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IDENTIFYING CAUSES OF CONSTRUCTION DELAYS IN INITIATIVES FOR EDUCATIONAL INSTITUTIONS

S.T. Alnaseri S. Naimi Z. Alrubaye

Department of Civil Engineering, Altinbas University, Istanbul, Turkey
203724089@ogr.altinbas.edu.tr, sepanta.naimi@altinbas.edu.tr, zainab.alrubaye@ogr.altinbas.edu.tr

Abstract- Iraq's construction industry faces several challenges. Construction project delays significantly affect time, a component that is essential to the success of the project. Numerous issues are brought on by the delay, including increased project costs, decreased operational effectiveness, then, on a significant scale, detrimental commercial and sociological effects for the nation. Najaf needs a ton of development work to continue its growing trajectory as one of Iraq's most significant metropolitan areas. Plans for new public schools show the necessary efforts made in cities, and the sporadic setbacks in these efforts have occasionally led to a hybrid operational model for the city's educational institutions. This study examines and evaluates delays in construction projects in various nations. Through discussions and surveys with stakeholders in Iraq's building industry, additional issues have been discovered. Their feedback was used to prioritize the five most common reasons of project delays and the ones uncovered through primary research. The delay in making payments to contractors is a contributing factor. Inadequate planning, wrong estimates of construction duration, conflicts with neighboring properties, and inexperienced contractors also play a role. The next step involves determining how much time each key reason mentioned in the projects added to the delays. Official documentation from 30 randomly selected projects (representing a statistically significant subset of completed school projects in Najaf) was used in this investigation. The presentation included comparative analysis with significant indications, as well as statistical data on the degree of delay brought on by various issues. It was also emphasized how important it was to hire better-rated contractors, competent employees, experienced project supervisors, and enough engineers on-site.

Keywords: Project Delays, Delay Reasons, Educational Institutions, Najaf, Project Management.

1. INTRODUCTION

The importance of development projects as crucial markers of a country's growth is shown by the considerable financial and budgetary investments made by a nation in infrastructure and construction. The justifications listed below highlight the relevance of construction project delays as a result: Time-sensitive initiatives have lost their significance due to a lack of finance and a delayed return on investment, increasing project expenses, a reduction in project budgets due to inflationary trends, procrastination, and underutilization of assets in other projects. These factors impose additional costs and cause stakeholder and project participant unhappiness, leading to conflicts between the parties. It is therefore vital to identify and classify these features according to the significance and presence of these traits in structures [1, 2]. Figure 1 shows one instance of how delays that occur prior to the commencement of construction may affect the overall timeframe of the project. In order to implement a project, it is crucial to identify these factors.

Project delays have been defined differently by various scholars. Delay, according to Turner, is "the act of performing work for a longer duration than originally anticipated". The hiring manager and the contractor's respective perspectives on the idea of delay have been provided by Asfaf and Hijji. The contractor was forced to pay more for everything from materials to labor. From the company's perspective, this reduces income and earnings. Rahimian et al. define delay as "the growth of a task or job beyond the original plan or anticipation." Project delays, according to Yazdi and Hemmati (year), are a substantial and frequent occurrence, with detrimental effects on the success of the project in terms of budget, timing, workmanship, and safety. Delays can be minimized by identifying and researching their underlying causes. When a project is not finished by the specified contractual or mutually agreed-upon deadline, there has been a delay. Numerous factors, including but not limited to the contractor's or employee's actions or inaction, the employer's or consultant's actions or inaction, or other unspecified causes, may be to blame for this [3, 4]. Despite having a significant geopolitical impact on the Middle East, Iraq's construction industry is currently struggling with many issues. Meanwhile, it becomes apparent how construction project delays affect time, a crucial component of project success.

