Lessons Learned From A Delayed Medical Construction Project

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Abstract: The aim of this study was to identify factors that lead to delayed or failed construction project start dates. This study concludes with several factors that may cause delays and failures. These factors were found to be preliminary technical, financial and economic weaknesses, which is consistent with previous studies. A lack of clarity with regard to the project objectives for the main elements of the construction project of quality, cost and time. This may also include contractors with low performance levels or insufficiently experienced technical cadres. It was also found that the system of tenders used in construction projects delayed subcontractor tasks and led to poor planning and contractor scheduling. The main factors that caused this were payment delays on behalf of the owner and design changes requested by the owner. Other factors that may also create delays are as follows: poor quality graphics documentation, delays in tables, drawings and information preparation, inadequate experience of the supervisory body, lack of proper planning, lack of design reviews, lack of economic policies and inadequate quality management during design and construction.

Index Terms: Case Study, Construction Projects, Delays, Project Failure

1 INTRODUCTION

Governments projects are key indicators of a country’s economic health. They also indicate which areas of development the country is most interested in. If a country’s economic situation is poor or unstable, the government may not be able to establish or begin new projects. Occasionally, countries with poor economies may struggle to continue with existing projects too. Projects demand initial costs as well as annual operational costs. Operational costs can persist over a long duration, which is why studies should be broad and inclusive. If a country’s economic situation is unhealthy or the project resources are rare, governments will be unable to develop the economy and initiate new projects. In turn, projects provide many benefits for countries. The project scope or service is the main benefit but there are also many others. For example, they provide jobs and encourage new businesses to develop after the project is completed. Different countries are interested in different sectors. As such, countries tend to develop reputations in specific sectors, which is also beneficial. In Saudi Arabia, project proposals are carefully considered, and many steps must be taken before they can be approved. This is especially true in the case of mega projects. Studies in this area cost the Saudi Arabian government millions while the projects themselves cost billions. Due to these high costs, project failure is a very disappointing incident. The most financially wasteful project failure occurs during the project execution phase after obtaining budget approval, finalising all required studies and spending the required fees to begin.

1.1 STATEMENT OF ISSUES

Construction project delays draw a great deal of attention due to their complexity in terms of design and implementation methods. Therefore, many researchers have written on this subject, especially in developing countries. Construction project delays have a significant impact on economic development.

In both public and private sectors, delay refers to the difference between the planned construction project time and the actual time of completion. Studying these issues is of significant interest due to the financial and economic costs associated with this phenomenon. These costs affect the economic development of a country and the overall economic climate of construction projects. In addition, these delays negatively impact the construction process of the company or owner as well as project consultants, government licensing institutions, project-based construction companies, governmental and non-governmental organisations. The delay process increases project costs and this outfit Dah are the additional costs resulting from direct and indirect costs. These costs must then be disbursed as a result of the delayed project implementation date. This study, therefore, sought to identify reasons for delays or failures in construction project completion according to initial schedules. It also sought to identify the contribution that construction process parties may have in delays or suspensions and suggests methods through which projects can be implemented on time.

1.2 STUDY OBJECTIVES

The overall research aim was to identify the causes of project delays or failure by creating a set of five sub-goals. These sub-goals are arranged as follows: first, identify factors that assist with timely and cost-effective project completion in accordance with quality standards and occupational safety. Second, study sections of the construction process and identify any factors that may delay project implementation. Third, identify parties involved in the construction process and establish their exact roles by studying the tasks they carry out. Fourth, examine project costs and identify factors that could lead to an increase in indirect costs and the price of materials or suboptimal resources. Fifth study the external economic, social and political factors to identify any aspects that may affect project implementation.

