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Factors Causing Delay in Jordan Public Road/Highway Projects

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Abstract

Project delays are an incessant dilemma haunting the construction industry worldwide and Jordan is of no exception especially with their public road/highway construction projects. This is not healthy as proper delivery of these infrastructures are vital for the citizens and country's development. This paper presents part of an-going research at developing a framework for delay mitigation in Jordan's public road/highway construction projects. The project at focus were public road/highway projects valued up to JD 210,000.00. Qualitative technique in form of interviews was conducted on 27 Jordanian industry professionals with a minimum of 10 years' relevant experiences. They were asked to assess the significant reason for delay in Jordanian public road/highway construction projects. Data analysis was conducted using Nvivo software resulting to the identification of 54 factors which were divided into 14 categories. Findings established Scheduling Related factors as the most significant reasons of delay followed by Change Related factors. On the other hand, three (3) categories were the least significant namely Financial Related factors, Decision Related factors, and Motivation Related factors. Findings from this study could assist Jordan practitioners to better understand the potential delay contributors in similar future projects and hence, strategize effective mitigation and control plans.

Keywords: Delay, Factors, JD 210,000.00, Jordan, Public Road/Highway Projects.

Introduction

Construction industry has been regarded as among the primary industries that contribute considerably to the economy and growth of a country. Besides contributing to various multiplier effect to other industries such as the manufacturing and production lines that work together to complete projects, the industry is also a major source for job opportunities, realization of Government plan, improving living quality of people and generating wealth for the country. For these reasons, project success has been very important and although it have been defined differently from one party to another, timely completion has always been one of the major one (see Riazi, 2014) due to the essence of time in construction. Project delays can be very costly for all stakeholders not just because it delays project handover but also because the industry plays a major role in delivering many important infrastructure and

amenities for public use. Hence delay not only cause sufferings to project parties but also the consumers that depend on the timely completion of it.

Delay has long been a global challenge for the construction industry (e.g., Zain Al-Abedien, 1983; Al-Sultan, 1987; Odeyenka & Yusif, 1997; Assaf & Al-hejji, 2006) and this problem has been continuously occurring until recent times (e.g., Abas et al., 2020). In this case, Jordan have been of no exception especially in large and complex projects such as the infrastructure. In fact, large infrastructure project delays happen regularly in the country (see Btouch & Harun, 2017). On top of that, public project's delays are also happening at an alarming rate. Research by Bekr (2018) highlighted the poor performance of the large Jordanian public construction projects, where approximately 95% of projects are found to be delayed, with more than half of them going beyond the stated completion date of by 10% to 30%. Among these projects were the road/highway constructions which are mainly performed by the Government. Research by Al-Hazim and Salem (2015) found that most Jordanian road development projects as being inefficient in term of time and cost. Amount of extra time to complete Jordanian public highway projects has also averaged at 83.57% (see Msallam et al., 2015) while delays rates of public infrastructure projects (i.e., public roads) in the country averaged at 226% (see Al-Hazim et al., 2017).

Public road/highway projects are important not only for daily use of the citizens, but it is also an important infrastructure for various economic activities in the country thus, delayed delivery of such vital amenity can have serious effect on the country. On top of that, these projects are conducted by the Government thus, poor performances also really paint a bad image for the administration. Hence, efforts should be continued to put a halt on such deficiencies. This paper therefore presents part of an-going research aimed at developing a framework for delay mitigation in Jordan's public road/highway construction projects. It is important to also note that past Jordanian initiative on delays in public road/highway projects has only covered projects up to year 2008 (e.g., Msallam et al., 2015; Al-Hazim & Salem, 2015) and that most of the delayed projects valued at maximum of JD 202, 400.00. Hence, this research, which started in 2018 investigates the more recent delay occurrences since previous findings are already ten (10) years old. On top of that, focus is made on Jordan public road/highway projects valued up to JD 210,000.00 due to past findings suggesting that delayed road/highway does not exceed this value (e.g., see Msallam et al., 2015). Data were collected from 27 Jordanian industry professional with relevant experiences using qualitative approaches. Findings are then analyzed using six-step thematic analysis, interpreted, and further discussed.