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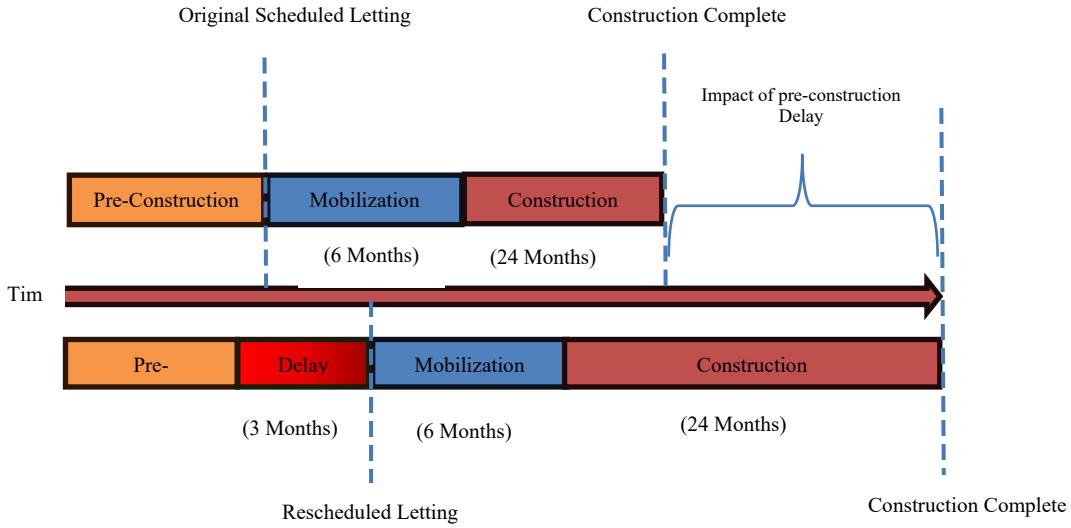

Figure 1. Preconstruction delays have an impact on when construction will be finished [1]

Numerous issues, including increased project costs, decreased operating efficiency, and, on a broader scale, significant economic and social repercussions for the nation, will arise because of the aforementioned delay. As a major urban hub within Iraq, Najaf needs a plethora of development efforts to advance. Building projects for public educational institutions are a notable illustration of essential urban endeavors. Recent times, however, have seen a mixed operational model for the city's schools as a result of delays in these projects. Therefore, it is highly academically valuable to do research on the causes of the protracted duration of building projects in Najaf. By doing an extensive case study and identifying the factors causing school building delays, it is possible to eliminate these reasons and enable improved progress in this urban area of Iraq.

2. PAST REVIEWS

In this section, we shall analyze relevant studies and academic literature. Project delays often result in an increase in the overall costs relating to the project, encompassing charges linked to time, financial claims, project being suspended, or premature project termination. The proposed explanation of "delay" by Ramezani and Keivani in the context of building jobs is the difference between the anticipated completion and execution of the project as well as the actual completion time. In more accessible language, delay refers to a situation in the construction process where a particular action takes more time than originally expected, resulting in an extension of the overall duration of the activity or a postponement of its commencement. Based on the definitions mentioned earlier, it is evident that various scholars have articulated the notion of delay from diverse perspectives. Nevertheless, a prevailing agreement among these scholars is that the act of postponing has an adverse impact on the organization and planning of projects, ultimately resulting in escalated project costs [5, 6].

The background of a successful development plan encompasses the historical context and relevant factors that contribute to its effectiveness. A development plan encompasses a collection of initiatives that share a common objective, whereby the successful implementation of these projects is achieved when they collectively fulfill the required aims. The satisfaction of the employer, contractor, and operator is a key indicator of a project's success. Employers typically express satisfaction when the predicted budget and costs remain stable, the project is completed within the designated timeframe, and the standard of workmanship of the deliverables meets the established standards [6, 7].

The significance of the time factor in building tasks is paramount. A delay is an occurrence that extends the timeline of a project; specifically, it refers to the duration between the scheduled time and the actual period of project operations. In contemporary times, the significance of promptly executing and operating important national and regional projects has been amplified by the volatile and abrupt fluctuations in pricing, as well as the swift advancements made by countries in their pursuit of developmental and progressive benchmarks. Particularly in the case of undertakings including both parental and infrastructural aspects, the routine execution of such endeavors has the potential to inflict substantial and irreparable harm onto the nation's economy [8, 9].

