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Towards a sustainable construction industry: Delays and cost overrun causes in construction projects of Oman

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A B S T R A C T

Every nation in the globe endeavours to achieve sustainable growth in its various industries. The construction industry has an enormous contribution to the economy primarily for the developed nations experiencing urgent demands to develop and expand their infrastructure. While this expansion is taking place through projects, it is essential to find the factors affecting completion of project premium. This paper investigates the main time delay and cost overrun causes in construction projects within Oman related to clients, contractors, and consultants. Through a comprehensive literature review, reasons for delays and cost overrun are determined and a survey targeting 100 project managers was conducted to indicate top causes among them. The findings may help the government develop better policy and construction firms to modify criteria procedures to avoid such drawbacks.

1. Introduction

In a research study, the literature review examines studies been done in the past about cases in delay in projects. It enables the researchers to identify the progress about a given topic and to relate to the currently proposed project. Also, it allows us to determine the existing gaps and model the current study to fill those gaps. This section reviews previous papers about the dilemma of project management in Oman. Precisely, the study presents reviews related to time delay and the cost overrun of project management in Oman.

2. Review of Empirical Studies

2.1 Causes of Delay in Project Completion

Saleh and Alalouch (2015) explored the challenges facing the Oman construction industry from a somewhat different perspective. The authors consider the sustainability of the construction industry and the problems related to it. Unlike the traditional focus on building and construction, which

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mainly emphasized on durability, utility, and economic costs, sustainable construction in modern society is supposed to focus on environmental, social, and economic factors. This is indeed an important consideration which the authors argued that it requires considerable time for the stakeholders to internalise the concept and embrace it. It takes more than the constructors and perhaps government policies to implement the sustainable construction approach. As a result, Saleh and Alalouch (2015) argue that it is one of the reasons that contribute to delays in project construction in Oman. Among the GCC countries, Oman has the lowest oil and gas reserved, and as such, the infrastructural development is targeted to improve the country's economy through the attraction of tourism. As such, the construction industry must be in line with global sustainable construction standards. In 2005, The Research Council (TRC) in Oman was established to facilitate innovation and innovative initiatives such as green building initiatives in Oman (Saleh & Alalouch, 2015). The TRC has supported the use of renewable energies, especially in terms of using sustainable methods in cooling and air-conditioning. The TRC also focuses on identifying crucial areas where renewable energy can be used and can impact on the economy of Oman. The council also lends support towards experimental pilot projects in specific areas applying the newest solutions in information as well as techniques. The same council also indicates scientific facts to help promote evidence-based solutions, which also assist in the planning of policies and regulations. All in all, the TRC indicates the importance of renewable energy in capacity building in order to establish a sustainable environment. Through the provisions of the TRC, the country has had its infrastructural growth following the policy guidelines – from feasibility, through the planning stage to construction, which is reported to significantly increase the construction time compared to ordinary projects that do not follow the policy guidelines. Delays in construction projects are reported to affect many countries in the GCC. However, few studies have since been conducted to explore the causes of such delays. The study by Emam, Farrell, and Abdelaal (2014) examined construction projects in Gulf countries to identify common significant factors that cause delays in project completion. Some of these factors include; finance and slow payments, ineffective planning and scheduling, shortage of materials, poor site management, design change by owners, deliberate decision by owners, delays by subcontractors, slow process of permits, weather conditions, and poor communication and coordination. According to Emam et al. (2014), a review of studies that have been taken place about Gulf countries differed in some of the delayed factors. The authors proposed a procedure to re-rank and re-categorise the findings presented by previous researchers. In this study, the ANOVA technique was employed to analyse the previous results and verify the commonality of delay factors. The findings indicated that management inefficiency, shortage of resources and personnel issues are the majority motives of delay factors in GCC. This study may find similar issues as well, especially concerning management inefficiency as well as shortage of resources which are common enough issues in the construction industry. Alnuaimi and Mohsin (2013) researched to explore the causes of project delays within the Muscat area, the largest city in Oman. The sampled projects for the research were classified into two temporary groups, those started in the period 2007-2008, and those in the year 2009-2010. The authors obtained data from clients and consultants. The results indicated that for both groups, over 40% of the projects were completed later than the initially scheduled completion time. Further, the study reported that the causes for delays were changing over time. Nevertheless, the results indicated that the majority of the delayed projects were as a result of the client's constant change in orders as well as the non-availability of construction manuals and procedures. For the projects in the first group – 2007-2008, the reasons for the delay ranked according to their priority included lousy weather, claims and variations, change in the initial design, lack of enough funds, new legal rules or instructions, and nature of the ground. For the second group – 2009-2010, the reasons, ranked according to their importance were: programming and planning construction work, lack of experience of contractors, material shortage, failure in translating the design into the actual construction, change in the initial design, and poor site management. In 2007, Cyclone Gonu struck Oman causing catastrophic damage in the infrastructure, and that explains the presence of weather in the first group as a principal reason. It is possible for causes of delay to change dramatically within a short period because some of the causes are still related to the initial causes of delay. The

causes of this change largely stem from the contractor benefiting from the constant changes suggested by the client. Therefore, considering the reasons provided for the two groups, it appears that causes of project delays in Oman are shared both by the owner of the project, and contractors. Change of initial design is mentioned in both groups; lack of materials is also mentioned in both groups except that it ranks low in the first group. Emam et al. (2014) summarized the causes of project delay as reported by the two studies is that causes of delay changed over time.

