# Delay Causes in Electrical Projects Commissioning.

Ashraf Seif[1], Joanna Furtak[1], Wooyong Jung[1*]

[1] *KEPCO International Nuclear Graduate School (KINGS) 658-91 Haemaji-ro, Seosaeng-myeon, Ulju-gun, Ulsan 45014, Republic of Korea,*
**Corresponding author: wooyong@kings.ac.kr*

## 1. Introduction

Delay in commissioning of projects is one of the foremost concerns of the construction industry in most countries, with it being handled then projects can be handed over and begin operation. Delay of projects generally means the slow down of development in all other fields, especially the energy sector because energy is the driving force promoting other investments.
Commissioning of substation projects is a process that is designed to build an environment for energy efficiency aimed at having reduced energy costs and the level of project performance is assured, in such a way for the owner to verify that the expectations and requirements of the project have been met.
Growing population in different countries has led to an increase in construction of more substations and connecting more customers on the grid due to increase in demand for electricity. This is much needed to satisfy the laod growth, but several challenges are mostly experienced in attempt to implement projects hence leading to delays. The magnitude of these delays vary considerably from project to project. This paper by a means of literature review and a questionnaire survey aims at identifying delay causes in two case scenarios; successful and unsuccessful case. A project is acknowleged as successful if it gets done within its target, schedule time, also in accordance with the specifications in the estimated budget and client satisfaction, otherwise it is considered unsuccessful. Daniel and Mohan (1996), stated that a project is considered successful if it is completed on time, within budget and to specified quality stnadards[1].
Several literature reviews have discussed about handling of project delays in construction projects. In the case of Pier and Giovanni (2019), an analysis of schedule delays was done and the concept of ''float bank'' introduced as a means of assigning and sharing delay responsibilities. They also introduced the implementation of an algorithmic method and application for a complete study, to potentially integrate the commercial in-house software and assist current project control, claim cases and the so called forensic management which involves investigating, analyzing key elements of the construction projects to ensure they are on schedule, on budget and adhering to relevant safety and codes[2].This paper presents results of a questionnaire survey on causes of delays in procurement, design, construction and commissioning stages of projects from two case studies.

## 2. Causes of delay

A comprehensive of literature review is conducted to build up knowledge required to identify the common delay causes in variety of projects related to construction and commissioning. The construction process is usually complicated due to the involvement of a large number of parties in the project cycle such as; client, consultant, planner, scheduler, stakeholders, contractors, suppliers and sub-contractors.At times, a single delay may not have a major impact on overall project schedule but when there are concurrent delays this could have major impact on the completion date.
Mohamed and Chafi (2018), determined critical causes affecting project delay in Moroccan construction industry and results indicated that the most important delay causes as perceived by the two parties; 1) lack of trainingin for employees, 2) lack of waste management strategy, 3) Unrealistic contract duration imposed by clients, 4) rework due to the construction errors, 5) excessive sub-contracting, 6) delay in obtaining permits from governmental agencies, 7) ineffective planning and scheduling and 8) lack of collective planning and skilled workforce[3]. Daniel and Mohan as well ranked and analyzed significant factors causing delays in Hong Kong construction projects, and results indicated as follows; 1) poor site management and supervision, 2) unforeseen ground conditions 3)low speed of decision making involving all project teams, 4) client initiated and necessary variations of works[1].A study performed by Yakubu and Olawale (2010), identified factors that inhibit both cost and time control during construction projects and came up with a checklist of good practice to help project managers improve the effectiveness of control of projects, the factors inhibiting schedule were as follows; 1) design changes, 2) risk and uncertainties, 3) complexity of works, and 4) non-performance of contractors[4]. Yau and Yang (2012) as well identified schedule delay factors in the design schedule of power distribution projects through questionnaire survey, findings were; i) improper detailed schedule planning, ii) lack of integration between project interface iii) public resistance, iv) improper communication between contractual parties, 2) from the designers perspective: i) long acquisition during seeking for approvals, ii) over subjective explanation of regulations[5].

