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Causes of Delay in Road Construction Projects in Afghanistan

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Delays in construction projects result in problems such as cost overruns, disputes between owners and contractors, and project abandonments. Many road construction projects in Afghanistan have experienced delays due to several factors. Therefore, it is absolutely crucial to explore the causes of such delays to minimize their effects in the future. Within this context, the aim of this study is to identify the causes of delays to road construction projects in Afghanistan. Interviews and questionnaires were carried out with participants from the private and public sectors in Afghanistan. Causes of delays were categorized into six main groups: external, owner, contractor, project and contract, design, and consultant factors. The analysis identified the contractor category as the main group of causes of delays with a mean value of 3.07. Political situation, war, and insecurity was determined to be the most important cause of delay with a mean value of 4.29. The top 10 causes of delays are discussed and some recommendations for minimizing future delays to road construction projects are proposed. The findings can benefit national and international construction companies seeking to invest in Afghanistan's road sector and help project managers develop strategies to improve project performance.

Keywords: Construction industry, Delay causes, Project management, Roads, Time overrun

Introduction

Delays are common problems in construction projects worldwide. Completing the project on time is crucial for avoiding additional costs, disputes between owners and contractors, and project abandonment.[1,2] In Afghanistan, the transportation sector plays an important role in social, cultural, and economic development of the country. As Afghanistan has suffered years of war and instability, there has been a need to rebuild its infrastructure.[3,4] Despite developments and substantial investment in the industry, many challenges remain, such as insecurity, corruption, financial problems of owners and contractors, low government support, lack of productivity, and project cost and time overruns, that influence the sector and create a barrier to further expected developments.[5,6]

There have been many studies on causes of delays and project time overruns in construction projects in different countries.[7–11] Niazai *et al.*[12] examined the critical factors that cause construction delays in Afghanistan. However, their study did not focus on a specific type of project. Moreover, some vital causes of delays to road construction projects, such as land acquisition, were not included in their research. Previous studies have shown that causes of delays differ depending on the country and project type.[13] Road and highway projects have their own characteristics in terms of design, construction, and maintenance. Thus, studies examining specific countries and project types should be conducted to explore the causes of delays.[14] Furthermore, many researchers have investigated the causes and effects of delays to road construction projects in different countries.[15–18] The in-depth literature review showed that construction delays and their causes differ regionally, can relate to project type, and depend on a country's general situation, such as security, economy, and other factors. Developed countries with an excellent economy and a high security level have fewer delays in their construction projects, while developing or underdeveloped countries experiencing economic difficulties and security problems face greater construction delays. The major causes of construction delays in the countries mentioned in the first category are slow decision-making, management and supervision problems, labor and material shortages, and workers' productivity. For the countries mentioned in the second category, insecurity, financial problems, lack of machinery, poor scheduling, poor management, and corruption are the main causes of construction delays. Kadry *et al.*'s[19] study showed that there are several causes of delays that are unique in countries

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facing high geopolitical risk. The causes of delays to construction projects also depend on the type of construction project being undertaken. Construction delays in building construction projects are mostly caused by inexperienced contractors, design changes, poor management, poor site investigation, and law and regulations, whereas the foremost causes of construction delays to road or highway projects are land acquisition problems, project scope changes, lack of machinery, and financial difficulties.

On the basis of the literature review, the causes of delays have been classified under different categories. Some studies and relevant delay categories used in the literature are presented in Table 1.

Despite the large number of studies on construction delays and the important role of roads and highways in the development of Afghanistan, there are few studies that addressed the challenges in road construction projects in Afghanistan. Consequently, studies investigating the causes of delays to road construction projects in Afghanistan are needed. Therefore, this study aims to fill this research gap by examining the major causes of delays to road construction projects in Afghanistan. The results of this study will raise awareness in both the public and private sectors in Afghanistan of the factors that cause delays to road construction projects. Moreover, national and international construction companies operating in the country, along with companies wishing to participate in road construction projects in Afghanistan, will better understand and overcome the existing difficulties. Consequently, this research aims to (1) identify and categorize the causes of delays to road construction projects in Afghanistan, (2) quantify the importance of each cause of delay and explore the major factors causing delays, and (3) test the perceptions of both the private and public sectors of the causes of delays and examine the differences.