Research Objectives

This research aims to achieve the following objectives

- To identify the factors causing delay in Jordan's public road/highway projects which valued up to JD 210,000.00.
- To group the factors causing delay into distinctive categories.

Literature Reviews

Project Delay

Being an important measure for success, delay has invited many definitions to as it is an important step towards properly understanding its meaning, what it refers to and knowing

when to call a project as being delayed (Riazi, 2014). The general principal of delay refers to any extended dates to complete projects beyond the ones planned in the earlier phase by the contractor (Kaming et al., 1997) while Turner (1989) added that delays are failures to meet project due date with no consideration of whatever happened to plan that have been made while construction works took place. Riazi (2014; p. 14) on the other hand improved the definition of delay by referring the latter two by concluding that delays is the “*failure for a project to meet its pre-set/original time-line*”. Therefore, in short, delay could be defined as project completions that failed to meet completion date as per stated in the original contract.

Due to the multiple parties involved in projects, project delays have been divided into various type to specify who is to take responsibility for the delay. There are generally four (4) types of delay namely excusable, non-excusable, compensable, and concurrent delays. Excusable delays generally refer to ones that cannot be controlled by the contractor and according to Alaghbari (2005) they usually lead to Extension of Time (EOT) that do not involve extra claims. Non-excusable delays on the other hand refers to delay that has the contractor to be blamed which according to Alkass et al (1996) does not allow for the contractor to claim either time or money. Instead, Liquidated Ascertained Damages (LAD) shall be imposed. Compensable delay generally happens due to client’s fault. This kind of delay allows for time and money claim by the contractor (Kaming et al., 1997). Lastly, when at least two (2) types of delay happen or overlap each other, they are referred to as concurrent delay (see Alaghbari, 2005) and the contractor is eligible for EOT (see Fong, 2004). Nevertheless, while delays can happen due to various reasons but if the original completion date (in the contract) is not met, technically it is still a delay which requires corrective actions to improve practices.

Delay in Construction Projects

Recognizing the importance of timely completion, research on reasoning out delay contribution has flourished in the past couple of decades. Many researchers from around the globe has touched on this matter in attempt to find mitigating route to the dilemma faced by their nation. Among them includes research by Al-Adwani et al (2018) who targeted the key elements leading to delays in Kuwait public sector construction projects. Using survey, they established that the five (5) most influencing factors were delays in deliveries and making decisions, delays to get municipal permits, deficiencies in term of coordination within the landlord's authorization procedures, low offer price and late document deliveries. Assaf and Al-Hejji (2006) on the other hand examined time overrun in variety types of Saudi Arabia projects and found that delays happened mainly due change orders, late payments, lack of planning by the contractor, poor management of project sites, labor shortages and financial problems of the contractor. A study was also conducted in Hong Kong by Zidane and Anderson (2018) which led them to discover 83 delay factors which they then classified into eight groups and according to them, the 5 primary culprits of delay were inadequate site management and supervision, unanticipated ground conditions, sluggish project team decision-making, owner-induced changes, and project-induced changes. Another study in India focused on eight active high-rise developments and found that design revisions, lack of planning, qualified worker scarcity, erroneous material estimations, and low labor productivity as the main cause of delay (Dixit et al., 2019). Mpofu et al (2017) examined the sources of building project delays in the United Arab Emirates where participants in the study were asked to complete a questionnaire which led to the discovery of 44 major elements, the top 10 being - insufficient work schedule, slow decision-making by the owner, manpower shortages, inadequate

supervision and bad site management, productivity of manpower, manpower skill, timely availability of materials, permission from municipal/government authorities, and financial problems of the contractor. Sarikaya (2010) performed research on the key causes and impacts of delays in the Turkish construction sector and identified that the most important causes of delay in the Turkish construction sector were - project suspension, delays in progress payments, unrealistic project deadlines, owner's slow decision-making, inadequacies in early planning, financial difficulties of the contractor, lack of workforce, slowness of material supply, obtaining necessary permits in public institutions, and design changes. Senouci et al (2016) on the other hand concluded that project duration has a significant effect on delays and cost overruns in public building projects in Qatar. Nevertheless, despite the vast number of research done on delays, there is dearth of efforts to investigate the time overrun of road projects in the Middle East region, particularly in Jordan hence the motivation of this study to focus on public road projects in Jordan. Being a generally less explored area in delay studies, this research attempts to bridge the gap of knowledge by looking into the delay causes in Jordan's public road construction projects and investigates their main factors with hopes to assist future mitigation efforts.