Albogamy, Scott, and Dawood (2012) conducted one of the most comprehensive studies that explored the causes of project delays in the MENA region. The research was specifically conducted in the Kingdom of Saudi Arabia (KSA). In the study, both qualitative and quantitative research designs were used. The qualitative research took the form of a meta-analysis. The meta-analytical research approach is a fundamental technique for studies that seek to establish particular past and future trends about a research phenomenon. Albogamy et al. (2012) determined the cases already existed with respect to project delay. The quantitative technique, on the other hand, was used to establish the present status of project delay in KSA. Survey technique was used to gather information from a total of 98 government projects. A preliminary report indicated that by the time Albogamy et al. (2012) were designing their study; approximately 70% of projects in the KSA had been reported to have experienced a delay for the previous decade. The impact of the delayed projects included a compromise of the project quality and loss of financial resources. Albogamy et al. (2012) classified the causes of project delays into the following categories: owner/client-related factors, contractor-related factors, external factors, and consultant-related factors. For each factor, different items were used to measure the respondent's perception of the causes of project delay. A total of 63 different items were developed for all four categories of potential causes of project delay. In general, the study reported that owner/client and contractor-related factors were the most critical determinants of project delays in KSA. For the owner/client-related factors, 17 different items were used to measure the construct. Of the 17 items, the study reported that poor performance of the lowest bidder for the government projects was a significant determinant as expressed by most of the respondents (63%). Many governments use the lowest bidder tendering system as a way of minimizing the costs incurred on construction projects. The government advertises its tenders to the public and invites different contractors to compete for the award of the tenders. The companies competing for the tender are then required to provide their costs and time estimates for the proposed project.

In most cases, the competition, especially in developing countries, as well as Spain and other parts of Europe, is based on the cost-effectiveness of the different tendering companies; with the lowest bidder often winning such tenders. In the cause of the project's life, such contractors are likely to face financial, and sometimes even from profession a constraint, which consequently causes project delays and loss of finances. The finding of the lowest bidder problem is indeed critical. In the studies that have been reviewed in the previous section, none of the researchers mentioned it, yet as it is reported by Albogamy et al. (2012), it seems to be such a critical cause of project delay. Note that the findings were as per the owners' point of view and not the contractor. According to the perspective of other respondents other than the owners, the results also indicated that the owners' delay in progressive payments, delays in contract approval by the owner, slow decision making, and changes in design by the owner were also important causes of project delays. The findings of inadequate planning, change of initial design and financial constraints have also been reported by other researchers already mentioned in this section.

A total of 23 different items were used to measure the construct of contractors' related factors. The results indicated that most of the project delays in this regard were as a result of delays caused by the sub-contractors, as expressed by the majority (47%) of the participants. The results also reported that poor planning and scheduling, shortage of qualified professionals such as engineers, low skills, training and experience, problems with cash flows, and poor drawings were also important determinants of project delays. The most predominant consultant-related causes of project delays in-

cluded delays in approval of project drawings. Other issues reported also included: changes in design, low qualification, and training of staff, issues with documentation and limited workforce. Lastly, two factors were reported to be the most important external factors, which were the lack of utilization of professional contractual management, and the increase in prices of construction materials. Indeed, the study by Albogamy et al. (2012) provides a crucial perspective on the causes of delays in construction projects. Since many projects globally usually experience delays, it is logical to assume that the causes of project delays in KSA could be more or less similar to those in Oman. It is therefore prudent that in the current study, the questionnaire explores causes of project delays in the four constructs – owner/client, contractor, consultant, and external factors, and to measure such causes.

Al-Emad et al. (2017) recently conducted a research study in which the delay factors in the Makkah's construction industry were ranked according to their significance. Therefore, using the information derived from the literature review, the researchers developed structured questionnaires that were used to collect data from construction experts in Makkah. A sample total of 100 respondents were included in the study. The average index approach was used to rank the factors, and a total of 10 factors were ranked according to their importance. The most significant factor was financial difficulty by the contractor; which somehow agrees with the results of Albogamy et al. (2012) on the lowest bidder problem. Al-Emad et al. (2017) reported that the financial problems of the contractors cause delay in various ways including delay in payment of sub-contractors, and delayed commencement of the project right after it has been awarded. Most of such contractors who bid with low project costs estimates often have less financial reserves to start projects once they have been awarded. As a result, after they have been awarded the tenders, it takes them some time to gather financial resources to start the project. The second factor that was reported to be a significant determinant of project delay was poor coordination between parties, which in most cases include the owners, contractors, and the consultants. The third important factor was workforce shortage, delay in design document productions, poor scheduling, and planning, delays in progressive payment, low labour productivity, inadequate communication among the parties to the project, poorly trained and experienced workforce, and lastly, inadequate management of the project. Most of the issues mentioned by Al-Emad et al. (2017) were also mentioned by Albogamy et al. (2012), including poor contract management.

Mpofu at al. (2017) explored the causes of delayed project completion in the United Arabs Emirates. From the outset, the researcher reported that overwhelming researches have since been done to explore the cause of project delays. In a country like the United Arabs Emirates, the pressure for infrastructural development is very high, given its development record in the past decade concerning infrastructural development. Despite many studies that have been done on the same, the problem of project delays persists and hence, need persistent effort through more studies and for improved solutions of dealing with the problem. Similar to the study by Albogamy et al. (2012), the study explored the causes of project delays in terms of three main categories, the consultants, contractors, and the clients, except for external factors. A quantitative research approach was used, with survey questionnaires distributed to the potential respondents to obtain data. The qualitative research approach was also used to obtain qualitative data through focus group discussion with selected key participants. The results reported several factors that were associated with project delays, but most importantly, unrealistic duration of the project contract, reduced productivity of labour, and financial delays by both the client and contractor were the most significant determinants of project delays. Generally, the author concluded that client, contractors, and consultants mainly caused project delays; again, these findings are more or less similar to those reported by Albogamy et al. (2012) and Al-Emad et al. (2017).