Methodology

In this study, first, a total of 300 causes of delays to construction projects were determined on the basis of the in-depth literature review. By taking into account the variables that were repeated and locally inapplicable to Afghanistan's situation, 71 out of 300 causes of delays were identified for further analysis. Then, to confirm the identified variables and determine new causes of delays, pre-questionnaire interviews were conducted with experts involved in Afghanistan's road sector. Next, the identified variables were categorized into groups and IDs were assigned to each variable. Finally, a questionnaire was carried out among participants from the private and public sectors in Afghanistan to determine and analyze the major causes of delays.

Pre-questionnaire Interviews

The main objective of the interviews was to explore new causes of delays besides those revealed in the literature review. Face-to-face pre-questionnaire interviews were conducted with 11 professionals. Six experts working at the National Road Authority (NRA) of Afghanistan and five experts from the private construction industry in Afghanistan participated in the interviews. Each interview lasted approximately one hour. The participants were interviewed in their native language, Dari. The interview consisted of closed questions about participants' demographics and an open-ended question related to possible causes of delays to road construction projects. The participants' profiles are given in Table 2.

The majority of participants had more than 20 years of experience in the construction industry (Table 2) and possessed significant information about causes of delays to construction projects. They were asked particularly to identify and list the possible causes of delays to road projects. The findings from the interviews revealed that the causes of delays gathered

Table 1 — Previous studies on delay groups in construction projects

Delay Group	Study
External	Fallahnejad[8]; Santoso *et al.*[15]; Aziz *et al.*[17]; Mahamid *et al.*[20]; Marzouk *et al.*[21]; Muhwezi *et al.*[22]; Le-Hoai *et al.*[23]; Fugar *et al.*[24]; Long *et al.*[25]; Doloi *et al.*[26]
Owner	Abd El-Razek *et al.*[7]; Hasan *et al.*[16]; Mahamid *et al.*[20]; Abbasi *et al.*[27]; Gunduz *et al.*[28]
Contractor	Aziz *et al.*[17]; Le-Hoai *et al.*[23]; Long *et al.*[25]; Gunduz *et al.*[28]
Design	Niazai *et al.*[12]; Aziz *et al.*[17]; Mahamid *et al.*[20]; Abbasi *et al.*[27]; Gunduz *et al.*[28]
Equipment and material	Fallahnejad[8]; Assaf *et al.*[29]; Sweis *et al.*[30]; Sambasivan *et al.*[31]
Project	Santoso *et al.*[15]; Mahamid *et al.*[20]; Gunduz *et al.*[28]
Contract	Fallahnejad[8]; Fugar *et al.*[24]; Sambasivan *et al.*[31]
Labor	Aziz *et al.*[17]; Mahamid *et al.*[20]; Kazaz *et al.*[32]
Consultant	Muhwezi *et al.*[22]; Assaf *et al.*[29]

Table 2 — Profiles of the interviewees

No.	Experience in construction (years)	Education level	Position	Organization
1	30	MSc	Deputy minister	NRA
2	45	PhD	Technical advisor to deputy minister	NRA
3	35	MSc	Director of planning and engineering	NRA
4	28	MSc	Deputy director of work corps	NRA
5	15	BSc	Director	NRA
6	12	BSc	Responsible for construction contracts	NRA
7	28	MSc	President and CEO	Private sector
8	12	BSc	President	Private sector
9	30	MSc	President	Private sector
10	20	BSc	President	Private sector
11	8	BSc	Designer	Private sector

in the literature review were applicable to road construction projects in Afghanistan and could be used to design the questionnaire. The participants mentioned a total of 32 causes of delays to road construction projects in Afghanistan during the interviews. Among them, 27 were related to the data gathered in the literature review. However, the experts suggested five additional causes of delays. Each one was stated by at least three participants. Thus, in total, 76 causes of delays were found to have effects on road construction projects in Afghanistan. Similarities between 76 causes of delays were examined, and combining them allowed for reducing this number to 53.

As mentioned before, the causes of delays vary by country and project type. Some factors responsible for delays to road construction projects in Afghanistan might differ from those relating to other project types and countries. Therefore, on the basis of the analysis from the interviews, causes of delays, such as land acquisition problems, monopolism and warlords' influence, and inexistence of third-party consultants in most of public projects, which might not be considered in other countries or project types as causes of delays, were included in this study.