Delay in Jordan Public Road/Highway Projects

Road/highway constructions in Jordan are typically conducted by the Government via the Ministry of Public Works and Housing (MOPWH) so, it is important to note that a vast majority of road/highway in the country are public sector projects. There has been evidence from past literature that Jordan road/highway projects are generally not performing well in term of time. In fact, large infrastructure project delays happen regularly in Jordan and in most of them (see Btouch & Harun, 2017) and among these projects are the road/highway constructions which are mainly performed by the Government. On top of that, large public projects in Jordan have also performed poorly which includes the construction of many public road/highway since road/highway projects are generally characterized as large size jobs with high contract value, highly complex, full of risk and unpredictable in term of time. For instance, Al-Hazim et al (2017) found an average of 226% delay rates when studying 40 public infrastructure projects in Jordan while Bekr (2018) in their study on large public projects in Jordan found that delays of these projects have been at an unacceptable rate (i.e., approximately 95%) and even worse, more than half of them exceeded stated completion date of by 10% to 30%. Study by Al-Hazim and Salem (2015) also further supported the poor time performance of Jordan road projects where most of them were found to be inefficient in meeting deadlines. In fact, delay rates have been very bad and was made clear by Al-Hazim and Salem (2015) in their study that involved 9 road construction projects in Amman, Jordan conducted between the year 2000 to 2008 where added time for completion of these projects ranged between 125% to 445%. Research on another type of public road project (i.e., highway project) in Jordan by Msallam et al (2015) also found astonishingly huge time overrun rates where these projects that were under the Ministry of Public Works and Housing (MOPWH) exceed original completion date by up to 180.50% with an average of 83.57%.

Based on these literatures, delay occurrences in public road/highway construction projects are obviously a common scenario and despite efforts to deal with them, their occurrence are still persistent (e.g., Abas et al., 2020). Based on findings by Msallam et al (2015), out of the nine (9) public highway projects between year 2000 and 2008 that they studied, three (3) of them showed the most significant delay rates. These three (3) projects valued at JD

202,400.00, JD 132,900.00, and JD 149,500.00 and their delay rates were 163.80%, 180.50% and 163.80% respectively. On top of that, out of the nine (9), only four (4) had delay rate of more than 100% and their values were between JD 132,900.00 and JD 202,400.00. Looking in perspective of findings by Msallam et al (2015), it was evident that most of the late projects did not exceed JD 202,400.00 in value. On top of that, this study and another one by Al-Hazim and Salem (2015) also covered public road/highway projects for up to year 2008 only and no research was made further from that year which calls for a new study to investigate reason for the delays in recent times. It is important to note that any efforts to reduce, alleviate, or eliminate delays must start by first determining their true causes therefore, identifying the delay factors of recent public road/highway projects are crucial for continuous delay mitigation efforts.

