TECHNIUM

Technium Vol. 4, No. 8 pp.1-10 (2022)
ISSN: 2668-778X
www.techniumscience.com

Delay Factors of Construction Projects in Oman

Amur Ali Mussallam Al Amri [1], Asst. Prof. Dr. Ali Erhan Oztemir[2]

[1] Cyprus International University, Master Student
[2] Cyprus International University, Institute of Graduate Studies and Research, Civil Engineering Department

Abstract. The construction industry is the second largest economic sector of the Sultanate of Oman. The construction industry plays important role in infrastructural development both for the public and private sectors. The delays in construction projects impact directly the economic development of the country. The present study aimed to analyze the delays in a construction project by conducting a survey based on a questionnaire. The questionnaire survey is answered by 74 respondents and the quantitative data is further subjected to statistical analysis. The results are further tested through the Pearson chi-square test of independence and Cramer's V tests. The results show that several factors contribute to the project delays in Oman including cultural differences, design changes, poor project management, and changes in project scope at the time of project execution. The managerial issues involved payment delays to contractors and authoritarian delays. The clients faced poor planning and execution of the project by the contractor and sub-contracting of the critical project phases.

Keywords. Construction, delays, infrastructure, management, planning.

1. Introduction

Delays in the construction industry are associated with several factors that include materials, workforce, contractual issues, coordination between teams, communication shortfalls, poor planning, and other external factors [3]. Construction projects involve different parties including owners, contractors, workforce, consultants, and clients that play a role in completing the project within the planned timeframe [16]. Construction projects are more likely to be delayed which causes significant loss to all the parties [5]. The results of delays in construction projects include loss of productivity, late completion of the project, disruption of work, increased cost, disputes between parties, third-party claims, and termination of the project. It is also highlighted that changing orders by owners and financial difficulties faced by contractors are leading reasons for delays in construction projects. Changes in government laws and environmental factors also contribute to the timely completion of projects [18].

[2] [6] study is aimed to evaluate the construction project delays in Oman and recommend mitigation strategies. The study is based on a systematic literature review and questionnaire survey that is aimed to evaluate the current condition. The study ranked five major causes of delays in construction projects including a selection of the lowest bidder, the poor financial condition of the contractor, poor decision-making of the client, and the poor management of the contractor [20]. The study identifies that project time overrun, and cost overrun are the major issues associated with the delays. The study

emphasizes that strong planning and coordination between stakeholders and the project management, and effective site management are the key strategies to overcome project delays. [13] estimate the problems resulting from the delays in construction projects. It is a field study in which the researcher did surveys of construction projects in the Muscat region. The data collected is further divided into two groups based on the year they started. It is estimated that 40% of projects are delayed and the project delaying factors are changing over time [13]. The major causes of project delays are associated with the owners, as the poor estimations of project stakeholders lead them to delays that further cost a hefty amount to compensate [1].

The construction industry is the key driving sector of the economy, and it provides a scale to measure development and sustainability in the economy. The economy of Oman is mainly based on the oil and gas sector [4]. The construction industry is the second major contributor to the Omani economy. Like other GCC countries, Oman is also focused on promoting tourism and development. the country is offering a luxurious experience to people from all over the world with well-developed cities and impressive infrastructure [7]. The high-rise buildings and urban structures play an important role to attract tourists for amusement, joy, and recreation. Delays in construction projects have a negative influence on the economy and delays result in increased project costs.

During the past few decades, the Omani construction industry has experienced exponential growth with the increasing trend toward sustainable building and development. however, the construction industry faced significant challenges due to project delays that increase the cost of the project [9]. The annual growth of the country is significantly dependent upon the completion of construction projects that are influenced by the delays and slow pace of development. Delays in construction projects not only increase the cost but also plays a role in a slowing economy that impact different aspects of life within the country [8]. The construction industry in Oman is led by the Omani government which includes both public and private projects [11]. Different stakeholders in construction projects are closely linked to the planning, execution, and completion of the project. The increased attention of the Omani government to uplift the construction industry and provide opportunities to business entities operating in the GCC region [23]. Due to delays, the construction industry is facing several challenges. The major infrastructure development is closely linked to the lives of people and delays in construction projects slowed the overall growth of the country. The present study is aimed to analyze the delays in construction projects, the involvement of different stakeholders in construction projects, and their role in delaying project timelines. The study highlights key causes of delays in the construction industry of Oman. Overall construction industry of Oman is considered, and steps are identified to complete construction projects within a defined timeframe by synchronizing the construction processes. The study aims to understand the importance of project management in managing project activities and how effective project management could reduce delays in the Omani construction industry.