### *2.1. Owner Related Causes*

In most cases the owner results into delays especially when they do not understand the contract, ignoring costs of project changes leading contractors to use less

effective equipment and low quality material. The owner may also cause delays by making changes to the project or even disputing certain aspects of the agreement among many others.

### *2.2. Contractor Related Causes*

Most studies have determined that the performance of contractors was the major cause of delays in some countries. At times upto a certain percent of the total construction capital is not used properly for construction purposes by contractor, due to poor project management. The common causes of delays as a result of the contractor are identified as follows; inexperienced contractors or sub-contractors, under estimation of cost and complexity of projects by the contractor, under estimation of project completion time by contractors, lack of planning and poor understanding of project specifications and requirements as per client's requirements and delays in mobilization. Sub-contractors are also often faced with the spectre of financial difficulties, incase of delayed payments which may result into delay or failure of a project.

## 3. Methodology

This study is based on a questionnaire survey approach to identify the common causes of delay in project schedule at the design, procurement, construction and commissioning stage . The study was conducted in two stages: stage one was through circulating qustionnaires electronically to different professionals, project practitioners who were directly involved and participated in either of the two projects. A total of fourteen responses were collected yielding a reponse rate of 70% with valid responses in relations to the projects' scope. The second stage was conducted through zoom video meetings to explore the topical issues revealed after analysis of the questionnaire survey response, and experiences of practitioners in greater depth.

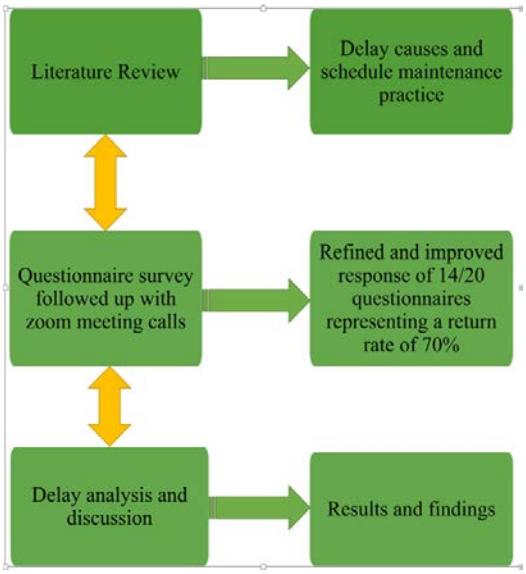


Fig. 1. Methodology flow chart

### *3.1. The Questionnaire Design*

The questionnaire was designed based on the objective of the study with similar survey questions, but with specifically related to invidual project. It consisted of three main sections 1) general information of the respondents 2) causes of delays in the successful and unsuccessful case scenarios 3) schedule maintenance practice applied in both projects**.**

Table I: Distribution of respondents for successful case scenario

| | Owner | Contractor | Total |
|---|---|---|---|
| Project Manager | 1 | 0 | 1 |
| Project Engineer | 2 | 1 | 3 |
| Sub-contractor | 0 | 1 | 1 |
| Total | 3 | 2 | 5 |

Table II: Distribution of respondents for unsuccessful case scenario

| | Owner | Contractor | Total |
|---|---|---|---|
| Contract Manager | 1 | 0 | 1 |
| Project Manager | 2 | 1 | 3 |
| Project Scheduler | 0 | 1 | 1 |
| Project Engineer | 3 | 0 | 3 |
| Cost Manager | 1 | 0 | 1 |
| Total | 7 | 2 | 9 |

### *3.2. Methology approach*

The responses from the questionnaires, were read through, analyzed by use of coding. The responses were categorized into a small number of groups of like answers, a number was assigned to each group of like answers to represent coding, then the related codes were sorted and grouped in terms of their relationship in reference to the same concept and number of occurrence in the questionnaire, and from this themes emerged as shown in table (III) for data analysis. Figure 2 illustrates the methodology steps taken to interpret data received from the survey, it also outlines flow of data being coded through assigning of unique numbers, then categorization of similar responses then themes are generated;

