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CAUSES OF CONSTRUCTION PROJECT DELAYS AND COST OVERRUNS IN OMAN: A LITERATURE REVIEW.

Al Amri, Tariq; Marey Pérez, Manuel Francisco

Universidad de Santiago de Compostela

In the past one and a half decades, Oman and most of the Gulf Cooperation Council (GCC) countries have experienced tremendous economic growth and the construction sector is one of the primary beneficiaries that all GCC countries have embarked on major infrastructural development. Oman is currently the leading country in the GCC region in terms of infrastructural development. Over 2400 government projects worth approximately \$190 billion are active. With such a huge number of projects all running at the same time mismanagement might sometime become an issue.

The paper presented shows the bibliographical review of the problems associated with the owner and the client and related to the contractor that mainly motivate the delay of the projects. The results obtained will serve in a later phase to explore the dilemma time and cost invested in the management of construction projects in Oman.

Keywords: *Project management; construction; review; Oman*

CAUSAS DE LOS RETRASOS E INCREMENTO DE COSTES EN LOS PROYECTOS DE CONSTRUCCIÓN EN OMÁN: REVISIÓN DE LA LITERATURA.

En las últimas décadas, Omán y la mayoría de los países del Consejo de Cooperación de los Estados Árabes del Golfo (CCG) han experimentado un tremendo crecimiento económico y el sector de la construcción es uno de los principales beneficiarios ya que los países del CCG se han embarcado en un importante desarrollo. Omán es actualmente el país líder en la región del CCG en términos de desarrollo de infraestructuras con más de 2400 proyectos gubernamentales por valor de aproximadamente \$190 mil millones están activos. Con un gran número de proyectos todos ejecutándose al mismo tiempo los errores en la dirección de proyectos podría convertirse en algún momento un problema.

El trabajo presentado muestra la revisión bibliográfica sobre los problemas relacionados con el propietario y el cliente y relacionados con el contratista que motivan principalmente el retraso de los proyectos. Los resultados obtenidos servirán para en una fase posterior explorar el dilema tiempo y coste invertido en la gestión de proyectos de construcción en Omán

Palabras clave: *dirección de proyectos; construcción; revisión; Omán*

Correspondencia: manuel.marey@usc.es



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1. Introduction

Construction projects are critical to the economic growth and development of a country, whether developing or developed. The government and private investors spent a lot of resources in various construction projects, most of which create jobs and enhance trade – both local and international. Therefore, it is imperative that construction projects of whichever kind are completed within the scheduled time, and with the planned resources. Unfortunately, many construction projects around the world are rarely finished in time. Failure to complete a project in time has several social, economic, and political consequences. Other than project delays, cost overrun is also typical in almost the same measure with project delays. Therefore, to mitigate these challenges, it is vital that a proper understanding of the underlying factors is achieved. This paper is prepared for a conference presentation. It is part of an ongoing proposed research study that seeks to determine the dilemma of project management in Oman, concerning causes of project delays and cost overrun. The current paper is, therefore, a critical review of studies that have since been done about the proposed study. Specifically, the paper examines the causes of project delays, and cost overrun in Oman, and in general. Previous studies formed the secondary source of data. The critical determinants of project delays were: financial problems by both clients and contractors, change of initial design by the client, poor planning and scheduling, and incompetent contractors. Regarding cost overrun, the critical factors included: change of initial design, financial constraints by the client and contractor, inaccurate cost estimation, inexperienced contractors, and poor tendering process. The paper proposed the use of Performance Information Procurement system instead of the lowest bidder system. Also, the project suggested the corporation among contractors, clients and financial lending institutions to mitigate the financial challenges.