About this research, the following are the null and alternative hypotheses:

- H_0: The type of ownership of the project and the project delays are independent of each other or the type of project ownership and the project delays are not relatable.
- H_1: The project owner and the project delays are dependent on each other, or the project ownership type and the project delays are relatable.

2. Material and Method

Research methodology describes the plan that how to achieve research objectives. The study involves primary research methods including the qualitative method. The systematic approach to acquiring knowledge through scientific research and tools. The qualitative results are strictly based on observations and calculations and results are independent. This paper collects quantifiable data through survey sampling techniques. The survey was conducted online to answer the research questions and address the knowledge gap.

2.1. Sampling Size and Procedures

The sampling is based on gathering useful data related to the Omani construction industry. The project managers are key performers that control all the aspects of the project including planning, decision making, leadership, communication, and work site. Therefore, the survey is based on analyzing managerial roles in construction projects and choosing 100 construction projects. Further, the survey is based on analyzing the availability and willingness of project managers and other individuals involved in construction projects.

2.2. Data Collection Techniques and Data Analysis Tools

A survey questionnaire is used to collect the data; the close-ended questions provide quantitative data, and the open-ended questions provide qualitative data. The online survey questionnaire is posted to the respondents that are shortlisted from LinkedIn. The survey results are based on the survey results of 74 respondents. The quantitative results are further subjected to non-parametric tests including Pearson's chi-square test of independence and Cramer's V test. Both the significance tests provide concrete results based on quantitative data.

3. Results and Discussion

3.1. Qualitative Data Analysis

The results are developed based on survey questionnaire shared through LinkedIn and online sources, the results include findings related to demographic details, details about construction projects and issues causing delay in construction industry. Demographic information includes identification of gender, age, experience and qualification of respondents. It is observed that only 6 respondents are female and high majority professionals are male in construction industry (as shown in figure 1). The age of participants is categorized in different groups including 18-34 years, 35-44 years, 45-54 years and above 55 years. The figure 2 demonstrate the age groups and results of survey. It is found that 29 participants fall under 18-34 years of age, 37 individuals are aged between 35-44 years, 8 participants aged between 45-54 years and a single participant aged above 55 years. Figure 3 highlights the qualification of participants. It is revealed that most of the construction professionals (43 participants) hold bachelor's degree in their respective fields. 28 individuals are holding master's degree, three professionals hold a diploma while single participant is holding a doctoral degree