2.0 LITERATURE REVIEW

A literature review is a necessary starting point for any scientific study. It enriches the knowledge of previous scientific efforts in the same field and contributes to the identification of analytical methods and target area. The following is a survey of the many scientific studies on factors that lead to project
implementation delay and failure. Olatunji, A. (2010) identified causes of delay in the delivery of projects in South Africa. Olatunji developed a model for timely project delivery using statistical regression tools and a linear analysis of the data collected. A selection of architects, builders, quantity surveyors, structural engineers and clients within five major cities in South Africa formed the basis of this study. The results indicated that the main factors negatively impacting project delivery time in South Africa were a lack of proper planning, poor management style, a lack of design reviews, insufficient employee motivation, insufficient economic policies, delayed contractor payments and poor-quality management during design and construction. Dayi, S. (2010) discussed the importance of construction schedules in achieving quality construction work during the specified time period. Monitoring the relationship between delays in construction schedules and contractor demands is a complex process. A simpler approach is to remind the owner or the contractor that time is money. Due to this, the reasons for delaying the construction schedule must be analysed and corrective measures must be implemented in a timely manner. The main purpose of this study was to investigate the reasons behind construction schedule delays and methods of table delay analysis. In this context, the construction of a covered building in Ankara was selected as a case study to analyse project scheduling delays. Ali’s study (2011), ‘Management and planning of construction projects and the impact of poor planning in the period of implementation of construction projects in Dubai,’ aimed to identify the impact of poor planning during the implementation of construction projects in Dubai from 2006–2010. This study found that there were a number of factors that led to delays during project implementation in Dubai. These factors included a lack of a clarity on the concept of administrative and engineering planning from contractors, a lack of awareness about the importance of administrative planning and engineering and a failure to adopt effective administrative planning and engineering methods. In Economic and financial risks for the projects of the BOT with exposure to Arab experiences, Youssef (2012) showed that private sector participation in implementing major economic and urgent projects has become common in the last decade. This participation has received support from many governments in both developing and industrialised countries. This trend has also been supported by the private sector due to the significant financial benefits for fields including infrastructure, contracting, finance, supply and manufacturing. If this were not the case, the private sector would be unlikely to invest in these kinds of projects. However, there are financial and economic risks that should be considered. These contracts, which are a form of public–private partnership, can lead to project implementation and completion delays. This is due to incompleteness of the implementation of the project in accordance with the specifications as a result of non-compliance with the construction contract, the completion of management and operation of the project until delivery, the risk of inadequate or insufficient resources for operation, transfers and distributions, environmental risks and political risks. Albogamy (2013) conducted a survey to assess the importance of 63 delay factors in Saudi Arabia and found that factors relating to the owner/client and contractor were the most critical reasons for delay. The six delay factors that had the highest impact on Saudi Arabian construction projects were as follows: poor Saudi Arabian government contractor performance, the tendering system used (lowest bidder), delays in sub-contractor tasks, insufficient experience and skill of technical staff, poor contractor planning and scheduling, owner/client payment delays and design changes requested by the owner/client. Islam, and Trigunarsyah (2015) found that 79 employees caused delays in the construction projects studied. Among these, all parties agreed that the following were the reasons for delay: a lack of experience in construction management, the selection of the minimum bidder, a lack of funds from the owner, project location restrictions, inadequate planning and scheduling, excessive contractor workload, a lack of proper management from the owner and contractor, poor site management, a lack of skilled workers, contractor cash flow problems during construction and the escalation of resource prices. Hussein's study (2016) titled Risk Analysis and Management of Construction Projects aimed to identify the risks faced by construction projects. Long-term projects were analysed as they contained complex risks that negatively affected the time and cost of project implementation. This study found that the most serious risk to construction in Libya was the lack of companies capable of implementing large-scale projects. Elawi (2016) examined delays factors in 49 infrastructure projects within Makkah. Delays due to the owner accounted for 53% of delays (26 out of 49 projects). Contractors were responsible for 27% of delays. The project was delayed out of 49 projects, followed by a misunderstanding between the various stakeholders (29%) and the eligible consultants (1%) of the delay. Hassan (2016) argued that the most significant delays affecting the construction industry are ‘low labor productivity, delays in decision making, owner changes to the project, delays related to the work of subcontractors, and [an] unqualified labor force’. Narh, Natasha and Afi (2016) found in road construction projects in Ghana, the main factors that caused project implementation delays were low customer cash flow, the financial constraints of the project contractors and improper planning of the project a special life cycle during the bidding stage. In addition, site restrictions, weather and changes in government regulations were found to contribute somewhat to project delays. These delays had a negative impact on project performance and duration. Due to this, participants had to adjust their funds accordingly. Soliman (2017) discussed the impact of communication problems caused project delays. A questionnaire that included 19 communication problems was distributed to two main groups: contractors and customer supervision personnel. The survey revealed five major problems that significantly affected project delays. These problems included the use of an outdated packing system, a lack of site progress meetings, poor quality drawings and documentation, delays in the preparation of tables, drawings and information alongside inadequate experience of the supervisory body. Al-Keim (2017) employed a multiple case study method to explore the strategies used by senior managers to reduce cost overruns and delays in construction projects. Primary data was obtained from semi-structured interviews with three senior managers of different construction project management firms. The three participants had succeeded in managing construction projects in one of the gulf countries. Al-Keim analysed the following: master planning, processes and procedures, management of the design phase, the use of appropriate computer programs, determining the cost and time of the project and the definition of a clear scope. A construction project will be unlikely to succeed without
proper planning for all the phases of the project life cycle. Through this examination of previous research on the causes of construction project implementation delays and failures, it can be concluded that the most crucial factors are the following: preliminary technical, financial and economic weaknesses; lack of clarity regarding the project objectives for the main elements of the construction project of quality, cost and time; poor technical cadre performance and experience; the system of tenders applied in projects (the lowest bidder); delays in subcontractor tasks; poor contractor planning and scheduling; delays in payment from the owner and design changes requested by the owner; poor quality graphics and documentation; delays in the preparation of tables, drawings and required information; poor supervisory body experience; a lack of proper planning; a lack of design reviews; poor economic policies; poor quality management during design and construction.