Construction project delay is a common phenomenon that is experienced in almost every part of the world. Past researches have documented some reasons for project delays – both universal and regional or project specific (Ramanathan, Narayanan, and Idrus, 2012). Different projects may have varied reasons that cause delays. However, the widespread nature of delays in completion of construction projects paints a picture that suggests a higher similarity of the causes. Nevertheless, it is certain that the magnitude of delays experience in various projects and countries around the world is highly varied. In some countries, the rate of project delay is significantly higher compared to others (Ika, Diallo, and Thuillier, 2012). In the United Arabs Emirates, for example, Gebrehiwet and Luo (2017 p.366) reported that at least 50% of construction projects are completed later than the scheduled time. Albogamy, Scott, and Dawood (2012 p.148) reported that 70% of the public projects in the Kingdom of Saudi Arabia had been delayed in the past decade. Perhaps the prevalence of project delays in the United States, Malaysia, India, or any other country could be different.

The consequences of project delays are numerous including economic, social, political, and environmental. Importantly, however, is that delayed projects often results in financial inconvenience to various parties involved in the construction project – the owner, constructor, and consultant. According to Sunjka and Jacob (2013 p.647), the common consequences of delays in completion of construction projects include budget overrun, poor project quality, litigations, disputes and claims, and sometimes total abandonment. These consequences are related to one another. For example, delayed building construction is likely to cost the owner additional finances. As Sunjka and Jacob (2013 p.647) mention, delayed projects may have low quality; which is a threat to the occupants of the buildings. If the building collapses, for example, the owner is likely to face some litigations; which are also directly related to

financial costs. Delayed completion of public projects has far-reaching implications. A delay in completion of a highway, for example, has a direct economic impact through delayed trade between regions that are connected by the highway.

2. Objectives

Given the prevalence, causes, and consequences of project delays, a study is proposed that explores the dilemma of project completion in Oman. We will examine the causes of project delays, and cost overrun in construction projects in Oman. The present communication, therefore, is a critical review of the suggested problems. The present aims to bring to perspective the existence of the causes of project delays, and cost overrun in Oman; which will further help in refining the proposed research.

3. Methodology

By consulting the databases of scientific journals specialized in the field of project management, a list of recent references regarding the subject of the research. Subsequently, the works have been classified according to their objectives, methods and most interesting results from the point of view of their validity for the development of our objectives.

4. Results

4.1 Causes of Project Delays

Albogamy et al. (2012) researched to examine the causes of project delays in the KSA, and the relative importance of the different causes of delay. The authors proposed 63 factors that could potentially cause project delay in the country. However, four main categories were developed under which the 63 factors were re-grouped. The categories were: owner/client; Contractor; Consultant; and External factors. The results indicated that the contractors and owner related factors were the most critical determinants of project delays. From the owner/clients' perspective, the study reported that poor performance by the contractors was the most important determinant of project delays. The owner/client-related factors included delayed progressive payment by the client, inadequate planning, and owner slow decision-making process, alteration of the initial plan by the owner, and delayed approvals of submittals by the owner. Regarding the contractors-related factors, the results indicated that delays by the sub-contractors were the most critical factor. Other factors include poor skills and experience, insufficient scheduling and planning, delayed drawings, lack of qualified engineers, and financial problems.

Al-Emad et al. (2017) conducted a study similar to that of Albogamy et al. (2012) by ranking the factors that caused delays in construction projects in Makkah. Through a quantitative survey approach, the authors administered 100 questionnaires to respondents who were mainly contractors, project management, and consultants. The respondents were specifically experts in the construction industry. Note that the project owner/client is excluded from this study. Also note that unlike in the study by Albogamy et al. (2012), Al-Emad et al. (2017) used a total of 37 factors that were derived from the literature review. Also, the authors did not categorize the factors like it was in the previous studies. Using the average score index, Al-Emad et al. (2017) ranked the following factors in order of their importance.

- i. Financial difficulty by the contractor
- ii. Poor coordination among the project stakeholders
- iii. Inadequate workforce

- iv. Delayed design documents
- v. Insufficient scheduling and planning
- vi. Delayed progressive payment
- vii. Low labor productivity
- viii. Inadequate communication among stakeholders
- ix. A workforce that is unqualified
- x. Poor contractor management

Alnuaimi and Mohsin (2013) explored the causes of delay in project completion in Muscat – the capital and the largest city in Oman. The authors used a quantitative research approach. The data were collected from clients and consultants. The contractors' perspective was therefore not captured in the study. In this study, the causes of project delay were reviewed for two periods – 2007/2008 and 2008/2009. Similar to the study by (Albogamy et al., 2012; Al-Emad et al., 2017), the study ranked the causes in terms of their importance towards project delays. In the current review, the top five causes reported for the two periods are presented below.