Identifying Categories of Causes of Delays

According to the findings from the literature review, different studies have used different numbers of categories of causes of delays. For instance, Marzouk *et al*.[21] divided the causes into seven groups, while another study in Egypt assigned the causes into 15 groups.[17] Previous studies also revealed that a particular cause assigned to a group can be placed differently in another study for an alternative group. For example, the cause improper ground surface was placed in a project-related group in Marzouk *et al*.'s[21] study in Egypt, while it was classified under external factors in Muhwezi *et al*.'s[22] study. In the present research, causes of delays were divided into six groups: external factors (EF), owner (O), contractor (C), design (D), project and contract (PC), and consultant (CS).

Data Collection

Data were collected through a questionnaire consisting of three parts that was prepared both in English and in Afghanistan's national language, Dari, to afford a better understanding to experts who are not fluent in English. The first part of the questionnaire consisted of demographic variables. In the second part, participants' opinions on the causes of delays identified in the literature review and pre-questionnaire interviews were examined. In this part, participants were asked to evaluate the importance of 53 causes of delays using a five-point Likert scale (1 = not important, 5 = extremely important). The last part of the questionnaire provided an open-ended question to allow for additional feedback. This question gave each participant an opportunity to freely write their opinion about any other causes that had affected their own projects and resulted in project delays.

In total, 120 questionnaires were distributed to the professionals at the NRA of Afghanistan and private sector professionals involved in the NRA's road construction projects. The majority of these questionnaires were distributed face-to-face to participants. Additionally, soft copies were sent via email to participants who were not available at their workplaces during the study period. In total, 98 participants completed the questionnaires, with a response rate of 81.6%. However, 20 out of 98 questionnaires were eliminated for being incorrectly completed, leaving 78 completed questionnaires (69 hard copies and 9 soft copies by e-mail) for validation.

Data Analysis

The participants' demographic data are shown in Table 3. The majority of the participants (84%) had more than 5 years of experience in road construction projects. Hence, the participants' experience profiles enhanced the quality of the study findings.

Statistical tests and analyses were conducted to evaluate the reliability and validity of the collected data. Causes of delays were analyzed via statistical tests by means of the Statistical Package for Social Science (SPSS) program. There are many statistical and graphical techniques to assess whether data are normally distributed and the scores given to variables by respondents are normal or not. This can be statistically measured by performing a Kolmogorov-Smirnov, Jarque-Bera, Shapiro-Wilks, or D'Agostino test or by obtaining the values of skewness and kurtosis. It can also be assessed graphically by Q-Q probability plots, P-P plots, and checking the outliers using the SPSS program.[33] The Kolmogorov-Smirnov statistic was used to assess the normality of the distribution of scores. The significance values were found to be 0.000, which is below the accepted value of 0.05. Thus, the normality assumption was violated. According to Pallant[33], the violation of the normality assumption is normal for large samples. Furthermore, the normality of the distribution of scores for each variable can be examined visually through histograms, Q-Q plots, and boxplots.[34] The score distribution can be observed graphically by histograms for any variable; a quite smooth normal curve over the histogram indicates the normality of the distribution of scores.[33] Histograms were performed for all 53 variables and an ideal smooth curve over the histogram for each variable was obtained. This graphical method was supported by normal Q-Q plots and boxplot checks, as these methods provide a helpful visual observation. The normal Q-Q plots for each of the 53 causes of delays were checked separately. The normal Q-Q plot for the variables showed that dots followed the distribution fit line, verifying the normality of the distribution. Another indicator of the distribution of scores with rectangular shapes is boxplots. These rectangular shapes represent 50% of the cases with lines called whiskers denoting the maximum and minimum values of the data set.[33–35] In the analysis, the majority of the scores represented a perfectly normal distribution. Only a few cases with outliers and extreme points were found. While cases having outliers and extreme points were removed in some studies, in most studies, cases were included in the analysis by replacing them with the closest value.[36] By changing the scores data of the variables having outliers with the closest value, boxplots were reproduced in this study.

Table 3 — Demographic data of the participants

Variable	Classification	Percentage
Education	BSc	50.6
	MSc	42.9
	PhD	6.5
Organization	NRA	60.3
	Private construction company	39.7
Experience in road construction (years)	≤5	16.0
	6–10	33.3
	11–15	30.7
	>15	20.0

When a study includes scales, it is critical to determine whether the scales are reliable. According to Pallant[33], the internal consistency of scores is one of the main issues that should be considered when checking the reliability of data. Cronbach's alpha coefficient (Cα) is the most commonly used indicator to find the internal consistency.[37] The Cronbach's alpha test was performed for 53 causes of delays using the SPSS program. The Cronbach's alpha coefficient value of the scale was calculated as 0.887, indicating a high degree of internal consistency.