3 METHODOLOGY

The study used data gathered from a failed construction project in Saudi Arabia and was conducted by the client project manager. Data from other case studies was also analysed and the delay factors were compared. A range of studies were reviewed to analyse delays in project completion and to identify key delay factors. The primary case study was then compared to secondary case studies and similar delay factors were identified and compared. Summarising the differences among all previous mentioned areas.

4 CASE DETAILS

In 2012, a project contract was signed with a contractor to build a specialised medical centre inside a medical compound. The purpose of the centre was to provide X-rays for compound beneficiaries. Creating a separate X-ray centre would have improved the service by offering additional high-quality treatments.

4.1 DESIGN CONCEPT

The project was highly specialised and advanced. It was well researched, and the management team reviewed and approved the project design. The project design covered the infrastructure and all required machinery including power transformers, backup generators, water and sewage tanks, air conditioning systems and all other medical and non-medical systems. The design also included medical and support equipment including various X-ray, Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) machines. Medical equipment usually requires significant support and infrastructure services such as purified water, steam and certain gases. These were also provided in the project design. All requirements were accounted for and included in the project plan. In a separate service building attached with the project and part of it. The building conformed to American medical recommendation standards. It is recommended by American healthcare facilities standards to use a building that is separate from the main service building. Transformers, generators, chillers, tanks and all other equipment can operate remotely. This also keeps the operational and maintenance entities as far as possible from patients.

4.2 PROJECT GOALS

This project was intended to achieve many goals, all of which relate to the support of medical advancements in Saudi Arabia. Updating and improving medical services such as imaging services, laboratories and pharmacies allows doctors to go further in their research and help them throughout the treatment process. This is especially true in the case of oncology diseases and cancers, which are the main beneficiaries of this project. One of the main project goals was to obtain very new and very costly X-ray technology. This would have been a huge step forward for X-ray services in Saudi Arabia. The technology uses nuclear acceleration concepts and is currently only manufactured by two companies. So far, this equipment has only been installed in ten hospitals globally.

4.3 EQUIPMENT

The equipment is used to scan and treat up to four patients simultaneously. This process takes an average time of six hours. It can perform surgery with high accuracy. The nearest equipment to that rate may be 50% accuracy. Overall, it is highly advanced and complex technology.

4.4 TECHNICAL REQUIREMENTS

From a technical point of view, this equipment demanded a lot of engineering work, especially civil engineering. To contain the radiation emitted from the machine, the equipment had to be stored in a room below ground level. It was surrounded by two meters of concrete on each side and six mm Light Emitting Diode (LED) walls. There electromechanical requirements included a special firefighting system, lighting, grounding, communication and a surveillance system. All materials used in the room had to be radiation resistant and the water had to be purified. This equipment was central to the project and highly complex.

4.5 PROJECT INITIATION

After the contract was signed, the consultant handed the site over to the contractor to begin work. The contractor began by studying the design and then submitted a time schedule for project execution alongside all other paperwork. The shop drawings and material specifications were also submitted for approval. Calculations for all systems were ongoing and no issues were encountered.

4.6 SITE WORK

When the contractor finished obtaining the required approvals, he began site work and civil engineering work. The site had already been prepared and excavation work had begun. The building was divided into two sections: one for the X-ray machines and the other for equipment. The contractor finished approximately 50% of construction work in the first section but only excavation work in the second. Work in the second section was delayed as the contractor had to wait for the equipment supplier to provide equipment dimensions to ensure everything fitted into the building. This occurred seven months after the work began.