Table 1. Causes of Delay in project completion

Period 2007-2008		Period 2008-2009	
i.	Weather	i.	Scheduling and planning
ii.	Claims and variations	ii.	Inadequate experience by contractors
iii.	Initial design change	iii.	Material shortage
iv.	Inadequate funds	iv.	Inability to follow the design practically
v.	New rules and regulations	v.	Initial design change

Source: Alnuaimi and Mohsin, 2013

The results indicate such a significant change in the causes of project delays within such a short period of one year. Furthermore, the weather is only a seasonal problem and should not count as a significant cause of the delay. However, between the two periods, change in the initial project design is common, which was also reported by (Albogamy et al., 2012; Al-Emad et al., 2017). The three studies also concur on project funding as a source of delay.

Alamri, Amoudi, and Njie (2017) analyzed the causes of dam constructions in Oman. Based on the analysis of previous literature, the authors developed 60 factors that could potentially influence project delays. Out of the 60 factors, the author performed statistical analysis to rank them in terms of significant influence. The results reported that adverse weather condition, change of design, uncertainty about the ground condition, poor management of the site, and bureaucratic process in clients' organization were significantly related to project delays. Although the study was project-specific, the weather is yet reported, similar to the findings by Alnuaimi and Mohsin (2013). Again, all the four studies concur on the change of initial project design.

Emam, Farrell, and Abdelaal (2014) explored the causes of project delays in countries in the Gulf Corporation Council (GCC). In Oman, Emam et al. (2014) report the results of another study conducted by Ruqaishi and Bashir (2013), which explored the causes of project delays.

Data in the study was collected from 59 project managers. The authors reported a high consensus among project managers on the following causes of project delays: poor site management, sub-contractor issues, scheduling and planning, delay in material deliveries, inadequate communication, and poor coordination with vendors.

All these factors except communication and problems with the sub-contractors are confirmed by Kog (2018). The study by Kog (2018) is indeed critical in this review since it is a meta-analytic study that has explored the majority of the studies that have been done concerning the cost of project delays in Saudi Arabia. The authors reviewed several studies in terms of the effectiveness of their methodologies. The studies whose methods were insufficient were not included in the analysis. Although none of the studies that have been mentioned herein was dismissed, the author indicated the overrepresentation of contractors' perspective by some studies. Therefore, Kog (2018) pursued a less bias approach and identified the following factors according to their degree of influence on project delays.

- i. Owners financial problems regarding payment of completed work
- ii. Change of the initial order design by the client
- iii. Inadequate planning and scheduling
- iv. Shortage of construction materials, or late delivery of the same
- vi. Incompetent contractors
- vii. Poor site supervision and management
- viii. Labor shortage
- ix. Inspection and approval delays

The majority of factors mentioned above have also been reported in other studies, which implies that despite the criticism by Kog (2018) about some study's methodology, the studies' findings are nevertheless not far from the true general picture. Kog (2018), however, offers a significant insight in designing future research on which the current review is based.

Alzara et al. (2016) reported the consultant-related issues that are critical determinants of project delays. The author examined the causes of project delays in a state university of Saudi Arabia which had most of its construction projects experience delays of up to 150%. The researchers used an exploratory research design. Further, the study compared the university-specific problems, to the general causes of project delays reported in KSA. An exploratory research design was used. The results reported that the causes of project delays in the university projects were similar to the general causes of project delays in the KSA. Also, the results indicated the significant consultant-related causes of project delays in the order of importance as indicated in the table below.