Ranking of Causes of Delays

In this study, the relative importance index (RII) was used to determine the ranking of causes of delays affecting road construction projects. The RII value of each cause was computed using the following equation:

$$RII = \sum W / (A*N) \quad \ldots (1)$$

In this equation, W is the weight of each variable given by respondents using Likert scales (in this study, it varied from 1 to 5), A is the highest weight (5), and N is the total number of respondents. The value of RII varies from 0 to 1. The highest value of RII represents the most important cause of delays.[38]

Measuring the average of the scores distribution or making a hypothetical approximation of the typical score yields the mean. The mean of group scores can be calculated by dividing the total score obtained from participants by the number of responses.[34] An independent samples t-test can compare the mean scores of the variables for only two groups.[33] In this study, the independent samples t-test was used to identify significant differences between public and

private sector groups. In this test, the value of the significance level (2-tailed) determines the availability of significant differences or equality of the mean of dependent variables. A significant difference between the two groups is found if the significance level is equal to or less than 0.05. On the contrary, if the significance level is above 0.05, it indicates that there is no significant difference between the two groups. Additionally, effect size indicates the magnitude of these differences.[33] The effect size can be calculated using the information from the t-test and through the Eta squared formula given in the following equation.[33]

$$\text{Eta squared} = t^2 / [t^2 + (n1 + n2 - 2)] \quad \ldots (2)$$

In this formula, t is the t value from the output of t-test results, $n1$ is the number of responses from the public sector, and $n2$ is the number of responses from the private sector. The Eta squared values of 0.01, 0.06, and 0.14 indicate small, moderate, and large effect sizes, respectively.[39]

Results and Discussion

Ranking of Causes of Delay

The causes of delays were ranked according to the RII values. The top 10 causes of delays to road construction projects in Afghanistan are shown in Table 4.

Similar indices were calculated for some of the causes (PC6 and CS5, RII = 0.613; EF9 and CS4, RII = 0.562; O5 and CS3, RII = 0.538; O8, D4, and PC10, RII = 0.536; O6 and D7, RII = 0.528). Therefore, the 53 causes of delays were also ranked according to the means, standard deviations, and standard errors of the means by using a simple descriptive analysis.

Descriptive Analysis

The ranking of the causes of delays according to the analysis are presented in Table 5. Similar means were calculated for the causes of delays that had the same degrees of significance in the RII method. The ranking of these causes of delays was clarified using their standard deviations and standard errors. To rank the variables with the similar means, the ones with a low standard deviation and low standard error are ordered as first, which shows a small distance of the data scores from the actual mean.

The ranking of the delay groups according to the overall means are illustrated in Table 6. The analysis revealed that the contractor group was ranked first with an average of 3.07. Moreover, contractor-related causes of delays were considered to be the most important group for participants from the public sector. Meanwhile, participants from the private sector highlighted consultant-related factors as the most important group. Interestingly, the owner group was determined to be the least important group. As shown in Table 5, O2, delays in payments to contractors for completed work, is the only cause of delay in the owner group with a mean score above 3.00.

Independent Samples T-test

According to the results of the descriptive analysis, EF3, PC1, C4, C9, PC5, EF4, C6, C8, PC6, and C7 were ranked as the top 10 causes of delays, while D7, O4, PC12, PC10, O7, O9, PC13, EF1, EF2, and EF9 were ranked as the bottom 10 causes of delays by participants from the public sector. Furthermore, EF3, C6, EF6, O2, PC1, EF9, CS1, C9, EF4, and PC3 were ranked as the major causes of delays, while PC6, D4, O9, EF1, EF2, PC7, EF7, C3, PC13, and O7 were

Table 4 — Top ten causes of delay identified by RII

			Number of respondents scoring							
ID	Description	Group	1	2	3	4	5	Total Weight	R II	Rank
EF3	Political situation, war, and insecurity	EF	0	0	17	21	40	335	0.859	1
PC1	Project bidding and awards	PC	1	5	20	31	21	300	0.769	2
C6	Financial problems of the contractors	C	0	4	23	33	18	299	0.767	3
C9	Poor and insufficient usage of new technologies and construction methods	C	0	12	18	30	18	288	0.738	4
EF4	Land acquisition problems	EF	0	12	20	28	18	286	0.733	5
EF6	Corruption	EF	0	12	25	25	16	279	0.715	6
CS1	Inexistence of third-party consultants in most public projects	CS	0	11	33	25	9	266	0.682	7
PC3	Poor subcontracting policy and illegal awards to subcontractors by the contractor	PC	0	15	30	21	12	264	0.677	8
D1	Errors by designers due to unfamiliarity with site conditions and environment	D	0	15	32	18	13	263	0.674	9
O2	Delays in payments to contractors for completed work	O	0	17	28	21	12	262	0.672	10