Research Methodology

To achieve its objective, this research undertook qualitative approach in form of semi-structured interviews that were targeted on Jordanian public road project participants. In overall, 27 experts from wide range of background with a minimum of ten (10) years' experience were interviewed to ensure maximum accuracy and validity of research findings. At the time of the interview, these professionals were working on different public road/highway projects in Jordan. Interview was used to allow for a free flow of discussion towards scrutinizing all delay factors relevant to the scope of this study. Based upon suggestion by Honigmann (1982), nonprobability sampling was adopted using purposive sampling recommended by Patton (2014) which best suited this research that needed to identify respondents based upon specific criteria which is that they must have adequate experience being involved in Jordanian public road construction projects. The sample size in this research adopted the concept of 'saturation' recommended by Mason (2010) to avoid unnecessary redundant information since there is no guarantee of additional qualitative data simply because more responses are acquired. Mason (2010; p. 2) also claimed that *"researchers generally use saturation as a guiding principle during their data collection"* to establish the proper sample sizes. A saturation point can be achieved at any stage of the interview with no specific number of respondents. In fact, saturation point has been called much earlier in past qualitative research for instance, Atran et al (2005) called it at 10 responses while Morse (1994); Guest et al (2006) stopped at merely 6 responses. This research went on to declare saturation after 27 interviews which is way more than past applications thus, further establishing the validity of findings.

After reaching saturation point, a six-step thematic analysis was conducted based upon recommendation by Braun and Clarke (2006) which involved the following steps: - (1) getting to know the data, (2) creating the initial codes, (3) researching the topics, (4) reviewing the topics, (5) determining topics and their meanings, and lastly (6) report production. Interviews were manually transcribed from high-quality audio recordings that were taken to ensure that no data are lost during the data acquisition process. The data was transcribed verbatim into the text which is known as the interpretive process. Data transcription involved careful checking and repeated listening of audios depending on the nature of the questions and answers. Analysis of data was performed using Nvivo software to understand answers and reactions, and consequently they were assessed and merged as a theory. Using guideline by Miles and Huberman (1994), texts were carefully read line by line to determine 'code' meanings of the main points of the passage which were then categorized into distinctive

groups. Data coding is an essential process which according to Strauss and Corbin (1998) is an integral part of the analytic process by which concepts are inductively identified and placed in the data. Although coding may represent side things, for example emotion and behaviors, in this research, the coding was based on aspects related to research in project delays and their pre-defined concepts. Then, through a long list of built-in codes, broader analysis unit was created, known as features.

Data Analysis

Respondent Backgrounds

Table 1 lists out the respondents that took part in the interview together with their positions and years of experience. In overall, 27 experts were interviewed, with their experiences ranging from 11 years to 40 years and them coming a wide range of background.

Table 1
Respondents Involved in the Interview

No.	Position	Experience	No.	Position	Experience
1	Road Engineer	22 years	15	Project Manager	23 years
2	Project Engineer	15 years	16	Client	29 years
3	Project Supervisor	40 years	17	Engineer	15 years
4	Contractor	10 years	18	Foreman	14 years
5	Project Manager	16 years	19	Contractor	20 years
6	Project Manager	20 years	20	Project Advisor	16 years
7	Project Manager	14 years	21	Consultant	20 years
8	Client	16 years	22	Project Advisor	12 years
9	Contractor	18 years	23	Project Supervisor	22 years
10	Consultant	15 years	24	Project Manager	16 years
11	Project Manager	21 years	25	Civil Engineer	11 years
12	Project Manager	11 years	26	Project Manager	20 years
13	Project Manager	19 years	27	Road Engineer	11 years
14	Civil Engineer	16 years			

Based on Table 1, most of the respondents (9 out of 27) were Project Managers with 11 to 23 years of experience involving in public road/highway projects in Jordan followed by various types of Engineers with six (6) of them. The rest were three (3) Contractors, one (1) Foreman as well as two (2) Clients, Consultants, Project Supervisors and Project Advisors respectively.

The highly experienced respondents involved in this research ensured that a vast majority of delay contributors could be identified which is important to ensure maximum accuracy and validity of research findings

Causes of Delay in Jordan Public Road/Highway Projects Valued up to JD 210,000.00

The data collection process led to the identification of 54 factor causing delay in Jordan public road/highway projects which valued up to JD 210,000.00. These factors fell under fourteen (14) categories (refer Table 2) and the most significant delay factors was related to scheduling of projects with 7 out 54 factors determined under this category. They were - Differences in sub-contractor’s schedule on work completion; Late material sample approval by owner; Late equipment delivery to project site; Poor scheduling of material sample submission by contractors; Late goods delivery to project site; Late inspection and testing of construction material; and Late processes and procedures for evaluating work progress. This was followed closely by factors related to changes made in projects with 6 factors which are - Design change by the owner; Scope change during implementation; Material shape, function, and specification changes; Changes order for completed works; Work plans change by the owner; and Additional works on construction projects.