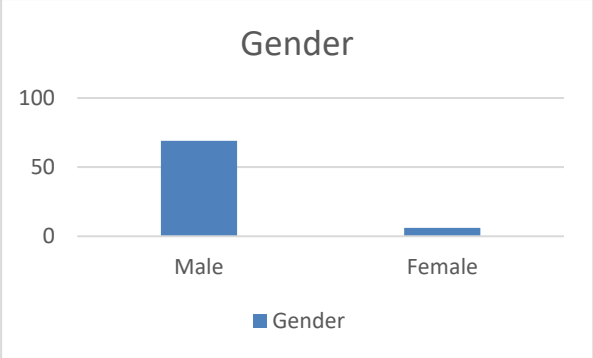

Figure 1: Gender information of Participants

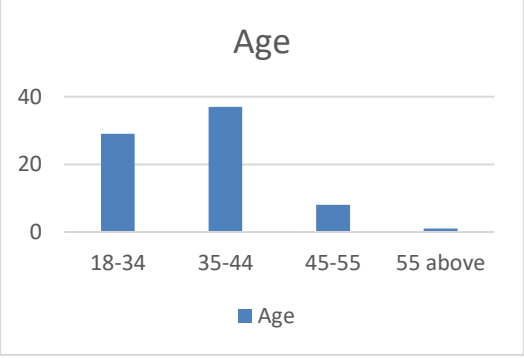

Figure 2: Age information

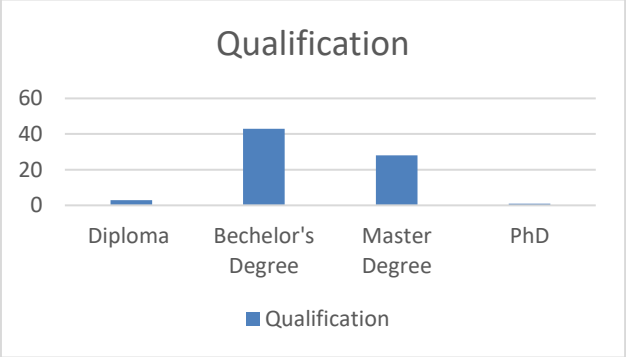

Figure 3: Qualification of Participants

Professionals working within construction industry of Oman are highly educated and have competencies to perform their jobs. Most of the professionals are serving private companies along with higher education that contribute to fast growth for infrastructure development. Figure 4 demonstrate the types of ownership of construction projects and results demonstrate that 40 participants are working in privately owned companies while 34 participants are working in government sector. It is important to note that difference is very low between people working for governmental organizations and private organizations that indicates that government of Oman is supporting and contributing to the development of infrastructure and construction industry.

It is reported that construction projects involve multiple stakeholders having different level of involvement in project. Figure 5 demonstrates that involvement of contractors, clients, constructors, and others within construction project. Results revealed that 29 participants are clients and have in-progress projects with many organizations. Constructors are involved in construction and building procedures and 15 respondents are constructors. 14 participants are consultants that plays a critical role in planning, designing of project. Consultants provide communication between constructors and clients. The remaining 16 participants are not directly related to construction work but they are working to facilitate the construction industry. the diverse nature of participants is important to authenticate the reasons of delays in construction projects.

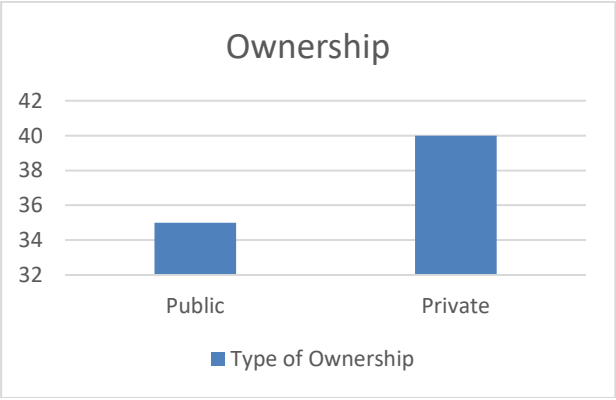

Figure 4: Types of Ownership of Project

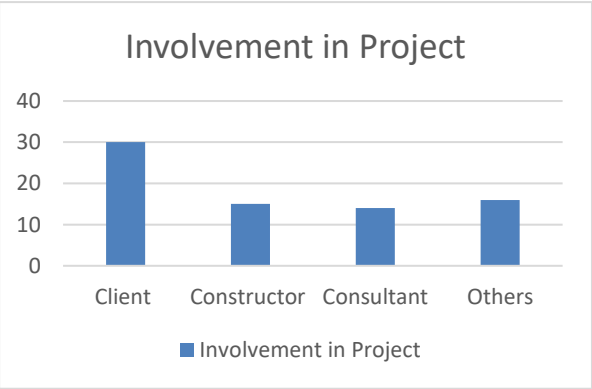

Figure 5: Involvement in Project

Several factors are considered and evaluated related to construction project delays in Oman. Figure 6 demonstrate the internal and external factors collectively and highlight the key issues causing delays in construction projects. Out of 74, 18 participants argued that change in project scope and delay in decision making process are major causes of delay. 18 respondents argued that delays in payment is major cause of delay, 13 support the argument that change in initial design of the project

lead to delay in construction projects. Small numbers of participants argued that financial difficulties and awarding contract to lowest bidder are actual reason for delays in construction projects. Figure 7 demonstrate the construction site factors that causes delay in construction projects. 16 respondents advocates that labour shortage at construction site is considerable issue that results in delays, 14 participants advocates that lack of site management is basic issue, 14 participants view that lack of experienced labour is major issue faced by contractors, 11 participants argued that sub-contractors fails to complete the project in given time frame, few participants view delay in payment to suppliers, late material supplies, and poor contractual management are core issues related to construction site.

