

Why are Power Projects delayed in developing Countries? : Discussing with similar issues in NPP Projects

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1. Introduction

Project delay is a serious issue and loss in all construction projects. Especially, the Nuclear Power Plant (NPP) project have suffered from repetitive delays and setbacks in many projects. The completion of Olkiluoto 3 in Finland was originally scheduled for 2009[1], but the start of regular electricity generation is scheduled for 2020[2]. Not only in the NPP project but also in the other power project like transmission and distribution in many developing countries have suffered from similar delay problems. In order to increase the schedule management capability of NPP projects, the government in a developing country, first of all, should improve the capability of managing the delay of other power projects. This improvement will support the government to be more confident to develop NPP projects in the future.

Many studies have dealt with delay problem in construction projects. Nevertheless, previous studies do not focus on the power project. The delay in commissioning of any project, including power project always involves different elements of cost overruns compared to civil and building projects. A direct cost of overruns is in terms of additional energy realized when the project is not commissioned on time, as well as additional sales revenue incurred thereof. Also, previous studies have mainly focused on the delay problem in a developed country. Still, there would be different delay causes in developing countries compared to developed countries.

This study investigated the cause of the delay of 60 power projects in Tanzania. The authors separately summarized the top 10 causes from the owner perspective and contractor perspective. Then, this study discusses which delay factors are related to nuclear power plant projects. This discussion will be helpful for NPP project development to be earlier realized in a developing country.

2. Background

2.1 Cause of Project Delay

Failure of proper time estimation has led to substandard work, which results in the requirement of more time for rectification in order to meet or exceed stakeholders' expectations [3]. Project practices causing delays and disruptions, and their effects put construction projects at great risk that affect their performance [4].

More researches in the electrical power industry are still required in order to improve performance and productivity of construction activities, which will enhance quality and well-timed completion of power construction projects as well as proper utilization of resources.

Many researchers have studied the causes and consequences of construction project delays. These studies revealed various causes of project delays such as lack of materials, poor supervision, and change of orders, lack of experienced project managers, and lack of workforce, finance difficulties, logistic problems, and unforeseen factors. With the reference of these views, the study aims to find out what are the reasons for power plant delays in developing countries.

2.2 Developed Countries VS Developing Countries

Many differences exist in construction practices in developed and developing countries. However, previous studies rarely applied comparative assessments considering the two contexts and thus very little is known about how and to whatever extent project governance differs in developing countries compared to developed ones.

Although the many causes of project delays in developed countries are almost similar to those of developing countries, the more important causes differ. For developed countries, the issue of financing, cash flow, skilled labor, and technology might not be a big deal compared to developing countries because of the economic stability differences.

2.3 Power Projects VS NPP Projects

Many previous studies have dealt with the causes, consequences, and success factors of construction projects. Most studies investigated civil or building projects. These studies revealed some causes of project delays such as lack of materials, poor supervision, and change of orders, lack of experienced project managers, and lack of workforce, finance difficulties, logistic problems and unforeseen factors. However, there are rare specific papers on causative aspects, which critically focus on power projects delays as the authors' best knowledge. Also, these kind of little studies are similar in NPP project research. So, this study investigates power projects and discuss with similar issues for NPP projects.

3. Methods

The study analyzes power projects and their relationships, facts and the extent to which they are related to the theories from the various research on project delays. The random samples of 60 completed power projects are selected and assessed by making measurable quantification through documentaries, questionnaires and project reports.

The study focuses on identifying, grouping, analyzing and ranking practices that cause project delays as per owner and contractor perceptions. Relative Importance Index (RII) technique is adopted.

3.1 Input Variable

Table 1 below shows the causes of project delays identified from different researchers and used for this study.

Table 1: Major Practices Causing Project Delays [5][6]

Group of factors	S/N	Practices causing project delays
1. Client/ owner/ Management-related factors	1	Change of scope during construction (additions, alterations, deletions, variations)
	2	Wrong choice of procurement approach
	3	Poor supervision in construction projects
	4	Poor communication and coordination with other stakeholders
	5	Slowness in decision making and approving documents
	6	Delay in site delivery
	7	Types of tendering and contractual arrangements (lowest price tender award)
2. Design-related factors	1	Change of design during construction
	2	Inappropriate data collection
	3	Use of unskilled and inexperienced design team in power projects
	4	Doing mistakes and delays in producing design documents
	5	Failure in identifying and create risk plan
	6	Untimely sorting out site and way leave problems
	7	Poor estimation and allocation of resources
3. Consultant and Contractor-related factors	1	Engaging inexperienced consultant/contractor on power projects
	2	Delay in approving major changes in the scope of work
	3	Improper planning of financial arrangement
	4	Ineffective project planning and scheduling

	5	Poor communication and coordination with other parties
	6	Poor site management and supervision
	7	Rework due to errors or mistakes
	8	Poor estimation and allocation of resources
	9	Misrepresentation of information during tendering
4. Finance-Related factors	1	Inadequate fund allocation
	2	Poor estimation of project cost
	3	Poor determination of budgets
	4	Late payment to suppliers or completed works
	5	Poor planning of cost management
5. Social /Man power-related factors	1	Absenteeism of workers
	2	Workers' low motivation and morale
	3	Striking of workers
	4	Poor Occupational Health
	5	Engagement of unskilled labour or inexperienced labour
6. Materials and Equipment-related factors	1	Slow movement of materials requisition and issuing documents
	2	Use of poor quality construction materials and equipment
	3	Late procurement of construction materials and equipment
	4	Supplying incomplete sets of materials
	5	Change of types and specifications
	6	Damaging materials/equipment during construction
	7	Late delivery of material and equipment
7. External-related factors	1	Delay in obtaining permits from authorities
	2	Improper identification and Planning of risk management
	3	Force Majeure (floods, rainy condition)
	4	Facing neighbours conflicts
	5	Unexpected surface condition (rocky, soil, water table)
	6	Facing political controls
	7	Vandalism

