisfactory performance. Various methodologies can be applied to find management efficiency in project execution, one of which is by building a benchmarking that can improve the performance of project scheduling [10].

## 2. METHODS

The research methodology used to obtain variables that affect the delay in the project schedule was a literature study on various scientific sources and quantitative analysis using a questionnaire distributed to all employees and management of PT. ABCD, who are directly involved with the management of the procurement and installation project for the 2018 Asian Games sports facility stadium.

### 2.1. Research Framework

The research was carried out in stages beginning with the collection of information and references as a research background and theoretical basis, both through literature and empirical reviews. Then, by using previous research references that have similar research topics, the determination of research variables was done and a questionnaire was developed to collect data as the object of research. After the data was collected, then recapitulation, evaluation, and calculation using SPSS statistical tools were done to see the validity and reliability of the data that has been obtained. If the results were not significant, then the evaluation and distribution of the second questionnaire were carried out to get results that have consistency and relevance with the research objectives. If it was significant, the results of the quantitative analysis were carried out further with expert interview methods in project management by using PMBOK as the basis for recommendations.

### 2.2. Research Variables

In determining the factors and variables to be examined, this study referred to a study conducted by [11] which also referred to previous research by [12], who said that the densest of more than 30 variables often appeared and were the cause of delay. The variables were obtained through studies of experts and experts from various backgrounds, such as clients, contractors and consultants in Hong Kong. Furthermore, all of these variables were categorized into seven categories of variables, namely client related (CL), related engineer (EN), related human behavior (HB), related contractor (CN), project related (PJ), resource related (RS), and external factor related (EX). Table 1 show the variables or factors listed in the study.

**Table 1.** Research Factors and Variables

Code Name	Category of Delay	Cause of Delay
CL 1	Client Related	Client variations/scope
CL 2		Unrealistic contract duration imposed by client
CL 3		Unavailability of the site access area
CL 4		Imbalance in the risk allocation
CL 5		Poor coordination between client and contractors
CL 6		Unrealistic client requirements

CL 7		Defective materials provided by client
EN 1	EngineerRelated	Necessary variations/impossibility
EN 2		Inconsistency in contract documents
EN 3		Inaccurate bills of quantity
EN 4		Poor site management and supervision by consultant
EN 5		Slow coordination and seeking of approval from concerned authorities
EN 6		Delays in providing design information and approval of contractor submissions
CN 1	Contractor Related	Exceptionally low bids
CN 2		Inexperienced contractor
CN 3		Delay caused by domestic subcontractor
CN 4		Delay caused by nominated subcontractor
CN 5		Poor workmanship
CN 6		Occurrence of site accidents
HB 1	Human Behavior Related	Adversarial/confrontational/controversial culture
HB 2		Delays in the response of project teams for potential dispute resolution
HB 3		Lack of communication
HB 4		Personality clash between contractor agent and resident engineer
PJ 1	ProjectRelated	Unforeseen ground conditions
PJ 2		Works in conflict with existing utilities
PJ 3		Buildability
PJ4		Delay in material/logistic
EX 1	External factor related	Inclement weather
EX 2		Uncontrollable external factors
EX 3		Environmental Restrictions
RS 1	Resource Related	Inadequate resources due to contractor/lack of capital
RS 2		Lack of skilled labour/technical personnel

All of these variables were then poured into the questionnaire, which was distributed to the employees of PT. ABCD, who were actively involved in project management.

## 3. RESULTS AND DISCUSSION

The results obtained from a questionnaire that has been distributed to 35 employees involved in project management in Seat Procurement and Installation for Asian Games sports facilities infrastructure returned as many as 30 respondents, equivalent to 85.7%. Sekran (1992) in [11] said that sample size greater than 30 and less than 500 is good enough for research. Therefore, it can be said that this research was quite relevant to the sample size owned, given the constraints of the limited number of employees owned by PT. ABCD was involved in project management. The correspondent demographic data is contained in Table 2.

**Table 2.** Respondent Work Experience Demography

Number of Year Works	Percentage (%)
0-2 Years	16.7%
3-5 Years	26.7%
5-10 Years	33.3%
10-15 Years	13.3%
15 Years <	10%

From the demographics data, the majority of respondents are in the range of 5-10 years working experience in project management with a percentage of 33.3%, followed by 3-5 years of experience at 26.7%. It can be concluded that employees of PT. ABCD in project management has a fairly balanced composition, between categories of experience over 5 years and inexperienced under 5 years, if it follows the common practice of a project management team. The combination of a team can be categorized as quite good, for the agility of a project, but it would be better if there was one senior person at each position, for the smooth running of the project [13]

The questionnaire that has been distributed contains 32 statements regarding which factors or variables can cause delays in project management schedules, with classification factors such as Client Related [CR], Engineering Related [EN], Contractor Related [CN], Project Related [PJ], Human Behavior Related [HB], Resource Related [RS], and External Related [EX]. Respondents were asked to answer using a Lik-ert scale between 1 - 5 with the understanding 1 if the respondent answered Strongly Disagree (STS) and 5 for Strongly Agree (SS). Table 3 shows the questionnaires validity test results.