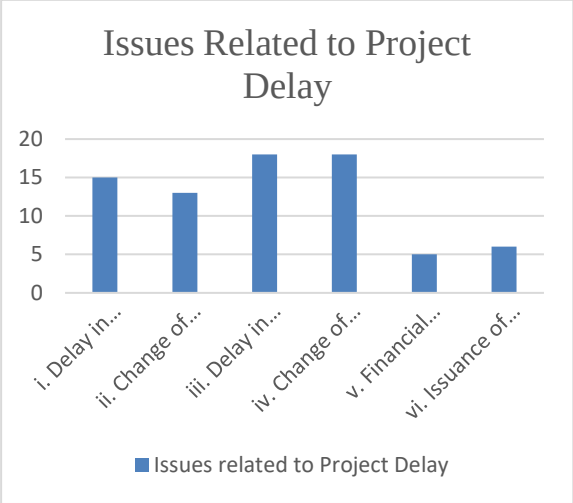

Figure 6: Internal and external factors

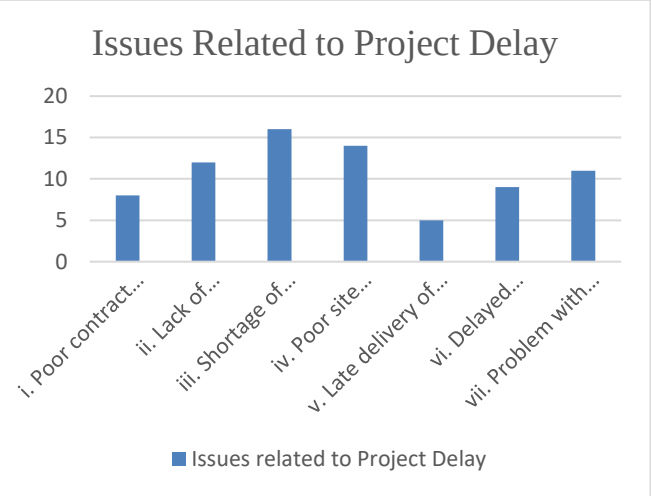

Figure 7: Construction site factors

Administrative issues related to construction project delays are highlighted in figure 8. Most of the participants argued that initial approval for drawing is delayed for projects, 16 participants view that quality related issues are causing delays in construction project, 13 participants pointed those frequent changes in construction design cause significant delays, 10 participants highlight the need to speed up the construction process by removing billing errors. Few participants highlight that approval of completed work influence the finalization and completion of projects. Figure 9 demonstrate the issues related to construction progress that cause delays in construction projects. High number of participants advocate that changing in project scope during the implementation phase of the project is biggest reason of delays in construction project in Oman. 16.2 percent of participants argued that poor communication between parties raise issues during implementation of project, 13.5 percent participants advocate the financial difficulties, and 6.8% participants agrees that delays in fund transfer halt the ongoing activities at worksite. Due to above mentioned factors the project phases are delayed that results in late completion of project.