Elawi Algahtany and Kashiwagi (2016) explored the factors that significantly contributed to project delays in Mecca, KSA. The findings of the study were compared with the causes of delays in other

projects and other countries in the Gulf Corporation Countries (GCC). Data for the study were collected from a total of 49 different projects within Mecca through quantitative research survey. This study, however, did not clearly indicate how these 49 projects were chosen if they were chosen randomly or not. The results of the study reported that 39% of the projects in Mecca experienced delays. Unlike the other studies that have been mentioned herein, Elawi et al. (2016) reported that the most severe cause of project delays in Mecca was land acquisition problems. However, it can be argued that the perspective of the other researchers was from the point of view that land for construction had already been acquired and tenders awarded to the selected contractors. Nevertheless, other results indicated that contractors' inadequate expertise, re-designing of the original project by the owner/client, and underground utilities which are haphazard were the leading causes of project delay. The study also reported that the majority of the findings matched those in other regions of KSA and the GCC.

From the review of the studies in this section, it is indeed evident that adequate researches on causes of project delays have been done in Oman, the neighbouring countries such as KSA, and United Arabs Emirates. The literature review also reveals that the causes of project delays can be grouped into three main sets – the owners, contractors, and consultants-related factors. External factors may also be considered. The findings are essential in determining how the questionnaire is to be structured.

2.2 Cost Overrun in Causes in Construction Project

Gobana and Thakur (2017) explored the common causes of order variation in construction projects. Order variation, as explained herein, is the change in the initial amount of order cost after the first agreement had been made. Sometimes the order change can be negative; however, in most cases, order changes often occur concerning increased order cost. The results indicated that the most common causes of order change include: schedule alteration, scope differences, financial challenges by the employer, delayed decision-making process, employers, stubborn nature and specification changes by the employer. Other causes include alteration of the design by the consultant, variation of the consultant's documents, design complexity, poor drawings of the work, change in specification by the consultant, unavailability of equipment, lack of professional workforce, and financial difficulties by the contractor.lo

Ismail et al. (2012) explored the causes of order variation in the railway construction projects in Iran. The study used a structured survey questionnaire to obtain data from key players, including employers, consultants, and contractors. Out of suggested 26 potential causes of variation order, the study confirmed ten. Among the ten factors, the ones reported as most critical include employers' change of plan/scope, omissions, and errors in the design, variations in site conditions and financial difficulties of the contractor. Consequently, variation order increases the period it takes to complete the order, and, the total cost of completing the project. The authors, however, do not indicate or discuss results associated with other authors. Also, Alnuaimi et al. (2009) explored the causes of inflated costs in public construction projects in Oman. The author posits that many contractors rarely inflate project costs. Instead, they provide a certain overhead percentage that is meant to take care of the unforeseen changes that require additional costs. Evidence indicates that in most cases, many projects often end up costing relatively more than their original estimate. Alnuaimi et al. (2009) reported fourteen issues that were potentially the cause of order variation in Oman, which were: The need for additional work because of emerging issues; modification of the original plan by the owner; unclear scope during the design stage; problem of decision making; poor representation of the owners by site engineers among many others. Sohu et al. (2017) explored the causes of cost overrun in Pakistani’s highway projects. Cost overrun for such projects is a common phenomenon worldwide. In the study, the researchers developed 64-item survey questionnaires that were used to collect data from a total of 30 respondents working in different construction projects in the

province of Sindh, Pakistan. The results indicated that delayed payments by the client, poor planning, interference of the project by the client, delay in decision making, change of scope, and poor management of contractors were some of the most important determinant of cost overrun.

Alghonamy (2015) researched on the causes of cost overrun in construction projects in Saudi Arabia. Similar to the majority of studies that have been reported in this section; the researcher used a quantitative survey questionnaire based on 34 different items as informed by the literature review. A total of 43 respondents working in various construction projects, clients, contractors, and consultants. Findings indicated that out of the 34 different items used to measure causes of cost overrun, the most important factors included: awarding of tender, or bids to the lowest bidder, change in design of the project by the owner, or consultant, inadequate project planning, lengthy periods between project design and actual implementation, and delay in payments. Alzara, Kashiwagi, and Al-Tassan (2016) expounded on the relationship between change order and cost overrun among the lowest bidding contractors. Firstly, the author explains the problem with the tendering system of KSA, where many bids are awarded to the contractors who present the lowest cost estimate for completing the project. Once they have won the tender, they change the project cost to compensate for the financial aspects that they had either understated or ignored in the original estimate. In such a case, the client has to foot the additional cost of the project; which in most cases often results in disputes and causing apparent delays in the commencement of the project. Depending on the financial capacity of the client, the project can be financed based on the new cost estimates, or completely abandoned as the client looks for a different contractor. If the client remains with the original contractor, mistrust is likely to develop, which consequently leads to poor communication among the parties involved; which is yet another source of dispute and quality compromise.

The review of the studies in the section on causes of cost inflation/variation indicated that three factors were critical as the potential causes of cost inflation. These factors are the change of the original plan as requested by the employer, change of the design as per the consultant, the poor, or unclear plan which prompts inevitable changes. Other important factors include the financial difficulty of both the employer and contractor, lack of clear communication among the stakeholders, problems in decision making. The literature review also indicates that the consequences of order variation affect the cost and time of completing the project. These findings are essential in designing the questionnaires that were used to collect data for the present study.

In summary, for both the time and cost, the literature indicates that the key determinants of delays and cost overrun are similar, and they are the client, contractors, and consultants. The first two factors are widely mentioned in many researchers to be very critical determinants more than the consultants. Almost all of the studies that have been reported in the literature review were conducted using survey questionnaires, and the majority of the results are reported as descriptive statistics. None of the studies is designed using correlations study design, which seems to be a significant knowledge gap. It would be more informative if studies could, for example, determine the correlation of the different causes, use techniques such as variance inflated factors to eliminate some variables and use multivariate regression analysis to determine the significance or lack of it thereof, for project delays and cost overrun. If more studies could be designed this way and report more similar findings, better solutions can be derived because as it is, using the descriptive statistics, it is difficult to determine which causative factor is more important than the other.