Table 5 — Ranking of causes of delays

		Mean		Standard Deviation	
ID	Description	Statistic	Standard Error	Statistic	Rank
EF3	Political situation, war, and insecurity	4.29	0.091	0.808	1
PC1	Project bidding and awards	3.85	0.107	0.941	2
C6	Financial problems of the contractors	3.83	0.096	0.844	3
C9	Poor and insufficient usage of new technologies and construction methods	3.69	0.113	0.997	4
EF4	Land acquisition problems	3.67	0.113	1.002	5
EF6	Corruption	3.58	0.112	0.987	6
CS1	Inexistence of third-party consultants in most public projects	3.41	0.099	0.874	7
PC3	Poor subcontracting policy and illegal awards to subcontractors by the contractor	3.38	0.110	0.970	8
D1	Errors by designers due to unfamiliarity with site conditions and environment	3.37	0.111	0.982	9
O2	Delays in payments to contractors for completed work	3.36	0.112	0.993	10
PC5	Poor project planning and scheduling by the contractor	3.32	0.112	0.987	11
D5	Poor knowledge of using the engineering design software	3.29	0.110	0.968	12
C4	Lack of technical staff and skilled labor	3.26	0.136	1.200	13
C8	Shortage in machinery	3.17	0.142	1.253	14
CS6	Poor project management assistance	3.15	0.116	1.020	15
PC11	Poor quality assurance/control	3.09	0.123	1.083	16
C7	Poor staff management	3.08	0.129	1.137	17
CS5	Delays in major change approvals in scope of works by the consultants	3.06	0.097	0.858	18
PC6	Lack of professional project/construction management team	3.06	0.131	1.155	19
PC8	Poor or wrong cost estimations	3.05	0.135	1.194	20
PC2	Poor contract management and unclear terms and conditions	3.01	0.110	0.974	21
PC9	Final inspection and certification performing delays by a third party	2.97	0.109	0.967	22
C2	Poor supervision and site management	2.96	0.132	1.167	23
O3	Slowness in decision making	2.95	0.122	1.080	24
O1	Owners' financial problems	2.94	0.127	1.121	25
PC4	Inadequate pre-construction site visits by the contractor	2.92	0.122	1.078	26
C3	Insufficient resource management	2.91	0.136	1.197	27
EF5	Monopolism and Warlords influence	2.90	0.125	1.100	28
D6	Poor or ill-integrated basic project survey and data	2.88	0.111	0.980	29
D2	Wrong or poor design, drawings' details and specifications	2.87	0.127	1.121	30
CS2	Instructions, design submittal, late document reviews and approval delays by the consultants	2.85	0.116	1.020	31
C1	Delay in site mobilization and commencement by the contractor	2.82	0.146	1.287	32
CS4	Poor inspection and test procedures used in the project	2.81	0.122	1.082	33
EF9	Currency fluctuation	2.81	0.141	1.249	34
C5	Low productivity level work and Incompetent project team	2.78	0.098	0.863	35
D3	Designers' slow decision making	2.74	0.101	0.889	36
EF8	Inadequate government judicial system for construction dispute resolution	2.73	0.126	1.113	37
EF7	Contractor's fraudulent practices	2.72	0.108	0.952	38
CS3	Testing and inspection delays by the consultant	2.69	0.108	0.958	39
O5	Variations and change orders during the construction	2.69	0.108	0.958	40
D4	Change orders and disagreement on design specifications	2.68	0.101	0.890	41
PC10	Poor knowledge or disuse of project management and scheduling software	2.68	0.109	0.960	42
O8	Delay in approval of completed works	2.68	0.131	1.157	43
D7	Changes in drawings and specifications	2.64	0.103	0.911	44
O6	Late approval of design documents by the owner	2.64	0.114	1.006	45
O4	Design changes by the owner	2.60	0.114	1.011	46
PC12	Improper ground surface and geological problems	2.59	0.115	1.012	47
PC7	Construction materials related problems	2.54	0.107	0.949	48
O7	Late issues of material approval	2.41	0.112	0.986	49
O9	Poor scope definition	2.38	0.117	1.035	50
EF1	Weather conditions and Natural disasters	2.33	0.112	0.989	51
EF2	Social, cultural and religious factors	2.32	0.123	1.087	52
PC13	Problems and delays in mix design	2.29	0.103	0.913	53

ranked as the bottom 10 causes of delays by participants from the private sector. The variables EF3, PC1, C6, C9, and EF4 were common in the top 10 lists for both participant groups. However, the remaining variables EF6, CS1, PC3, D1, and O2 were not seen as important enough in this list by either group. Therefore, an independent samples t-test was performed to determine whether there were any statistical differences between the perceptions of private and public sector professionals.