Table 2. Causes of project delays

Factor number in order of importance	Consultant-related cause of project delay
1	Failure by the consultants to produce the design document
2	Failure of the approval of the design documents
3	Discrepancies and mistakes in the design document
4	rigidity
5	Poor performance by the consultant
6	Inadequate employees of the consultancy companies

Source: Alzara et al., 2016

Atout (2016) also confirms the first three consultant-related causes of project design as listed by Alzara et al. (2016) as top priority causes of project delays in Saudi Arabia and the Gulf region in general. The two studies provide crucial information regarding the role of consultants in construction projects. Another factor that is mentioned by both studies even though it is not listed as priority cause but occurs occasionally is the failure by the consultants to notice mistakes and discrepancies from the initial design during progressive work. Often when such mistakes are discovered later, the resulting consequences may sometimes involve reconstruction which not only causes a delay in completion but is costly as well.

4.2 Causes of the project cost overrun in Oman

Alghonamy (2015) researched the causes of cost overrun in Saudi Arabia's construction projects from the contractors' perspective. Data were collected from 43 respondents using survey questionnaires. Based on the findings of the literature review, a total of 34 potential factors were examined. The factors were ranked according to their importance in influencing cost overrun. The results indicated that the award of project tenders to the lowest bidders was the most significant factor. Note, however, that this is the contractors' perspective, which makes the finding even more appropriate. Other factors include the change of the initial design, poor planning, the prolonged duration between design and project implementation, and lastly, delayed payments.

Mahamid (2014) conducted research similar to Alghonamy (2015). In this study, 41 factors were identified based on the review of literature and consultation with experts. Data were collected from 51 contractors. The results of the study reported that wrong cost estimation was the most significant cause of project cost overrun; which is very common, though not reported by Alghonamy (2015). The two studies however concurred on one factor - the prolonged period between design and implementation. Other factors reported include absence of construction cost data, cost of labor, and machinery costs.

Johnson and Babu (2018) explored the causes of time and cost overrun in construction projects in the United Arab Emirates. The authors used both qualitative and quantitative method to analyze the data which were collected from professionals in the construction industry. Similar to other studies that have been mentioned in this paper, the authors ranked the various factors according to their importance regarding cost overrun. The results indicated that the top five causes of cost overrun for construction problems in the UAE were:

- i. Variation in project design
- ii. Poor cost estimation
- iii. Poor decision making by the client
- iv. Client's financial constraints
- v. Procurement procedures that are inappropriate

The results by Johnson and Babu (2018) concur with Mahamid (2015) that poor cost estimation is an essential cause of cost overrun. Further, the researchers concurred with Alghonamy (2015) on the change of project design as a cause of project cost overrun. It is important to note that the change in initial cost design is also mentioned as a significant factor regarding causes of project delays. Client's financial constraint, although only mentioned by one study, is a potential cause of project cost overrun, especially considering its broad documentation as a factor of project delay. When a client delays with progressive payment, for example, the contractors are likely to hold their services until the payments are completed; which causes project delays. While the projects are on hold due to financial delays by the client, the prices of construction materials are vulnerable to inflation. As such,

should inflation occur during the delay period, the prices are likely to increase and cause project cost overrun.

However, Senouci, Ismail, and Eldin (2016) reported that contract cost was directly related with the cost overrun which differs with the findings of Alghonamy (2015) who reported that low bids were associated with the cost overrun. This brings out yet, the impacts of relying on the perspective of a specific respondent group like Alghonamy (2015) did – the contractors' perspective. However, the finding by Senouci et al. (2016) does not obscure the significant role of poor project cost estimation which is typical among many contractors – low, moderate, and high bidders. Aljohani, Ahiaga-Dagbui, and Moore (2017) comprehensively reviewed the literature to determine the major causes of cost overrun as documented by studies in different countries. The study examined 17 countries and reported the following as the most commonly reported causes, in order of the significance:

- i. Change of design frequently
- ii. Financial constraints by the contractor
- iii. Payment delays by the client
- iv. Inadequate experience by the contractors
- v. Poor estimation of project cost
- vi. Inappropriate tendering
- vii. Improper tendering and documentation

Again, these findings concur largely by those reported in the study by Johnson and Babu (2018). These findings were yet confirmed by Sharma and Goyal (2014), which ranked the causes of project cost overrun as: slow decision making, unrealistic durations for completing projects, owner's interference, slow payment of completed work, and mode of payment, poor planning and scheduling, inadequate experience by the contractors, contractors' financial constraints among others.