3. Methodology

3.1 Study Design

The study design is the technique employed by the researcher to answer the research questions using the given data (Wahyuni, 2012). The quantitative and qualitative approaches determine the type of study design the researcher should use. Both the quantitative and qualitative research designs are

based on two main philosophies – the positivism, and interpretivism philosophies. The positivism results are the philosophy on which quantitative research is based. According to this philosophy, knowledge is not subjective and can only be acquired through a systematic and scientific procedure (Scheurich, 2014). The philosophy further assumes that in undertaking the study, the researcher does not have prior knowledge of the phenomenon under study, and even if he/she has, the results of the research process are independent of such prior knowledge (Schweber, 2015). Conclusions are made strictly out of observation. The researcher, in this process, is, therefore, an independent and passive participator. Based on the hypotheses set at the start of the study, results of the observation determine whether the hypothesis is accepted or rejected.

The qualitative research design, on the other hand, is based on the interpretivism philosophy. According to interpretivism, knowledge and truth are subjective and can be perceived differently by anyone (Haddadi et al. 2017; Scotland, 2012). As such, a qualitative researcher actively participates in interpreting the results of the study, which makes the process vulnerable to bias. The methodology of the research is a significant determinant of study validity; which is often determined by the degree by which a given study can be done by a different researcher using the same procedure, in a different setting and arrives at the same conclusion. This is only possible in the case of quantitative research or positivism approach where there is a scientific and systematic procedure, and the results and interpretation are independent of the researchers' subjective knowledge. In the interpretivism research approach, it is difficult to replicate a given study and obtain similar results (Chowdhury, 2014). This is because, even if the procedures were similar, the fact that interpretation is subjective to the researcher's rationale, and perception of knowledge implies that even when the outcome means the same thing to the researchers, their communication can differ significantly, which can inevitably affect the quality of the outcome. Consider yet, that the primary purpose of the research is to solve societal problems, which means communicating research results is important.

Indeed, many proponents of the positivism research philosophy have criticized the interpretivism philosophy for lack of credibility and adequate validity. Nevertheless, several cases exist where the quantitative approach cannot effectively generate the appropriate research knowledge; hence, the need for the qualitative approach. As such, many researchers today, both the proponents of positivism and interpretivism approach are finding common ground for mixed research approach. The quantitative design uses numerical data to answer the research questions. Often, the research design is based on pre-determined hypothesis or research questions which are explained using statistical results. The qualitative approach, on the other hand, uses the data collected from the respondents to develop a theory or hypothesis that answers a given research question (Marshall & Rossman, 2014). It does not require numerical data to develop the answers to the study questions (Bowling, 2014; Punch & Oancea, 2014). Mostly, researchers prefer to use quantitative design since it reduces study bias. In this case, the researcher independently interprets the study results based on the underlying theories and principles. The qualitative design, on the other hand, allows the researcher to interpret the results based on his/her knowledge, intuition and even experience, as well as existing knowledge (Bowling, 2014). The active participation of the researcher in interpreting the data makes the process more vulnerable to bias. The present study, therefore, will use the quantitative research design. Specifically, the survey research design will be used to collect data from respondents.

Quantitative studies are also justified for this study because they provide quantitative and reliable measures of data (Johnson & Turner, 2003). For this study on delays in project management in Oman, the quantitative design can work best as it has better control in terms of sampling and design as compared to qualitative research (Wahyuni, 2012). It is crucial to control sampling and design because this can provide a more accurate representation of results on project management. Quantitative research also ensures proper control of causality statements via the application of controlled experiments (Johnson & Turner, 2003). In understanding delays in projects, it is vital to have reasonable control of experiments in order to accurately establish causes for such delays (Wahyuni, 2012). A numerical understanding can also be established using a quantitative research design. The

use of statistics ultimately provides a measurable result for the research question which is very much necessary in this research where the delays in project management in Oman are being established (Marshall & Rossman, 2014). Moreover, the research process for quantitative research design can be replicable. It is important to ensure that research methods are replicable in order to allow for a repeat of procedures in order to check the results and processes involved in the research (Marshall & Rossman, 2014).

Quantitative research is also justified for this study as it can be used to identify information by accumulating numerically supported data (Marshall & Rossman, 2014). This ensures that the opinions, beliefs, as well as attitudes of individuals are weeded out of the information. It is essential to eliminate mere opinions from the data on project management delays because opinions would not provide an accurate portrayal of the causes of delays in projects (Scheurich, 2012). Quantitative research also usually uses closed-ended research questions which does not allow for in-depth answers from respondents (Scheurich, 2012). However, the choices indicated in the questionnaire for this study are based on data gathered from previous studies or previous literature on a similar topic (Scotland, 2012). Quantitative research methods are also justified for this study because they allow for the gathering of data from a larger number of respondents (Scotland, 2012). The target population was significant for this study, but the final number of respondents was limited (Scheurich, 2012). Still, this research method is justified as it starts off from a large population of prospective respondents. The chosen close-ended method for this study is appropriate because it helps confine the answers of the respondents to the choices. The choices have been screened thoroughly based on previous studies (Scheurich, 2012).

This study includes a qualitative component, specifically in relation to the "other" option indicated in the questionnaire. This is an open-ended option which is more common in qualitative studies, but not uncommon in quantitative studies (Scotland, 2012). It is justified as a remedy which helps respondents make personal choices not based on the choices indicated or chosen by the researchers (Scheurich, 2012). Forcing the respondents to choose from the options indicated in the question can cause bias in results (Scheurich, 2012).

3.2 Sample Size and Sampling Procedure

The project managers are involved with the daily practices and management of the projects, more than employees and consultants. The study, therefore, decided to sample project managers purposively. Assuming that the total active projects in Oman, which are estimated at approximately 2400 is the target population. A sample size of 100 participants was chosen to represent the target population. Projects from which to obtain respondents were selected randomly, and the respondents as well.