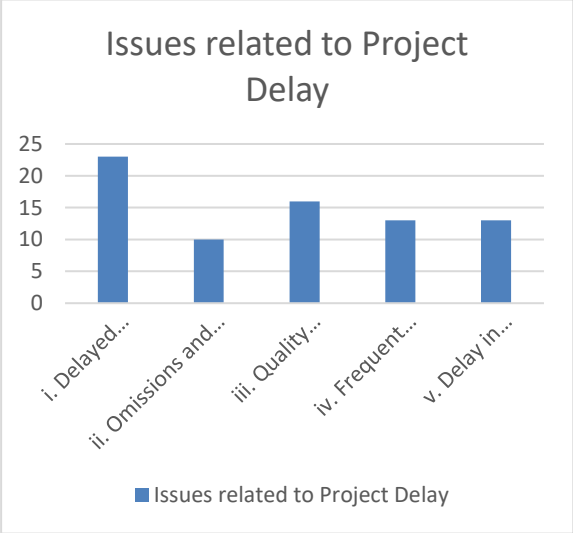

Figure 8: Administrative issues

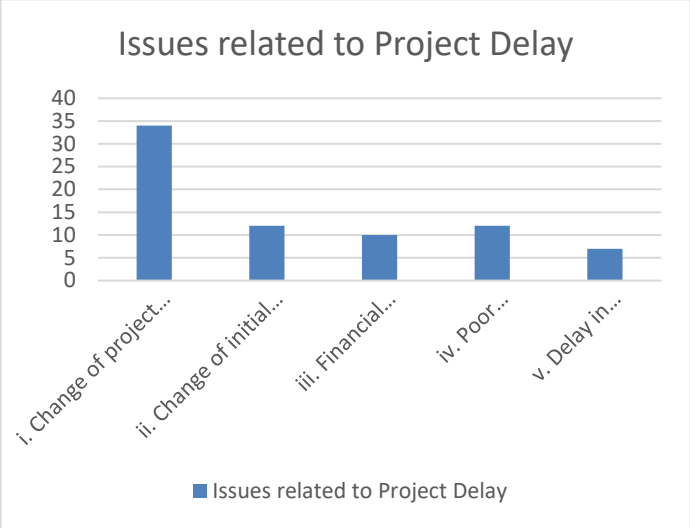

Figure 9: Construction progress issues

Planning phase is significantly important for construction projects as sound planning is helpful to complete the project within pre-decided timeframe. Figure 10 highlights the issues related to planning phase that could result in delays. The graph shows that 43.2 percent participants argued that delays in approvals by submittals is major cause of delays in planning phase, 29.7 percent argued that poor drawing, and 27 percent argued that quality assurance issues are major concerns during planning phase that results in delays in projects. Poor planning causes significant loss to all the parties and it is important to put greater emphasis on planning stage of construction project to avoid delays. The role of government and licensing authorities is highlighted, and key issues are demonstrated in figure 11 that results in project delays. Government is directly involved in each construction project through licensing and approvals. 36 participants argued that an increase in material cost is important factor that causes delay and government is responsible to regulate the prices of building and construction material. 7 participants argued that culture, political stability and weather of the country determines the completion of project. Land disputes are also identified as a cause of delay in construction projects. The government should provide land reforms to mitigate the land disputes. Permits and NOCs are the approvals to start construction and government delay the permits that eventually causes delay in completing the construction project.