The implications of project delay: As stated by Hajivand and Kazemnejad (2010), the occurrence of delays in projects can result in several adverse outcomes. The aforementioned factors encompass escalated expenses, diminished efficacy, compromised workmanship, surpassing the allocated budget, necessitating modifications and recompense due to delays, discontent among customers, inability to promptly utilize project revenues, failure to retrieve capital as planned due to economically unviable projects, project inefficiency, and ultimately culminating in political and social unrest. The occurrence of delays attributed to the employer. It is a regular occurrence for employers to have prolonged implementation of construction projects.

Certain external delays can be attributed to the employer, including issues such as the absence of a building permit, inconsistencies in the building's usage as per municipal permits, and a lack of reliable supervision in accordance with city planning instructions and laws. These factors can pose challenges in initiating the project, leading to the need for contractor compensation and, in some cases, contract termination [11, 12].

The inadequacy of project management stems from the need for managers of projects to possess a combination of skill and impartiality when making decisions relating to the project, together with a deep commitment to the study of the project. The ineffective project manager lacks the awareness to recognize the contractor as a subordinate with executive authority. Instead, the project manager views the contractor as a party entitled to considerable flexibility in their requests. These managers see the capacity to postpone announcements and obscure contractor claims as essential components of their managerial skill set. The aforementioned causes contribute to project delays and escalated costs for endeavors with predetermined time constraints [12]. The project encountered delays due to the actions or lack thereof of the contractor.

There is clear evidence to suggest that a substantial proportion of delays can be attributed to the contractor. The delay can be attributed to various factors, such as the inherent volatility in the economic environment and the rapid influx of influential variables inside the proposed strategy. Furthermore, the delay might be attributed to the limited labor force and knowledge inside the contractor system, together with deficient management procedures [13]. One of the limitations observed in the contracting system is the weakness of project management. One of the prevailing issues pertains to the conventional approaches employed in management. Hence, it is evident that there is a clear requirement to adopt novel management practices, including the incorporation of a project management system within project-oriented organizations. In contemporary times, it is seen that contractors operating in developing nations experience a greater degree of managerial deficiencies, with technological weaknesses assuming a secondary role. The system for managing projects must take into account various categories, including time management, cost management, quality management, risk management, project scope management, procurement management, communications management, and human resources management [14].

The occurrence of delays attributed to the consultant: The current state of feasibility studies conducted by engineering consultants in the construction industry, both in domestic projects and overall, is characterized by a lack of effectiveness. Regrettably, the specialized nature of feasibility analyses has been diminished, resulting in a more procedural approach. Furthermore, apart from employer involvement, the lack of experience among consultants can also contribute to this issue. Consequently, many projects are typically developed using information from previous projects of a similar nature and are executed without proper economic justification, resulting in the squandering of the country's financial resources. Delays are the direct result of problems with the materials. There are several potential obstacles that could cause delays in the completion of the project that are related to the materials. These concerns include the level of quality of the materials, the availability of inadequate resources, delays in material procurement, and changes in either the types of materials required or their requirements while the construction project is underway [15].

The labor force refers to the total number of individuals who are employed or actively seeking employment within a specific geographic area or industry. The presence of a workforce is essential for the tangible advancement of the project. Periodically, there arise concerns within the labor force pertaining to the availability of personnel, the effectiveness of personnel, and the proficiency and competencies of personnel. In the context of equipment and machinery, project delays can be attributed to the following factors: The absence of adequate access to machinery and equipment, as well as challenges related to the availability of replacement parts, machinery malfunctions, and the overall condition and effectiveness of current machinery have been identified as significant factors [16].