4.7 THE SITE VISIT

During project execution, the consultant received a site visit request from the end user to ensure that the project was being completed as per his demands. This is usually an acceptable practice, so the consultant arranged for the site visit with the contractor. During the site visit, the equipment supplier was with the end user. After the first building tour, both parties went to the second building area. The supplier suggested enlarging
the equipment capacity due to the availability of space. The end user thought this was a good idea.

4.8 EQUIPMENT DIMENSIONS
The contractor asked the equipment supplier for the equipment dimensions so that he could begin work on the second building. The suppliers suggested that the contractor should wait as the final dimensions may change. As this was unacceptable, the consultant alerted senior management.

4.9 FIRST SUSPENSION
While work was running at the peak time of the execution, the consultant was asked to stop all work while the project was reevaluated by senior management. Senior management wanted to extend the size of the nuclear equipment area to address future demand. This may have caused a change in the building size and the required services. After several weeks, information regarding the new equipment was obtained. The new required size was over 225% of the original size. The required building structure to be redesigned alongside all other support services. All site work had been suspended until this issue was finalised. All engineers and labourers had left the site. A new design was requested from the designer.

4.10 NEW DESIGN
The new design was sent to the consultant thirteen months after the project was suspended. The consultant studied and approved the new design under the same original project items prices. The contractor was then asked to proceed with the work using the new design.

4.11 SECOND SUSPENSION
The contractor continued work but submitted a payment claim for the duration of the project suspension. This claim was both legal and logical but was rejected from senior management. The contractor then stopped work until this issue was resolved.

4.12 CLAIM FINALISED
After several meetings between the contractor’s solicitors and the project owner’s legal team, a settlement for his claim was reached. This took approximately two years. Afterwards, the contractor continued to work on the project.

4.13 THIRD SUSPENSION
While the contractor was preparing to proceed, he calculated that there had been many changes in the market prices over the past three years. These changes caused him a significant loss in profit and maybe he would lose in this project with that situation. As such, the contractor repriced the project. The contractor submitted new prices to the consultant at an increase of 175% in unit price. This was much higher than the current market prices. These prices were rejected by the consultant, which resulted in a third suspension. After the repricing rejection, the contractor informed the consultant that he would stop work immediately and sue the entity for responsibility of his losses. Eventually, the project site was closed.

4.14 PROJECT WITHDRAWAL
After the contractor left, the entity made several attempts to solve the issue and proceed with the project. No solution was reached with the contractor. As such, the project was withdrawn and put on hold until further notice.

5. DISCUSSION
Through reviewing many studies and analysing the primary case study, it can be concluded that the primary and secondary case studies are not dissimilar. All reasons of the governmental project inside and outside Saudi Arabia did not face the same issues, but many of these factors lead to the same result. A study conducted by Hassan (2016) noted how changes in the owner’s requirements may cause project delays or failure. The most impactful changes are the ones that occur in the middle of project execution. Regardless of the reasons behind the changes, the changes themselves the main issues. In the primary case study, the changes were caused by a lack of communication. This was a factor previously noted in Soliman’s study (2017). In addition, these changes also created a budget shortage. This was a factor noted by Al-Keim (2017) and Narh, Natasha and Afi (2016). The main cause of project failure in the primary case study was the insistence on project changes by the owner at a very late stage. If the changes had occurred earlier, they may not have had the same effect. If the owner had asked his consultant about the potential effects of the proposed changes, the project may not have been suspended. By studying the feasibility of implementing the project accurately and studying the project costs well. The person who requested the changes did not consider the difference in cost. A precise project design can display all items and expenses before the budget is adopted and before being put into competition. In the primary case study, a better project plan would have made the variations in price clear. If there were several interpretations of the technical specifications required for the project, this may have mitigated the different views of the parties involved. In addition, the contractor may not have been able to raise the unit prices as much. Avoiding the long routine to decide on the orders of change. In the primary case study, the time taken to reevaluate the changes affected the prices and the project. Establishing a communication management role for all project parties so that all communication must be with the highest authority in the beneficiary in the presence of its representative on the site to ensure clarification before the officials offer solutions to serve all parties to the contract. The development of a mechanism at a national level requires planning, monitoring and project follow-ups. If that was available, no contractor could manipulate government projects as this would affect future work. The establishment of a special unit of the owner of the project known as the project follow-up unit, composed of representatives of all concerned departments benefiting from the project so that decisions can be issued after reference to all members.

6 REFERENCES
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