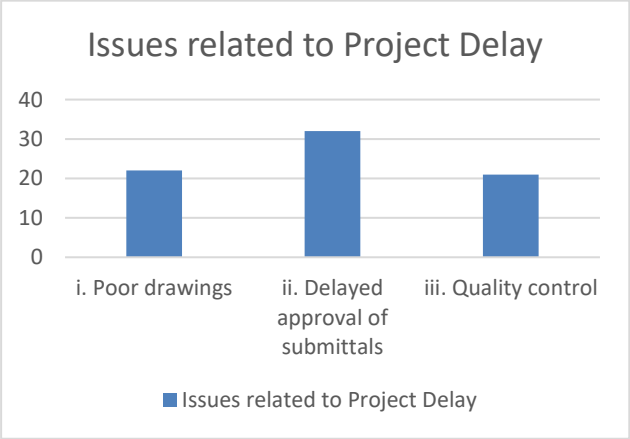

Figure: 10 planning phases issues

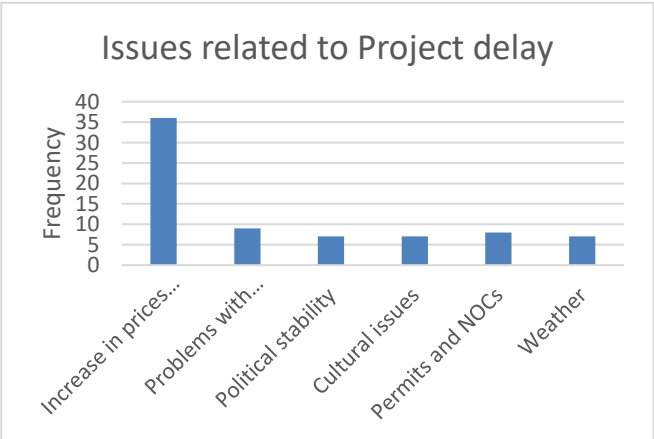

Figure 11: Authoritarian Issues

3.2. Tests of Independence

3.2.1 Pearson chi-square Test

Pearson chi-square test is performed to estimate the relationship between the project delays and different external and internal factors associated with it. It is drawn that the null hypothesis is rejected if the p-value is less than the 0.05 significance level. The test provides a significance level of 5% the results show that the null hypothesis is accepted, except for the only factor in which construction-related issues are discussed the relationship is non-significant and the null hypothesis is rejected.

Table 1: The result of the chi-square test of independence between the type of ownership and issues related to project delays in Oman

Issues related to project delays in Oman	Chi-square test statistic value	p-value	Decision
Issues related to internal and external factors	1.978	0.852	Do not reject Null Hypothesis
Issues related to construction sites	3.149	0.790	Do not reject Null Hypothesis
Issues related to administrative	2.442	0.655	Do not reject Null Hypothesis
Issues related to construction progress	13.289	0.010	Reject Null Hypothesis
Issues related to planning phases	2.352	0.309	Do not reject Null Hypothesis
Issues related to government and licensing authorities	4.456	0.486	Do not reject Null Hypothesis

3.2.2 Cramer's V Test

From table 2, the results of Cramer's V test show a significant and non-significant association between different factors of project delays. All interactions are weak associations that are not significant except the construction-related issues that show moderate interaction of significant factors.

Table 2: The result of the Cramer's V test of the strength of association between type of ownership and issues related to project delays in Oman

Issues related to project delays in Oman	Cramer's V test value	p-value	Decision
Issues related to internal and external factors	0.163	0.852	Weak Association (not significant)
Issues related to construction sites	0.206	0.790	Weak Association (not significant)
Issues related to administrative	0.182	0.655	Weak Association (not significant)
Issues related to construction progress	0.424	0.010	Moderate Association (significant)
Issues related to planning phases	0.178	0.309	Weak Association (not significant)
Issues related to government and licensing authorities	0.245	0.486	Weak Association (not significant)

3.3. Discussion

The construction project delays are categorized into three types that are contractor related issues, client-related issues, and government-related issues. It is evident from the quantitative results that the client's related issues have a profound impact on timely construction project completion. The clients that have a poor understanding of the engineering designs and project plans are creating hindrance in the project execution. The clients found changing project designs and scope creates major issues for the contractors and designers. The changes in critical aspects of construction design can change the overall construction procedure of the infrastructure which is the major cause of delays. It is evident that design changing through the project execution is the new trend in the construction industry, as the technology and market-related forces are involved in the changing process of infrastructure. It is also evident that the lowest bidders are awarded the contract that in most cases unable to complete the project as per the requirements and poor construction may further create delays. The bigger contracts are further sublet by the contractors and different vendors, suppliers, and workforces are involved in the construction process that demands a steady flow of payments from top to bottom. The delays in payments by the clients are also a major issue that delays the work at the site. The clients that frequently visit their work site can observe the material and progress made by the contractor and its team. Similar results are also evaluated by [17] [12] [14], the delays in construction projects are much related to the client, as the poor selection of contractors by the client, payment delays, and alteration in the initial design of the project are major issues causing delays. The contractor should guide the client regarding every aspect of the project and critical sections that demand skills and attention. The clients should follow the financial needs of the project and all payment-related issues should be solved timely. The clients should be aware of global and regional conditions, as most contracts demand extra financing to complete the ever-changing global conditions of the supply chain [16].