3.3 Data Collection Tools and Technique

Questionnaires were used as the main data collection tool. Questionnaires can either be closed or open-ended (Johnson & Turner, 2003; Tharenou, 2007). Close-ended questionnaires are used to collect data for quantitative data, and the open-ended is usually used for qualitative data. The use of a close-ended questionnaire for quantitative data is to enable ease of coding, entering and analyzing data in respective statistical software. The response levels in the close-ended questionnaires are often limited based on the underlying theory. The findings of the literature review mainly informed the questionnaires developed for the current study. The questionnaires were sent to the selected respondents via their Linked page. The respondents were given 60 working days to fill and return the questionnaire to the researcher. Before the actual data collection, ten questionnaires were mailed to respondents for the pilot study to determine how effective they were. Adjustments depending on the feedback of the pilot study were made. A total of 100 questionnaires were mailed to different respondents, with 35 questionnaires returned. The questionnaire gathered information

about their demographic profile (gender, age, educational level), participation in the construction industry of Oman, as well as project affiliation. For the more specific content of the questionnaire related to the research topic, the respondents were asked about the causes of delay of projects in Oman, with these causes of delay classified based on typology of delays.

3.4 Data Analysis and Presentation

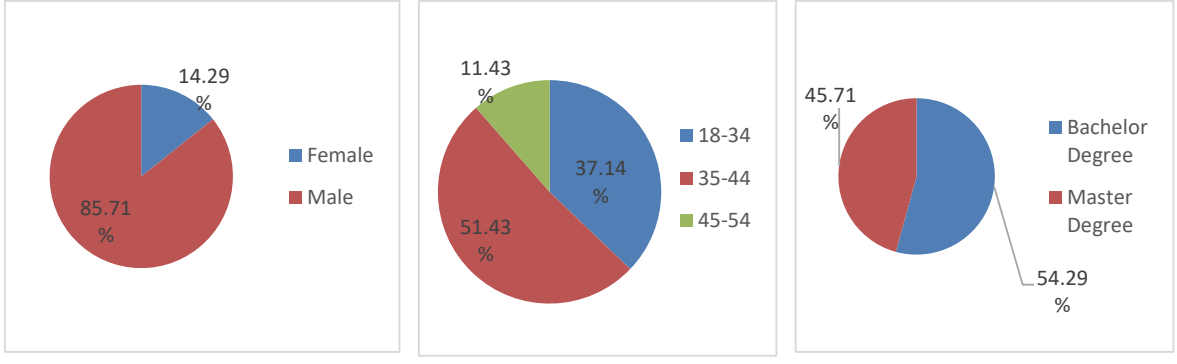
Regarding data analysis, the researcher used the S Statistical Package for Social Scientist (SPSS 20) software to compute statistical results. Frequency distributions in the form of percentages formed part of the main results of the study. The data were presented using charts tables. Themes were also generated from the results, as noted in the responses of the participants. These themes helped develop more organized answers to the research questions.

4. Results and Discussion

A total of a hundred questionnaires were sent to respondents via LinkedIn. However, only thirty-five respondents were able to complete and send back the questionnaires. Results were visualized and analysed the Statistical Package for Social Scientist (SPSS 20). Descriptive statistics were the primary data targeted. The following section presents the Excel output.

4.1 Demographic Information

According to the chart below, (85.71%) of the respondents were male; while only (14.29%) were females. Regarding age, figure 2 below indicates that most participants were of the age bracket 35-44 (51.43%), and another majority (37.14%) were aged between 18 and 34, while the rest (11.43%) were of the age 45-55 years. All the respondents possessed either a bachelor or master degree, as depicted in figure 3 below. The majority of the respondents (54.29%) had a bachelor's degree while the rest (45.71%) had a master degree.



Gender Age Educational background

Fig. 1. Personal characteristics of the participants (Gender, Age and Educational background)

Also, findings showed that most of the participants were affiliated more with public projects (54.29%) and the rest (45.71%) were associated with private companies. Further, it was revealed that majority of the respondents were clients (54.29%). Another (25.71%) were consultants, and only (17.14%) were contractors. These findings are presented Fig. 2 as follows.

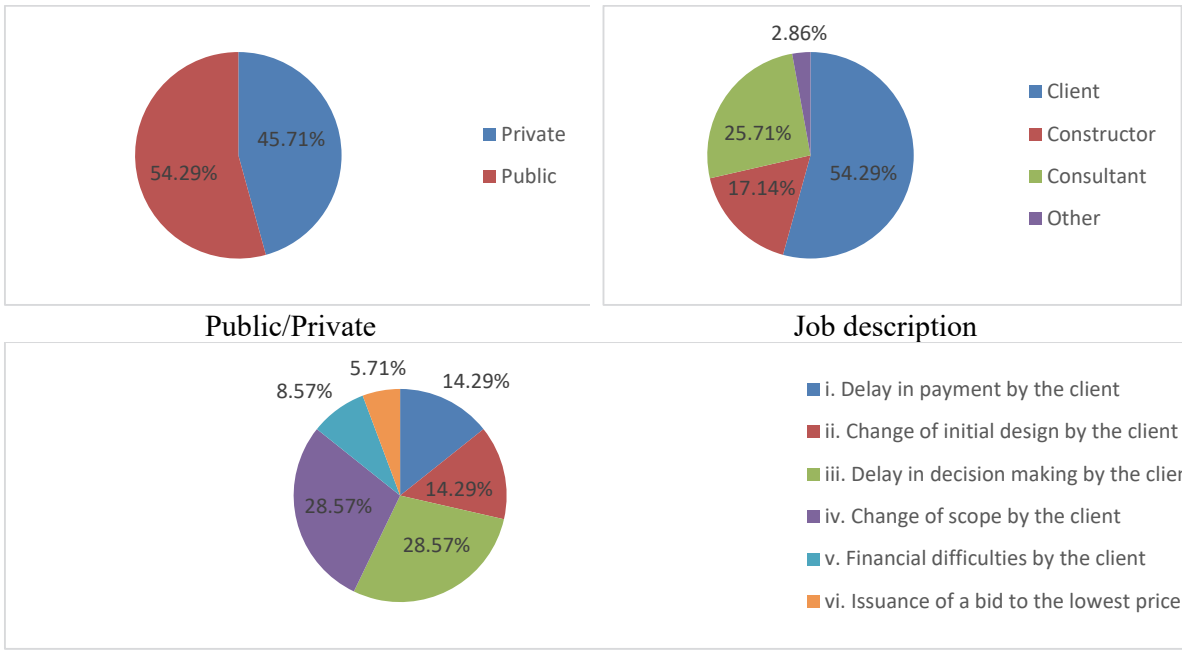


Fig. 2. Characteristics of the project managers, their job description and client related cases of delay in accomplishment of projects