Table 2

Causes of Delay in Jordan Public Road/Highway Projects valued up to JD 210,000.00 and their Categories

Categories	Delay Factors
Labor Related Factors	Inexperienced manpower in projects
	Poor discipline of manpower in projects
	Inadequate workers for project
	Labor nationality
	Replacement of labor
Material Related Factors	Poor quality of material
	Shortage/scarcity of construction material
	Damage to materials in storage
	The price of the material is too expensive
Equipment Related Factors	Equipment breakdowns
	Unavailability of adequately needed equipment
	Poor equipment productivity
Site Related Factors	Poor surface & underground conditions
	Physical characteristics of buildings surrounding the site
	Inappropriate storage area on site for construction materials
	Poor access to hard-to-reach construction project sites
Financial Related Factors	Funding difficulties in contractors
	Payment difficulties by owner
Change Related Factors	Design change by the owner
	Scope change during implementation
	Material shape, function, and specification changes
	Changes order for completed works
	Work plans change by the owner

	Additional works on construction projects
Error Related Factors	Design mistakes made by planners
	Errors in soil research
	Incorrect/incomplete drawings/specifications
	Inaccurate orders
	Work correction/repetition due to defects/mistakes
Decision Related Factors	Delayed decision making by owner
	Disagreements on working drawings between planners and contractors
Planning Related Factors	Careless in determining duration of work
	Wrong/inappropriate construction/work execution method
	Poorly structured/integrated work order plans
	Incomplete identification of the type of work in project
Scheduling Related Factors	Differences in sub-contractor's schedule on work completion
	Late material sample approval by owner
	Late equipment delivery to project site
	Poor scheduling of material sample submission by contractors
	Late goods delivery to project site
	Late inspection and testing of construction material
	Late processes and procedures for evaluating work progress
Competence Related Factors	Failure of contractor to carry out works
	Inexperienced Field Managers
	Poor sight or environmental response around the project site
	Incompetent equipment operator
Communication Related Factors	Poor communication between owner representative and contractor
	Communication between the workforce and the head foreman
	Poor communication between planners and contractor
Motivation Related Factors	Poor worker motivation
	Inexistence of incentives for contractor early completion
External Related Factors	Intense rainfall occurring at the project site
	Social and cultural factors
	Unexpected events (e.g., floods, storms, earthquakes, landslides, etc.)

Data from Table 2 also shows that the third most significant delay contributors Labor Related factors and Error Related factors; both of which had 5 factors respectively. On the other hand, at fourth was another four (4) categories with 4 factors each namely Material Related Factors, Site Related Factors, Planning Related Factors and Competence Related Factors. The least significant factors were identified to be rooted to Financial, Decision and Motivation Related factors, all of which had 2 factors respectively. For Financial Related factors, they were – Funding difficulties in contractors & Payment difficulties by owner while Decision Related

factors comprised of - Delayed decision making by owner & Disagreements on working drawings between planners and contractors. Motivation Related factors on the other hand included - Poor worker motivation & Inexistence of incentives for contractor early completion.

Discussions

Based upon the analyzed data, the most significant cause of delay in Jordan public road/highway projects valued up to JD 210,000.00 were Scheduling Related factors. This comes to no surprise since the main issues being investigated was related to delay or time overrun, which also means poorly scheduled works. The factors under this category typically surrounded issues to do with late approval of material, late delivery of equipment and material/goods as well as delayed procedural activities such as inspections, testing and work evaluations. Many of these findings were consistent with past research, as such, issues related to delay in material/goods has in the past been linked to project delay (i.e., Ogunlana et al., 1996; Frimpong et al., 2003; Sambasivan & Soon, 2007). Other than that, delay in equipment delivery has also been highlighted as impacting timely completion by (Sambasivan and Soon, 2007; Islam and Trigunasyah, 2017). Improper scheduling practices has also been found to cause delay in many studies such as (Sweis et al., 2008; Assaf and Al-Hejji, 2006).