It is evident that contractor-related issues are causing delays in certain projects, as the poor management of the project, lack of experienced team to execute the project, and subletting critical sections of construction may cause delays in project completion. The low bidders are usually having smaller teams that are inexperienced and cannot handle large-scale projects. Most contractors are relying on engineers and site managers for the perfect execution of every section of construction. The cheaper labor is used to cut the cost of the project which poses threat to the sustainability of the project. The management team should be experienced, as they can only save the contractor from on-site losses and project delays. The inability of a contractor to comply with the project execution lies in the poor planning and management of the site. [22] also find that in the Gulf region the labor working on construction site have poor training and technical skills that cause on-site accidents and losses. The contractors are also least concerned with the labor training and development, as they want to cut the cost of project execution. The national statistics and information center shows that most construction-related labor in Oman came from Bangladesh, India, Sri Lanka, and Pakistan [14]. They do not have the training and specific skill set to cope with the challenges of complex engineering designs. The quality of project management deteriorates with people that have different origins and have no skillset and technical knowledge of the field.

The delays related to government, supply chain, and availability of the material are the major concerns of the clients and contractors. As the regional condition and global supply chain are the backbones of the construction projects in Oman. In Oman, most construction material is imported from global vendors, and any supply chain crisis may cause delays in the construction process. The government and other authorities should also monitor the plan and execution phase for legal compliance. The legal issues may hinder work at a site that can have a far lasting impact on project execution. The authorities can rule back the NOCs for any project at any level, as the changing demand and market forces determine the need for infrastructure in the future [19]. The construction approvals from the regional agencies is the core job mainly monitored by the clients, but such approvals in some case may

delay the project. The external barriers like cultural differences and land disputes are the issues that can alter the project deadline.

The Pearson chi-square test of independence and the Cramer's V test of strength guide that the internal and external factors are independent of project ownership. The external and internal factors impact the private and public sector project similarly. It is also noticed that the type of ownership of the project is independent of the issues related to the construction process. The authoritarian issues are also independent of the ownership, as both private and public projects may face similar issues. The projects are also facing cultural barriers, project management issues, material supply chain issues, and payment issues. The Cramer's V test of strength should weak and non-significant relation between the parameters, as the construction process has a significant relationship [21]. The project delays are based on the common issues that prevail in private and public sector infrastructure projects. The result accepts the null hypothesis and rejects alternating hypotheses based on a statistical analysis of quantitative data. The major issues involved workforce-related issues, material supply chain, poor management of projects, and poor planning.

4. Conclusion

Construction project delays cost heavily to the contractors and clients. These delays can only be minimized by improving project management techniques and client-contractor cooperation. It is evident from the study that effective project planning and least changes in project plan while execution can fruit optimal results for the contractors and clients. Public and private infrastructural development projects are critical for the growth and development of the country, so they should be completed on time. The poor-quality projects are posing threat to the sustainability of the infrastructure, especially when the construction design is challenging. The study shows that most clients and contractors are educated and have an optimal experience in the field. The cultural barriers are also there, as most designs are challenging and require the exceptional skill of the contractor and its team. The changes in designs and scope of construction during the execution phase are critical issues faced by contractors. The clients also face issues related to poor management of construction projects and a lack of skilled teams at the work site. The contractors are also found sub-contracting the original work order and it is always challenging to collaborate with different teams working on a single site. The government and regional legal matters also cause certain delays, as certain NOCs from authorities are critical to be taken before planning and execution. The tests of independence performed show that both the private and public sectors are impacted by project delays and all internal and external factors are responsible for these delays.