4.3 Causes of Project Delays: External Factors

Other than the constructor, client, and consultant-related issues, other causes of project delays are numerous and may include general project management, and weather among other factors. In a study which examined the use of indicators in project management, project information from different countries around the world was explored in non-probabilistic research design. The results indicated that successful project management was dependent on systematic planning and use of indicators, which may either be a project, or project management-specific. The results indicated that almost 80% of the projects around the world use general project management indicators which include: customer satisfaction, project progress, earned value, and risk indicators (Montero et al., 2017). Responding to the general issues of project management, Amaral and Dias (2017) proposes the use of the project management office PMO governance. It is believed that this office will encourage information sharing and learning among top management, which will be effective in harmonizing the significant problems of project management and develop appropriate solutions for the same.

Weather is yet another critical external factor that can potentially cause project delays. Specifically, extreme weather conditions (EWC) such as flooding and hailstones are a significant cause of project delays since they stop the project construction workers from accessing the sites. According to Alshebani and Wedawatta (2014), the Middle East construction workers have generally adopted to some of the weather conditions such as heat waves. However, EWC remains a major cause of project delays. Aziz and Abdel Hakam (2017) conducted systematic review research to investigate the top causes of project delays in Egypt. The studies sampled were drawn from different countries to enhance the sample

representation. The results of the study indicated that weather as an external factor was mentioned with the highest frequency. It is therefore important to include weather as a potential significant determinant of delays in project completion.

5. Conclusions

From the studies reviewed in this section, the most salient factors that cause the delay in completion of projects are financial problems by the client and contractors, change of the initial project design, poor planning and scheduling, problems with the sub-contractors, communication, and inadequate skills and expertise in construction. Delay of materials and the shortage of labor are also important causes of the delay. To this extent, it is logical to argue that financial issues rank more importantly because of its relation to other factors such as the purchase of materials. Furthermore, it is a problem that affects both clients and contractors. It is worth noting also that few studies have had consultants' issues ranked among the top ten significant causes of project delays, yet, they play such a significant role in construction project management.

Regarding the causes of cost overrun, the salient factors identified from the review include the change of the initial project design by the client, financial constraint by both the client and contractors, inadequate experience by the contractors, poor cost estimation, poor tenderbidding processes, and slow decision making by the clients. In this perspective, it is evident that the change in initial project design significantly influences the overall financial cost.

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6. Recommendation for Future Action

To deal with the problem of project delays, Alzara et al. (2016) recommend the use of the Performance Information Procurement System (PIPS). As revealed by the literature, other than the clients' financial constraint, and change of initial project design, the contractors seem to bear most of the responsibility for both project delays and cost overrun, which some studies argue to be a result of the lowest bidding tendering procedure. It is apparent indeed that many contractors are likely to present unrealistic low contract bids to win tenders; which consequently causes the mentioned problems. It is therefore prudent that the procurement procedures should henceforth be based on the performance track record of the contractors. At least through this method, the risks of project delays and cost overrun are significantly minimized as has been demonstrated in places where the PIPS are utilized.

The financial constraint is yet a major cause of project delay and cost overrun. It is a complex problem and requires a collaborative approach between clients, contractors, and financial institutions. Public projects may not be affected by this problem significantly since the sponsoring institution can always seek funding from a relevant government authority. The private clients and contractors are however very vulnerable to this problem. The financial institutions in Oman should explore legal ways by which justified financial support can be offered to projects experiencing unnecessary delays and cost overrun. The legal provision should provide the modalities on which such credit support can be offered and repaid. For this arrangement to work, it is yet important to emphasize the need for a rigorous tendering process to eliminate unscrupulous contractors.

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