4.3 Causes of Project Delays in Oman

4.3.1. Client-related Causes

As shown in Fig.2 above, the issues that were majorly cited as the client related cause of project delays in Oman include change of scope (28.57%), and delays in decision making by the client (28.57%). Change of initial design was also revealed to be an important determinant of project delays (17.14%), and delay in payment (14.29%). The issue of the low bid was mentioned in the literature review, but the results indicate that only (5.7%) of the clients considered it to be an important factor in determining project delays and cost overrun. As the results indicate, the major client-related causes of project delays include change of scope and delays in decision making. Delays in payment are also reported as a major cause of delay. Similar findings are also reported by Elawi et al. (2016), including the problem with decision making by the client. The issue of bureaucracy in clients' organization has been stated by Alamri et al. (2017). At many stages of a project's life cycle, the client is expected to provide instructions on how the project should be completed continuously. Some of the instructions require significant time, especially when there were unforeseen events and require additional finances.

4.3.2 Contractor-related Causes

As shown in Fig. 3, the major contractor-related causes of project delays include lack of experienced workers (37.14%); which had a similar response rate with poor contract management (37.14%). Late delivery of materials was also found to be an important cause, although it was only reported by (11.43%) of the respondents.

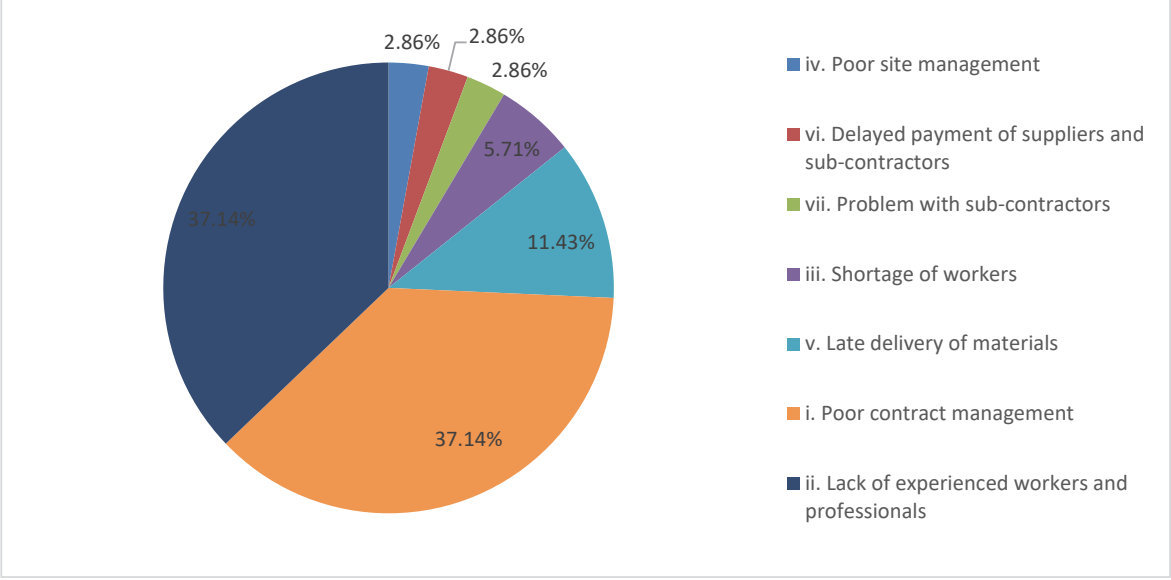


Fig. 3. Contractor-related causes of project delays

The current study found that the main contractor-related causes of project delays include poor contract management and lack of experienced workers. These findings are also reported by Albogamy et al. (2012) as reported in the literature review. Lack of experienced workers can indeed be a major cause of problem delay in the Gulf region. Generally, the majority number of workers in Oman are expatriates according to National Centre for Statistics and Information there are 526,895 workers in the construction field (2019). They come mainly from Bangladesh, India, Pakistan, Philippines, Egypt, Uganda, Sri Lanka, Nepal and Tanzania, respectively. The figure is high compared to the total number of the expatriate population in the country due to the huge demand of construction industry which urge accepting workers from no/lack of experienced background especially from low-income countries to overcome high wages criteria for local man force. Eventually, the quality of contract management deteriorates.