References

[1] Al Alawi, M. (2021). Delay in payment effects on productivity of small and medium construction companies in Oman: exploration and ranking. *Asian Journal of Civil Engineering*, *22*(7), 1347-1359.
[2] Al Amri, T., & Marey-Pérez, M. (2020). Key quality issues affecting the sustainability of construction projects in Oman. *International Journal of Advanced Science and Technology*, *29*(3), 4330-4338.
[3] Al Amri, T., & Marey-Perez, M. (2021). Project delays and cost overruns between public and private sectors in Oman. *Journal of Public Affairs*, *21*(3), e2262.
[4] Al Maamari, A., & Khan, F. (2021). Evaluating the Causes and Impact of Change Orders on Construction Projects Performance in Oman. *International Journal of Research in Entrepreneurship & Business Studies*, *2*(1), 41-50.
[5] Al Sulaimani, S. H. K., & Yahia, H. (2021). Evaluating the impact of change orders on construction projects in Oman. *Journal of Student Research*.
[6] Amri, T., & Marey-Pérez, M. (2020). Towards a sustainable construction industry: Delays and cost overrun causes in construction projects of Oman. *Journal of Project Management*, *5*(2), 87-102.

[7] Cramér, Harald. 1946. Mathematical Methods of Statistics. Princeton: Princeton University Press, page 282 (Chapter 21. The two-dimensional case). ISBN 0-691-08004-6 (table of content Archived 2016-08-16 at the Wayback Machine)
[8] Umar, A. A., Al Rizeiqi, R. K., & Badr, A. (2020). Major Causes Assessment of Construction Delays. *Journal of Engineering, Project & Production Management*, *10*(3).
[9] Umar, T. (2018). Causes of delay in construction projects in Oman. *Middle East Journal of Management*, *5*(2), 121-136.
[10] Al Saadi, A. M. D., & Rahman, I. A. (2019). Identification of delay factor in Oman construction industry. International Journal of Sustainable Construction Engineering and Technology, 10(1).
[11] Oyegoke, A. S., & Al Kiyumi, N. (2017). The causes, impacts and mitigations of delay in megaprojects in the Sultanate of Oman. Journal of Financial Management of Property and Construction.
[12] Alnuaimi, A. S., & Mohsin, M. (2013, December). Causes of delay in completion of construction projects in Oman. In International Conference on Innovations in Engineering and Technology (pp. 267-270).
[13] Albogamy, A., Scott, D., & Dawood, N. (2012). Addressing construction delays in the Kingdom of Saudi Arabia. International Proceedings of Economics Development & Research, 45, 148-153.
[14] Al-Emad, N., Rahman, I. A., Nagapan, S., & Gamil, Y. (2017). Ranking of delay factors for Makkah's construction industry. In MATEC Web of Conferences (Vol. 103, p. 03001). EDP Sciences.
[15] Elawi, G. S. A., Algahtany, M., & Kashiwagi, D. (2016). Owners' perspective of factors contributing to project delay: case studies of road and bridge projects in Saudi Arabia. Procedia Engineering, 145, 1402-1409.
[16] Gobana, A. B., & Thakur, A. S. (2017). Critical review on causes and effects of variation order on construction project. Critical Review, 4(12), 1602-1606.
[17] Wahyuni, D. (2012). The research design maze: Understanding paradigms, cases, methods and methodologies. Journal of Applied Management Accounting Research, 10(1), 69-80.
[18] Scheurich, J. (2014). Research method in the postmodern. Routledge.
[19] Haddadi, A., Hosseini, A., Johansen, A., & Olsson, N. (2017). Pursuing Value Creation in Construction by Research-A Study of Applied Research Methodologies. Procedia computer science, 121, 1080-1087.
[20] Scotland, J. (2012). Exploring the philosophical underpinnings of research: Relating ontology and epistemology to the methodology and methods of the scientific, interpretive, and critical research paradigms. English Language Teaching, 5(9), 9-16.
[21] Hamad, R. J., Tayeh, B. A., & Al Aisri, H. A. (2021). Critical Factors Affecting the Success of Construction Projects in Oman. Journal of Sustainable Architecture and Civil Engineering, 29(2), 121-138.
[22] Albogamy, A., Scott, D., & Dawood, N. (2012). Addressing construction delays in the Kingdom of Saudi Arabia. International Proceedings of Economics Development & Research, 45, 148-153.
[23] Alamri, N., Amoudi, O., & Njie, G. (2017). Analysis of construction delay causes in dams projects in Oman. European Journal of Business and Social Sciences, 6(2), pp.19-42

Submitted: 11.07.2022
Revised: 19.08.2022
Accepted: 22.08.2022