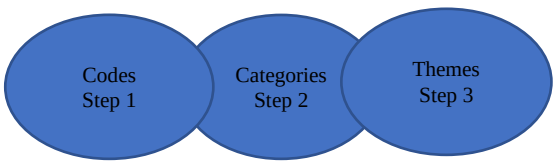


Fig. 2. Methodology Steps

Table III: Analysis questionnaire responses

| Code number and coded theme | Successful Case | Unsuccessful Case | Total number of sorted responses per code and theme |
|---|---|---|---|
| (1).Poor communication | 8 | 5 | 13 |
| (2).Poor specifications, planning, supervision and monitoring | 21 | 19 | 40 |
| (3).Low quality and lack of materials ( Labor resources) | 3 | 12 | 15 |
| (4).Insufficient Human resources | 0 | 6 | 6 |
| (5).Lack of skills and competence | 4 | 24 | 28 |
| (6).Disputes among participants ( owner, contractor) | 1 | 5 | 6 |
| (7).Poor transport and logistics network | 5 | 4 | 9 |
| (8).System downtime and process delays | 25 | 39 | 64 |
| (9).Changes required (Rework issues) | 7 | 7 | 14 |
| (10).Payment and misuse of funds challenges | 3 | 14 | 17 |
| (11).Low quality of works ( paper and field works) | 2 | 3 | 5 |
| (12).Non sequential of works | 4 | 12 | 16 |
| (13).Monopolization of materials by the owner | 1 | 0 | 1 |
| (14).Site complications (wayleaves, accessibility) | 0 | 9 | 9 |
| (15).Political interference | 0 | 1 | 1 |
| (16).Unavoidable situation ( accidents duuring work) | 0 | 2 | 2 |
| (17).Corruption challenge | 0 | 1 | 1 |
| | **84** | **163** | **247** |

## 4.0 Results:

Table (III) displays a total of 247 responses of the most common causes of delay that result into schedule and commissioning delays, it also groups the responses from each case scenario to clearly show which specific delay causes affected each project individually, as per the responses from the questionnaire survey, the responses were grouped into related answers based on the type of cause and number of occurrence, then they were were summed up to give the total from each case scenario as illustrated in table (III). The response on system downtime and process delays happened to be the highest in number from both case scenarios, followed closely by response on lack of skills and competence, this shows that knowledge and experience is one of the key factors in construction, the responses revealed that both successful and unsuccessful project scenarios faced challenges and possible delay causes, but successful case personnel managed to work around them and delivered project on time. The other listed responses touching on poor specifications, planning and supervision of the projects and low quality of materials had high listing as well affecting the projects success for the unsuccessful case scenario. The least mentioned delay causes in both the case scenarios included; accidents during work, corruption challenge,political interference and monopolization of material by the owner.

## 5.0 Conclusion:

Commissioning consists of a number of activities that include testing, running, and even putting the plant under operation that can probe any necessary adjustments for an unexpected operation. This study identified some common causes of delays and analyzed questionnaire responses, the purpose of this analysis is to potentially alleviate some prevailing challenges faced by project participants in construction industry. There are no straightforward solutions of schedule delays, but this study findings, can add onto information required in a project's check list to avoid projects delayed and play some role in the direction of project success.

## References

[1] D W M Chan, M. M. Kumaraswamy, *A comparative study of causes of time overruns in Hong Kong construction projects,* S0263-7863(96)00039-7

[2] P. Luigi Guida, G. Sacco, *A method for project schedule delay analysis,* Volume 123, February 2019, Pages 246-357

[3] M. Mohamed Saad Bajjou, A. Chafi, *Empirical study of schedule delay in Moroccan construction projects,* International Journal of Construction Management, Volume 20, 2020-Issue 7

[4] Y. Adisa Olawale, M. Sun, *Cost and time control of construction projects: Inhibiting factors and mitigating measures in practice*, Construction Management and Economics 28(5):509-526 May 2010

[5] N.-J. Yau and J.-B. Yang, *Factors Causing Design Schedule Delays in Turnkey Projects in Taiwan: An Empirical Study of Power Distribution Substation Projects,* Project Management Journal, vol. 43, no. 3, pp. 50–61, Jun. 2012, doi: 10.1002/pmj.21265.