Change Related factors on the other hand was the second most significant delay contributor in this research which cannot be more than obvious since changes could lead to surprises which can affect the original work plan. Usually, when a project is awarded, works are planned according to the agreed scope based on the original contract. When changes are made during construction phase, this plan gets interrupted thus, delays become inevitable. In this research, findings showed that this aspect of delay typically originated from owner-initiated changes to design, scope, material, work plan as well as making additions to original works and ordering changes on completed works. These findings coincide with various past literatures, as such, change orders by clients has proven as among the main delay factors by Assaf and Al-Hejji (2006); Sweis et al (2008); Abdullah et al (2009) while design and scope changes was pointed out by Chan and Kumaraswamy (1997); Abdullah et al (2009) respectively.

Another significant finding of this research was that two (2) categories made it as the third most influencing reasons for delay in Jordan public road/highway projects valued up to JD 210,000.00 where all of them recorded the same number of factors (refer Table 4.2). They were Labor Related factors and Error Related factors. Labor Related factors mainly was related to manpower's lack of experience and discipline, shortage of supply, frequent replacements, and differing nationalities. Labor Related factors has consistently led to project delays in many past studies for example Odeh and Battaineh (2002) who found poor labor productivity as being among the main factors - which in a way has to do with their lack of experience in performing tasks. Shortage of labor/manpower on the other hand was consistent with findings by (Al-Khalil and Al-Ghafly, 1999; Assaf and Al-Hejji, 2006; Samabasivan and Soon, 2007). Muhwezi et al (2014) also highlighted absenteeism issues which is related to discipline. Error Related Factors on the other hand was related to mistakes in design, soil research and giving orders as well as work defects/mistakes and incorrect/incomplete drawings/specifications. These findings were consistent with studies by Aibinu and Odeyinka (2006) who pointed out on incomplete drawings, Assaf et al (1995) and Abd El-Razek et al (2008) who pointed out design errors, Chan and Kumaraswamy (2007)

mentioned design mistakes/discrepancies, and Assaf and Al-Hejji (2006) who cited reworks due to errors/mistakes.

Lastly, four (4) more categories were found to be the fourth most significant delay contributors namely Material Related factors, Site Related factors, Planning Related factors, and Competence Related factors (refer Table 4.2). Material Related factors referred to issues to do with material quality, price, shortages, and damages. Various past research has also highlighted Material Related factors such as material shortage (i.e., Sambasivan & Soon, 2007), escalation of material prices (i.e., Abdullah et al., 2009), poor material quality as well as damaged materials (i.e., Muhwezi et al., 2014). Site Related factors on the other hand surrounded site surface & underground conditions, physical buildings around the site, inappropriate material storage on site, and poor access to site. Many of these factors also coincided with variety of past studies such as the identification of unforeseen ground condition by Abdullah et al (2009), subsurface conditions by Assaf and Al-Hejji (2006) and site related issues by (Long et al., 2004). Assaf and Al-Hejji (2006) also pointed out on damage of sorted materials when are urgently required – which can happen because of inappropriate storage of material. Planning Related factors in this research had to do with poor project preparations such as unrealistic duration of project, inappropriate construction method used for the work, improper integration or structuring of works and poor work scope identification. Planning failures have in the past led to delays for example research by Long et al (2004) highlighted on the improper techniques and tools used for works which caused time overrun thus, implying inappropriate method/approach that are used to perform works. Poor work scope identification can also happen due to design errors which is another common delay factor (i.e., Muhwezi., 2014). On the other hand, Muhwezi et al (2014) found that poor estimation of contract duration also affects timely completion of projects. Ineffective/improper planning has numerous times proven itself a persistent contributor to delays, mentioned in many studies such as (Assaf and Al-Hejji, 2006; Sambasivan and Soon, 2007; Sweis et al., 2008; Abdullah et al., 2009; Muhwezi et al., 2014). Competence Related factors in this research on the other hand covers aspects such as failure to accomplish tasks and inexperienced/incompetent project parties. Competency is a vital aspect that must be possessed by all parties involved in projects to ensure that they can properly and effectively carry out their tasks as well as avoiding costly mistakes. Issues related to incompetence has also been a consistently derived factor in past delay research (see Odeh & Battaineh, 2002; Frimpong et al., 2003; Assaf & Al-Hejji, 2006; Sambasivan & Soon, 2007; Al-Kharashi & Skitmore, 2009; Muhwezi et al., 2014).