3.2 Questionnaire survey

The authors sent 500 questionnaires electronically to potential and professional respondents nationwide throughout Tanzania. 240 questionnaires were collected and 211 responses were valid. 91 responses are collected from the owner side and 120 questionnaires are investigated from the contractor side.

3.3 Analysis Method

This study used Relative Importance Index (RII) method to analyze and determine the relative importance of the various practices causing project delays.

Moreover, the study separately calculates RII from owner and contractor perspective. The five-point Likert scale ranged from 1 (very low) to 5 (very high important) were adopted and transformed to relative importance indices (RII) for each factor as follows:

$$RII = \frac{\sum W}{(A \times N)} \quad [4]$$

Where:

W was the weighting given to each factor by the respondents (ranging from 1 to 5).

A was the highest weight (that was 5 in this case), and

N was the total number of respondents.

4. Results and Discussion

Table 2 and Table 3 show the Top 10 RII values from the owner perspective and contractor perspective respectively. The most salient ten practices causing power project delays were also identified.

Table 2: Top 10 Delay Causes from Owner Perspective

Causes of Project Delay	RII	Rank
Inadequate fund allocation	0.644	1
Late delivery of material and equipment	0.636	2
Poor planning of cost management	0.631	3
Vandalism	0.626	4
Supplying incomplete sets of materials	0.608	5
Delay in obtaining permits from authorities	0.588	6
Improper planning of financial arrangement	0.584	7
Engagement of unskilled/ inexperienced labour	0.571	8
Engaging inexperienced	0.564	9
Consultant/Contractor in power project	0.545	10
Change of design during construction	0.545	10
Total	5.997	

From the owner perspective, Inadequate fund allocation ranked as the first significantly influential of power project delays with the highest RII value (RII=0.644), followed by late delivery of material and equipment (RII=0.636), and the third one is poor planning of cost management (RII=0.631). Poor planning of cost management and late delivery of material and equipment also ranked high in causes from the contractor perspective. So, the owner and contractor should make an effort to improve these delay. Whereas, inadequate fund allocation, delay in obtaining permits from authorities, and change of design during construction ranked in only owner perspective.

NPP project among other power projects requires high initial capital investment and consequently, it is a big challenge for the low economic capable countries to deliver enough finance. This lack of budget or finances can induce lack adequate finances, institutional capacity,

electrical grid, roads, and transportation system to support a big project like NPP.

Table 3: Top 10 Delay Causes from Contractor Perspective

Causes of Project Delay	RII	Rank
Vandalism	0.721	1
Poor planning of cost management	0.713	2
Poor estimation of project cost	0.704	3
Supplying incomplete sets of materials	0.703	4
Late payment to suppliers or completed works	0.681	5
Engagement of unskilled/inexperienced labour	0.680	6
Poor communication and coordination with other parties	0.680	7
Late delivery of material and equipment	0.669	8
Improper planning of financial arrangement	0.665	9
Facing political controls	0.653	10
Total	6.869	

From the Contractor Perspective, the three foremost practices included the following: Vandalism (RII=0.721), poor planning of cost management (RII=0.713) and poor estimation of project cost (RII=0.704). There were little differences between owner and contractor perspective, as from the comparison from Table 2 and Table 3, most of the causes identified are similar, but the rank is different. Vandalism ranked as the most cause of delay as per contractor perspective while ranked number four as per the owner perspective. However, poor estimation of project cost ranked in only contractor perspective.

NPP projects tend to have similar causes of project delays as observed in Table 3. The delay of Olkiluoto NPP unit 3 project in Finland showed similar delay factors as observed in this study. These included; poor cost estimation, poor communication and coordination between the companies involved in the project, and quality control issues due to inexperienced contractors who had no training related to safety culture prior to concreting of the base slab [1]. Overall RII values are higher in the contractor perspective rather than in the owner perspective, which implies that project delay is more caused by contractors. So, this implies that sound schedule performance can be achieved from a well-selected contractor rather than well-selected consultants of owner-side.

5. Conclusion

This study investigated the cause of the delay of 60 power projects in Tanzania and will be helpful for NPP project development to be earlier realized in a developing country.

This study identifies and analyzes the causes of project delays as shown in Table 1. In the case of the owner

perspective, the study identifies three foremost causes: inadequate fund allocation (RII=0.644), late delivery of material and equipment (RII=0.636) and poor planning of cost management (RII=0.631). From the contractor perspective, three foremost delay practices are: vandalism (RII=0.721), poor planning of cost management (RII=0.713) and poor estimation of project cost (RII=0.704).

The high ranked causes of this study were also observed in the Olkiluoto NPP unit 3 project in Finland. So, if the developing countries solve the delay causes in power project, these improvements will help expedite the NPP project development. In the future, the authors will investigate the cause of NPP project delay in a developing country and compare this study with future study.

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