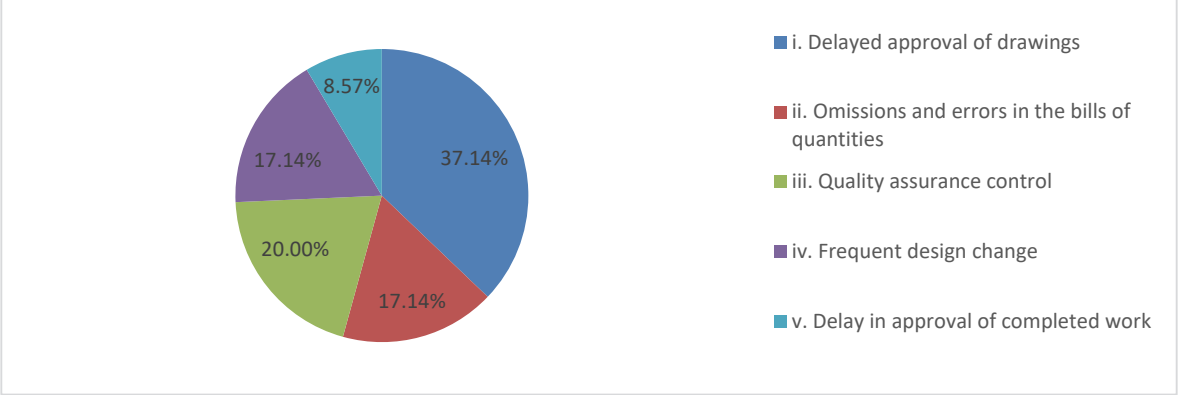


Fig. 4. Consultant related issues

According to Fig. 4 above, majority of the respondents (37.14%) reported that delayed approval of drawings was the major cause of project delays in Oman. Issues with quality assurance control chosen by (20%). Frequent design change and errors in the bills of quantities were also reported as important causes of project delays (17.14%) each. The results also show that delayed approval of project drawings is an important cause of project delays from consultant-related factors. Again, the finding is confirmed by Albogamy et al. (2012). Delays of approvals could be as a result of several reasons including lack of efficiency by the relevant approving departments. Other reasons could include huge case backlogs that may take unnecessarily long to clear.

4.4 Causes of Cost Overrun

4.4.1 Client-Related Causes

As shown in Fig. 5, most of the respondents (65.71%) believed that a change of project scope by the client is a significant cause of project cost overrun in Oman. Also, (17.14%) of the clients cited poor communication with other parties; (14.29%) cited change of the project's initial plan. Only (2.86%) mentioned the delay in progressive payments. Results of the study revealed that the major client-related cause of project cost overrun is a change of scope of the initial project. This was yet reported in the literature review by (Gobana & Thakur, 2017). Changing a project scope, especially to increase its size, often involve additional financial resources.

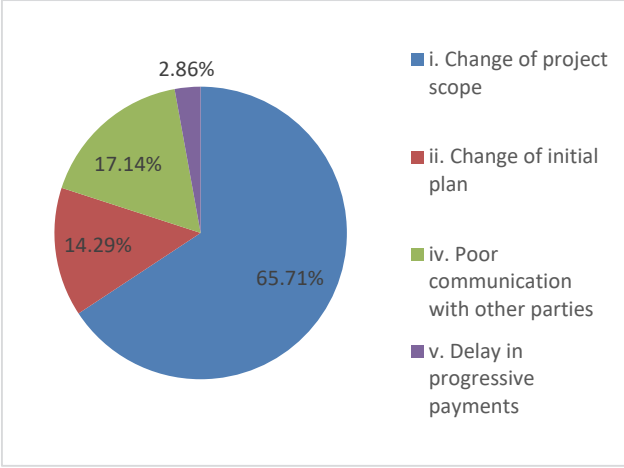


Fig. 5. Client-related causes

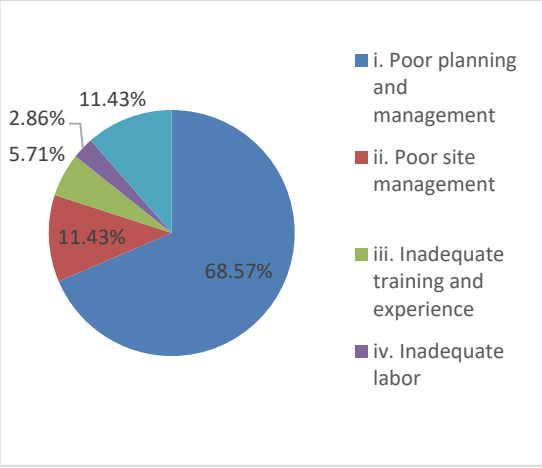


Fig. 6. Contractor related causes

4.4.2 Contractor Related Causes

Concerning contractor-related causes of cost overrun, Fig. 6 above indicates that a large majority (68.57%) of the respondents thought that poor planning and management of the projects is the major cause of cost overrun in Oman. Also, (14.29%) cited problems with sub-contractors; (11.43%) reported poor site management. Inadequate labour and inadequate training and experience were both reported at (2.86%). Regarding the contractor-related causes, the study indicated that poor planning and management was an important factor. Workers backgrounds, in terms of language and culture, contribute to the hardship of panning and managing and inefficiency of site management. Poor planning can potentially result in significant loss of time and resources, which causes cost overrun eventually.

4.4.3 Consultant Related Causes

According to Fig. 7, the major part of respondents (40%) reported that poor drawing was an important factor that causes project cost overrun. Another (37.14%) reported that delayed approvals of submittal were also an important problem. Lastly, (22.88%) of the respondents cited poor quality control. There is no one reason shows a clear dominance over the others.

4.5. External factors

As shown in Fig. 8, the majority of the respondents reported that the increase in prices of materials was the most common external factor (48.57%) that caused both delay and cost overrun. Also, (14.29%) cited a combination of other factors which were classified into the following factors: approval by the government of various activities including water, electricity, municipalities, and other relevant stakeholders. Other external factors include lack of access to the appropriate information

from relevant external stakeholders, stakeholders' need that may not have been captured in the original design, requirements by the third party such as gender or persons with disabilities and permit and NOCs. Another (11.43%) reported land dispute problems; (11.43%) mentioned cultural issues; (8.57%) reported weather as a significant cause of project delay and cost overrun. Lastly, (2.86%) reported political stability as a crucial external determinant of project delays. Commodity prices in most economies are always rising, and the country's economic condition often determines the general price levels.