The t-test results revealed no significant difference in the perceptions of the two groups in the mean scores for the variables EF1, EF2, EF3, EF4, EF6, O3, O5, O8, O9, C6, C9, D1, D5, D7, PC1, PC2, PC3, PC9, PC10, CS1, CS2, CS4, CS5, and CS6. However, a significant difference was found for the variables EF5, EF7, EF8, EF9, O1, O2, O4, O6, O7, C1, C2, C3, C4, C5, C7, C8, D2, D3, D4, D6, PC4, PC5, PC6, PC7, PC8, P11, PC12, PC13, and CS3. As presented in Table 7, there was no statistically significant difference between the mean scores of both groups in the top nine causes of delays whose significance level was greater than 0.05. However, significant differences were found between groups for the cause of delays ranked 10th, O2. Professionals from the private sector gave more importance to delays in payments to contractors for completed work than those in the public sector.

Immediate action should be taken to address the most important causes of delays. Thus, the top 10 causes of delays are discussed below.

Political Situation, War, and Insecurity (EF3)

The data analysis revealed the political situation, war, and insecurity to be the most important causes of delay to road construction projects in Afghanistan. These problems have prevented most road construction projects from being completed on time, and have been the main obstacles to infrastructure projects in Afghanistan. The political situation leads to high costs for workers and materials, lack of resources, and increased project costs due to unforeseen delays in projects.[20] The political situation was also the major cause of delays to road construction projects in Palestine[20] and in the construction industry in Iraq.[40] According to Nikjow[41], the security problems, particularly in southern and southeastern Afghanistan, caused project delays and cost overruns. Niazai *et al*.[12] mentioned that the governmental bodies of Afghanistan should take necessary actions to maintain the security.

Project Bidding and Awards (PC1)

Participants from both the public and private sectors agreed that project bidding and awards is an important cause of delays. According to the Procurement Law in Afghanistan, there are four types of national or international procurement methods used in procurement procedures in the country: request for quotations, open tendering, restricted tendering, and

Table 6— Ranking of the delay groups

No.	Group	Average		
		Overall	Public Sector	Private Sector
1	Contractor	3.07	3.53	2.61
2	External	3.01	3.14	2.89
3	Consultant	2.98	3.05	2.92
4	Project and Contract	2.92	3.20	2.64
5	Design	2.88	3.10	2.66
6	Owner	2.70	2.87	2.53

Table 7 — Independent samples t-test

ID	Description	Mean			Significance level (2-tailed)	Eta squared (%)
		Public sector	Private sector	Overall		
EF3	Political situation, war, and insecurity	4.40	4.13	4.29	0.142	2.8
PC1	Project bidding and awards	3.89	3.77	3.85	0.587	0.4
C6	Financial problems of the contractors	3.77	3.94	3.83	0.389	1.0
C9	Poor and insufficient usage of new technologies and construction methods	3.83	3.48	3.69	0.135	2.9
EF4	Land acquisition problems	3.81	3.45	3.67	0.125	3.1
EF6	Corruption	3.40	3.84	3.58	0.057	4.7
CS1	Inexistence of third-party consultants in most public projects	3.34	3.52	3.41	0.389	1.0
PC3	Poor subcontracting policy and illegal awards to subcontractors by the contractor	3.40	3.35	3.38	0.827	0.1
D1	Errors by designers due to unfamiliarity with site conditions and environment	3.47	3.25	3.37	0.261	1.7
O2	Delays in payments to contractors for completed work	3.06	3.81	3.36	0.001	13.6

single-source procurement. Open tendering is the default procurement method. In the open tendering method, bids are awarded to the lowest price after evaluation and fulfillment of the criteria of qualitative and technical standards of procurement. In this method, the lowest price is considered to be the major factor in the process of selecting the successful bidder alongside some other factors, such as the bidder's qualifications and capacity. Depending on the lowest bid price in contractor selection may result in serious problems in the long run. According to Mahamid *et al*.[20], improving the prequalification standards can be an effective way to overcome this problem. A systematic approach in the contractor selection process can eliminate insufficiently financed, inexperienced, and incompetent contractors.