**Table 3.** Questionnaires Validity Test Results.

Factor	Test results	Alpha Significant Level 5%	Validity test
CL1	0.343	0.361	Not Valid
CL2	0.527	0.361	Valid
CL3	0.647	0.361	Valid
CL4	0.478	0.361	Valid
CL5	0.750	0.361	Valid
CL6	0.726	0.361	Valid
CL7	0.529	0.361	Valid
EN1	0.612	0.361	Valid
EN2	0.679	0.361	Valid
EN3	0.679	0.361	Valid
EN4	0.777	0.361	Valid
EN5	0.757	0.361	Valid
EN6	0.692	0.361	Valid
CN1	0.460	0.361	Valid
CN2	0.746	0.361	Valid
CN3	0.829	0.361	Valid
CN4	0.588	0.361	Valid
CN5	0.783	0.361	Valid
CN6	0.503	0.361	Valid
HB1	0.896	0.361	Valid
HB2	0.775	0.361	Valid
HB3	0.810	0.361	Valid
HB4	0.894	0.361	Valid
RS1	0.918	0.361	Valid
RS2	0.888	0.361	Valid

Factor	Test results	Alpha Significant Level 5%	Validity test
PJ1	0.619	0.361	Valid
PJ2	0.681	0.361	Valid
PJ3	0.787	0.361	Valid
PJ4	0.812	0.361	Valid
EX1	0.805	0.361	Valid
EX2	0.934	0.361	Valid
EX3	0.891	0.361	Valid

From the Table 3, there is only 1 of 32 variables said to be invalid, namely the CL1 variable. If the factors were observed in detail, the factors related to the client's requirements are unclear or irrelevant. Seeing this, it can be concluded that these factors, based on the results of statistic testing, are not significant and have no relevance to project management in the company PT. ABCD, so that it cannot be categorized as a cause of delay in the management of the 2018 Asian Games Sports Facility Stadium Chair Procurement and Installation.

Meanwhile, the reliability test used to see the consistency of the questionnaire distributed to all respondents has the test results in Table 4.

The reliability test results explained that the overall factor group has a good level of reliability, at a significance level of 1%. Each factor has a reliability level above 60%, so this questionnaire has consistency and can be accounted for. The results of the highest reliability test are found in related resource factors, meaning that the overall respondents have a tendency or consistency and harmony in these factors, which is related to the availability of financial funding / support as well as the limitations of expert employees owned by the company.

**Table 4.** Questionnaires Reliability Test Results

Factor Related	Cronbach $\alpha$
Client Related	0.718
Engineering Related	0.791
Contractor Related	0.739
Human Behavior Related	0.862
Project Related	0.698
Resource Related	0.770
External Factor Related	0.843

Based on the results of the quantitative analysis conducted, there are dominant variables that cause delays in sports construction projects at PT. ABCD which occurred in nine project procurement and installation of stadium chairs, which is described in Table 5.

From Table 5, based on the results of a survey conducted on 30 respondents, the most dominant factor in project delay is the inaccuracy of the Bill of Quantity (BoQ) which is very closely related to the volume of work. BoQ inaccuracy results in changes in the scope of

work that can be reduced or increased, so it gives an impact on inefficiencies in project management. Some of these variables in line with the results of research findings conducted by [8] and also [12], are similarities in the variables EN5, RS1, PJ1. Whereas for EN3, EN2 and PJ4, only happened in the case of PT. ABCD. In other words, this shows that the problem still exists and special attention is needed for future improvements. The findings are totally different from [11] where in the case of UAE countries, the main cause in the UAE is the unrealistic duration of the contract given by the client.

**Table 5.** Mean Scoring and Contractor Ranking.

Variable	Description	Mean Scoring	Contract or Ranking
EN3	Inaccurate bills of quantity	3,87	1
EN5	Slow coordination and seeking of approval from concerned authorities	3,87	2
EN2	Inconsistency in contract documents	3,87	3
PJ4	Delay in material/logistic	3,83	4
PJ1	Unforeseen ground conditions	3,80	5
EN6	Delays in providing design information and approval of contractor submissions	3,70	6
RS1	Inadequate resources due to contractor/lack of capital	3,67	7

**4. CONCLUSION**

It can be concluded that PT. ABCD, in this case as a contractor, had limited resources related to finance and also the limitations of experts, as the most dominant group factor in causing delays, with the highest mean score compared to other factor groups. This is very relevant with the capacity and capabilities possessed by PT. ABCD in working on the megaproject at the same time. If referring to the [13], this can be anticipated, and improvements can be made by conducting knowledge area mapping, where areas that need to be mastered by PT. ABCD is how to compile a project charter at the initiating stage, and analyze key activities on the project in the planning stage, elaborate the scope of work by considering all risks and mature calculations, so that the resource requirements and cost estimates are accurate. With this provision, then the development of capability and resource equity both financial and expert labor can be anticipated before the project is executed [13].

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