Conclusion

The main objective of this paper was establishing the main causes of delay in Jordan public road/highway projects valued up to JD 210,000.00 and organizing them into distinctive categories. Works presented in this paper is part of an-going research aimed at developing a framework for delay mitigation in Jordan's public road/highway construction projects. Qualitative data was collected by interviewing 27 Jordanian industry experts with a minimum of ten (10) years' experience working on public road/highway projects in Jordan. Interviews were ended after meeting 'saturation point' whereby, no more meaning data are obtained, and they were analyzed using Nvivo software. In overall, 54 factors were found to cause delay in Jordan public road/infrastructure projects which valued up to JD 210,000.00 and they fell into fourteen (14) categories namely - Labor Related factors, Material Related factors,

Equipment Related factors, Site Related factors, Financial Related factors, Change Related factors, Error Related factors, Decision Related factors, Planning Related factors, Scheduling Related factors, Competence Related factors, Communication Related factors, Motivation Related factors, and External Related factors. Out of these fourteen (14) categories, the most significant cause of delay in Jordan public road/highway projects valued up to JD 210,000.00 was Scheduling Related factors with 7 factors under it. This was followed by Change Related factors (6 factors) and two (2) other at third with 5 factors each namely Labor Related factors and Error Related factors. Next was another four (4) categories at fourth namely Material Related factors, Site Related factors, Planning Related factors, and Competence Related factors with 4 factors respectively, and another four (4) categories at fifth namely Equipment Related factors, Decision Related factors, Communication Related factors, and External Related factors with 3 factors respectively. Lastly, the least significant factors were Financial Related factors, Decision Related factors, and Motivation Related factors, all of which had only 2 factors respectively. These findings could assist project practitioners as well as the relevant Government departments to better identify possible things that go wrong and lead to delay in future road/highway projects. Being quite recent, the factors identified in this study could be more relevant with the current circumstances in Jordan rather than relying on factors that were identified more than ten (10) years ago. Although the findings in this study only focuses on projects valued up to JD 210,000.00, which is the case for most public road/highway projects in Jordan, some factors may still be applicable in projects with higher value thus, findings in this paper could still serve as a guide for the relevant parties. With improvements that are expected to come with better identification of delay contributors, it is hoped that the Jordan Government can restore better image in future.

In overall, this research contributes to the body of knowledge from several perspectives. One of them is by adding up to the literature related to delay studies in construction industry. Being an incessant problem surrounding the industry, project delays remain an actively researched area until today and can always benefit from additional information and data. While there have been Jordanian initiative on this matter, research is still lacking and that the last ones focusing on delays in public road/highway projects can be tracked back to ten (10) years ago. This research, which started in 2018, therefore, not only adds to the delay-related literatures but also provides a more up-to-date data in relation to delays involving Jordanian public road/highway projects. On top of that, respondents involved in this research had between eleven (11) to forty (40) years' experience, meaning that perhaps the findings of this research can be considered as expert perspective which makes the findings even more meaningful for future studies of similar nature. Other than that, this research also divided the delay factors into distinctive categories which could also contribute to the body of knowledge by serving as a guide for future research that aims at grouping their delay factors. Additionally, this research also used the concept of "saturation" in deciding the appropriate sample size which is an approach not much used still up to this point especially regarding delay studies. Having used this method contributes to the body of knowledge by not only being a guide for future applications but also expanding literature in relation to determining the appropriate "saturation point" that can provide a valid outcome.

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