Project bidding and awards was also a major cause of delays highlighted by the experts in the pre-questionnaire interviews. Most interviewees noted that there should be a limit on the number of ongoing projects awarded to a company. Their comments suggest that close relationships of some companies with governmental bodies may influence the selection of the bidder. Moreover, it was stated that due to the high number of projects running at the same time, these companies face difficulties in completing projects on time. The findings correlate with some previous studies in the literature. Project bidding and awards was ranked third by Mahamid *et al*.[20] and fourth by Bekr[40].

Financial Problems of the Contractors (C6)

Financial problems of the contractors were ranked as the third important cause of delays. The contractors may face financial difficulties due to the competitive environment of the industry.[30] As mentioned in the previous section, insufficiently financed contractors should be eliminated during the bidding process to overcome this problem. Moreover, Abbasi *et al*.[27] suggested that the implementation of techniques such as lean construction and earned value management could help contractors reduce the risks of time and cost overruns.

Poor and Insufficient Usage of New Technologies and Construction Methods (C9)

Poor and insufficient usage of new technologies and construction methods was also determined to be one of the most important factors. Afghanistan is a developing country where traditional methods continue to be used in different sectors, generally resulting in time overruns. New technologies and methods have not yet been implemented in Afghanistan's construction industry. This finding echoes research recently conducted by Nikjow[41]. According to his research, the use of traditional construction methods has continued in the construction industry of Afghanistan, and the findings indicate that on-time delivery of projects was one of the factors affected by the use of these traditional methods. Implementing new tools and technologies, such as building information modeling (BIM), can significantly help to mitigate project delays.[27]

Land Acquisition Problems (EF4)

According to Sadiqi *et al*.[42], land acquisition is defined as a difficult and slow process that creates a major obstacle to renewal. In their study, Santoso *et al*.[15] proposed hiring external consultants to evaluate the land value. The law related to land acquisition was reviewed by the government in 2017, but there are still some factors that are causing delays and preventing the on-time delivery of road construction projects in Afghanistan. Additionally, this factor was identified as one of the major causes of delays to highway projects in Pakistan, the bordering country of Afghanistan.[43]

Corruption (EF6)

According to a survey, Afghan people see corruption as one of the major problems in the country.[44] In this study, corruption was determined to be the sixth most important cause of delays. According to the analysis, corruption was ranked 3rd by private sector participants and 14th by public sector participants. Although the significance value of 0.056 indicates statistically significant agreement between the participants, the eta value of 4.7% demonstrates a medium effect size. Corruption poses a threat to the development of the construction industry as it has a serious impact on the increase in construction costs.

Corruption was ranked third among the top five causes of delays under external factors in a study exploring the causes of delays to road construction projects in Egypt.[17] In the study of Niazai *et al*.[12], corruption was also identified as one of the main factors causing cost and time overruns in the construction industry in Afghanistan. They emphasized the need to develop a legal framework to overcome the problem of corruption.

Inexistence of Third-party Consultants in Most Public Projects (CS1)

The inexistence of third-party consultants in most public projects was determined to be a major factor in the analysis. Participants also highlighted this issue in

the interviews. According to interviewees from the private sector, the inexistence of a third-party consultant in most public projects that are financed by the government results in disputes between the government and private sector bodies. The government itself generally acts as both consultant and owner. Thus, a third-party consultant is required to instruct the contractors properly. Faridi *et al*.[45] recommended the involvement of construction management firms in public projects to overcome this issue.

Poor Subcontracting Policy and Illegal Awards to Subcontractors by the Contractor (PC3)

Poor subcontracting policy and illegal awards to subcontractors by the contractor was highlighted as an important factor. This factor had a mean of 3.38, a significance value of 0.827, and an eta square of 0.1, indicating strong agreement between both participant groups. In the pre-questionnaire interviews, participants from the private sector also complained about the lack of a comprehensive policy for subcontractors, which results in delays in the progress of projects. Yet in the pre-questionnaire interviews, most participants from the public sector mentioned that the contractors illegally subcontract most of the projects to a third or fourth party. Within this context, the government should implement effective policies to improve the subcontracting process in construction as well as in road construction projects. In addition, contractors should implement an objective evaluation system for subcontractor selection. This will enable contractors to select the most appropriate subcontractor for a project.