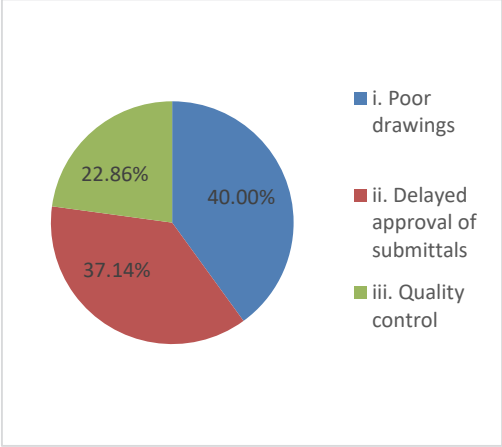


Fig. 7. Consultant related causes of project delays

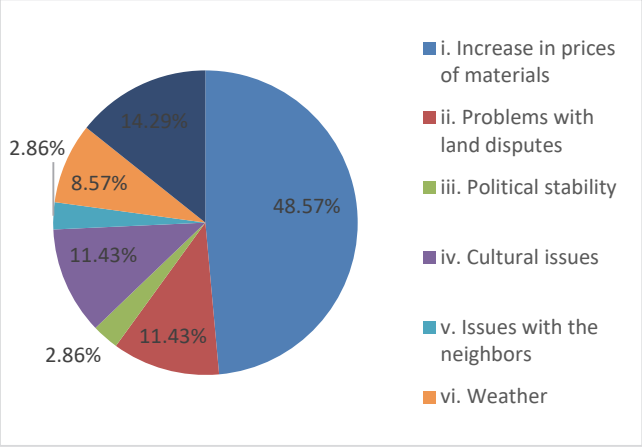


Fig. 8. External factors influencing on project delays

The current study revealed that the increase in the prices of materials is the most common external cause of project delay and cost overrun. Similar findings are also reported in (Aziz and Abdel-Hakam, 2016). Depending on the length of the project, some projects may experience the even worse effect of price increase, especially if the event occurs abruptly. It is safe to argue that the Qatar boycott may have a significant effect on the cost of materials due to restricted movements of goods and services within the Gulf region. Land disputes and cultural issues could be attributed to regulations and indicate an issue that should be solved by the government. The presence of weather as a critical external factor is normal due to the location of the sultanate, which almost yearly struck by storm or cyclone. External factors influencing project delay and cost overrun could be enormous therefore a qualitative approach to gather some other factors which may not be distinguished from previous studies this was done by adding an open "Other" option for respondents. Different factors have been indicated, but no repetition of one input reoccurred.

5. Conclusion

Project delays and cost overrun are costly to the clients, contractors, consultants, and every other stakeholder who has interest in the project. Economic growth, for example, is significantly affected when national projects such as roads and railroad constructions are delayed. Likewise, poor quality of projects exposes the expected users to risks of injuries and sometimes death. It is therefore important that project management minimizes costs and complete the project in time. The current study was designed to examine the causes of project delays and cost overrun in Oman. The study used a quantitative and qualitative approach. The major findings indicate that change of scope and delay in making decisions are the most important client-related causes of project delays. Regarding the contractor-related factors, the study found that poor contract management and lack of experienced workers were the most common causes of project delays. Delayed approval of drawings was also found to be an important consultant-related cause of project delay. On cost overrun, the main client-related factors include change of the project's scope. Poor planning and management were established as important contractor-related determinants of project cost overrun. Lastly, poor drawings contributed as a top cause for consultant related cost overrun reasons. From the results of the study, all the results are confirmed by the literature review. It, therefore, implies that the research

community has significantly established the causes of project delays and cost overrun. However, few studies have been conducted in Oman. The present study, therefore, recommends that future study should be taken place on the same; with a specific focus on individual factors such as Cost overrun, and clients' relationship. This would add more information to the already existing body of knowledge and enhance rational policy formulations.

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Appendix

Questionnaire

Section A: Personal Information

1. What is the gender of the respondent?
   Male
   female
2. What is the age of the respondent?
   18-34
   35-44
   45-54
   55 >54
3. What is the highest educational qualification of the respondent?
   i. High school
   ii. Diploma
   iii. Bachelor's degree
   iv. Master's degree
   v. PhD
4. What type of ownership is the project the respondent involved?
   i. Private
   ii. Public ()
5. What is the respondent's involvement in the project?
   i. Client
   ii. Constructor
   iii. Consultant
   iv. Other (specify)_____

Section B: Causes of Project delays

a. Client/owner related issues

1. Pick only one issue that considered as a major cause of project delays in Oman
   i. Delay in payment by the client
   ii. Change of initial design by the client

iii. Delay in decision making by the client
iv. Change of scope by the client
v. Financial difficulties by the client
vi. Issuance of a bid to the lowest price
vii. Other (specify)_____

b. Contractor related issues

i. Poor contract management
ii. Lack of experienced workers and professionals
iii. Shortage of workers
iv. Poor site management
v. Late delivery of materials
vi. Delayed payment of suppliers and sub-contractors
vii. Problem with sub-contractors
viii. Other (specify)_____

c. Consultant-related issues

i. Delayed approval of drawings
ii. Omissions and errors in the bills of quantities
iii. Quality assurance control
iv. Frequent design change
v. Delay in approval of completed work
vi. Other (specify)_____

Section C: Causes of Cost overrun

a. Client/owner related

i. Change of project scope
ii. Change of initial plan
iii. Financial difficulties
iv. Poor communication with other parties
v. Delay in progressive payments
vi. Other (specify)_____

b. Contractor/owner related

i. Poor planning and management
ii. Poor site management
iii. Inadequate training and experience
iv. Inadequate labour
v. Problems with sub-contractors
vi. Other (specify)_____

c. Consultant-related

i. Poor drawings
ii. Delayed approval of submittals
iii. Quality control
iv. Other (specify)_____

d. External factors

i. Increase in prices of materials
ii. Problems with land disputes
iii. Political stability
iv. Cultural issues
v. Issues with the neighbours
vi. Other (specify)_____