Errors by Designers due to Unfamiliarity with Site Conditions and Environment (D1)

Errors by designers was ranked ninth among the causes of delays. The surveying processes of road projects in Afghanistan face difficulties, such as security and ground surface difficulties. Most of these projects are designed overseas or have been designed by newly graduated engineers who do not have sufficient experience or familiarity with the site conditions and environment. In the pre-questionnaire interviews, participants mentioned that in many cases, site engineers face application problems on construction sites due to errors in shop drawings. Employing new techniques, such as BIM, can significantly facilitate the design process and minimize design errors. Site investigations should be carried out by all parties involved in the design process to address the design challenges.[22] Furthermore, several researchers have recommended developing multilateral coordination between contractors, design groups, and other sections during the design phase to overcome this problem.[27]

Delays in Payments to Contractors for Completed Work (O2)

Delays in payments by the owner can result in time overruns in a project and serious financial difficulties for contractors. This cause of delay was found to be another important factor causing delays to road construction projects in Afghanistan. This result supports the findings of many previous studies identifying delays in payments to contractors as an important factor.[46] This factor had an overall mean of 3.36 and significance value of 0.001, indicating a difference of opinion between the two groups of participants. The analysis showed that this cause of delay was ranked fourth by the private sector participants and 30th by the public sector participants. The private sector participants in the pre-questionnaire interviews also highlighted this cause of delay as a major problem. As mentioned before, this was the only cause of delay in the owner group with a mean score above 3.00. In their study, Santoso *et al*.[15] obtained a similar result in which late progress payment was the only factor related with the owner listed in the top 10 factors. According to Niazai *et al*.[12], bureaucracy in governmental bodies of Afghanistan has also negative effects on the payment process. Thus, unnecessary bureaucracy should be eliminated in these organizations to accelerate this process.

Recommendations

Although there are no direct solutions to overcome delays to road construction projects, several approaches can be adopted to minimize their occurrence and effects on projects. Thus, the following recommendations are presented.

- Security factors for road projects should be taken into account during the construction phase of a project. A security team should be created in cooperation with the national security sector for projects on risky and unsecure sites.
- The government should review the legislation and policies on all construction and road projects. Policymakers should review the procurement law. Methods of project bidding and awards should be reviewed and a performance-based contracts

system should be considered for an alternative to the lowest-price bidding system. A separate legal document for large construction projects with detailed project specifications and requirements, contractors' qualifications, detailed and adequate policy for subcontractors, detailed conditions and requirements for hiring third-party consultant for all types of public construction projects, and other aspects could be explored using international standards.

- Contractors have financial problems in Afghanistan. This is due to their difficulties in accessing bank credit and loans. At the same time, payments are mostly delayed by the owners. Hence, the conditions for accessing bank credit and loans should be simplified and the owners should speed up the payment process for completed work by reducing paperwork.
- All parties involved in Afghanistan's construction industry should transform their business methods. Instead of traditional methods, new technologies and construction methods should be implemented to improve the productivity of the construction sector. The traditional documentation system based on paperwork used by the government should be digitalized to save time.
- Necessary actions should be taken to accelerate the land acquisition process.
- Corruption not only affects the road sector but also the quality of life within the community. To overcome this problem in all sectors, training on humanity and behavior should be given to individuals from an early age (e.g., by providing ethical lessons to children from an early age in primary school and in the family, or by disseminating multimedia resources addressing public spirit, ethics, and humanity throughout the country to rebuild the nation).
- Capacity building for engineers involved in this sector should be initiated by the government as well as the private sector. It can benefit the sector, save considerable time losses, and enhance quality.

Conclusions

The results of the study will be helpful to a wide range of stakeholders in Afghanistan's construction industry, such as engineers, architects, contractors, owners, designers, and local governments. The study has provided an overview of the current challenges for national and international companies that are planning to make investments in Afghanistan's construction industry. By considering the major causes of delays and taking proactive actions, the risks in road construction projects can be minimized and more successful projects can be carried out.

The study has several limitations that should be considered carefully. Potential factors related to the COVID-19 pandemic are not included. The relatively small sample size is another limitation of this study. However, the participants' experience profile has added quality to the study findings. Moreover, this study concentrated solely on road construction projects in Afghanistan. Some causes of delays may be unique to projects of this type. Thus, future studies on different types of projects in Afghanistan can improve the study findings.

Conflict of Interest

The authors declared that there is no conflict of interest.

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