There exist supplementary factors, beyond the ones already classified, that contribute to the prolongation of publishing timelines. Several significant reasons that have a substantial impact on the situation include inflation and increasing costs, alterations in rules and laws, and challenges presented by nearby entities and inhabitants. The political concerns pertaining to the wider cultural and social context of the region have been identified [17]. Among the various factors contributing to this phenomenon, inflation and escalating prices emerge as the most predominant ones. The influence of environmental factors on the occurrence of developmental delays. Extensive research conducted worldwide, mostly focusing on building projects, has revealed a comprehensive classification of environmental elements that contribute to project delays. The impact of geographical factors, cultural elements within the community, project structure, technical and technological factors, managerial considerations, contractual agreements, workforce-related factors, and civil disputes can be categorized into seven distinct groups [17]. The aforementioned groupings can be categorized as: the impact of geographical elements, cultural dimensions within the community, and the project's organizational framework.

Based on the aforementioned evidence, it is evident that there has been a scarcity of comprehensive research conducted thus far on the underlying variables contributing to the delays experienced during the execution of construction projects in the Middle East region. The primary focus of this study is the statistical analysis of the duration of delays, together with an examination of the various contributing reasons to these delays. Within this specific domain, there exists a

requirement for further investigation. Despite the findings of a comprehensive scholarly inquiry pertaining to the circumstances in Iraq, a definitive resolution has not yet been identified. There is a need for a systematic approach to project delay management in Iraq due to several factors. These factors include the high occurrence of construction projects and delays that accompany them, the examination of contingency plans to prevent these delays are absence of precise and current delay databases, and absence of standardized consistent procedures.

This holds particular significance given the absence of standardized and consistent protocols now implemented. The objective of this study is to examine the multiple factors that contribute to the protracted duration of construction projects in Iraq. The evaluation of efficiency for each element will be conducted from the standpoint of the diverse stakeholders engaged in project management, including the employer, the consultant, and the contractor. Upon completion of all tasks, we shall proceed to do the statistical analysis. In conclusion, this paper provides a comprehensive overview and examination of the pertinent topics, culminating in the proposal of viable strategies to mitigate or resolve the existing challenges. The researcher employed a range of methodologies to examine and ascertain the occurrences of delays in Iraq. These methodologies are outlined in Table 1 [18-20]. An in-depth analysis of the available evidence suggests that studying the educational institutions in Iraq's Najaf province will lead to observable improvements.

Table 1. The factors causing time delay

First Study [18]	Design weaknesses and conflicts. The employer's delay in reaching choices. The extended endorsement of work plans. Insufficient planning by the contractor. Insufficient human resources. Unforeseen ground and foundation conditions.
Second Study [19]	Delays in decision-making by employers. Errors throughout the construction process. Insufficient human resources. Insufficiency of equipment. The lack of experience among contractors. Unforeseen ground and foundation conditions. The contractor's lack of motivation to fulfill their obligations.
Third Study [20]	Inadequate management and monitoring. Design faults and discrepancies. The financial challenges faced by contractors. Errors throughout the construction process. The occurrence of delays in remunerating the contractor. Insufficient availability of resources and tools. The lack of experience among workers.

Therefore, by conducting a thorough examination of investigations and studies concerning delays in construction projects in different nations, pertinent aspects have been discerned. Furthermore, by the implementation of interviews and surveys with professionals in the construction sector in Iraq [18, 19]. Additional variables have been obtained. Ultimately, via the integration of the perspectives provided by these esteemed individuals, a systematic evaluation of many aspects has been conducted, resulting in the establishment of a hierarchy based on data derived from both primary and secondary sources. There are five key variables that significantly contribute to project delays. These factors include delayed payment to the contractor, design problems, inaccuracies in construction length estimation, challenges arising from surrounding entities, and insufficient contractor expertise [20].

3. METHODOLOGY OF THE STUDY

In this study, we conducted an examination of relevant literature in library studies, specifically focusing on articles and research pertaining to the factors influencing construction project delays. Through this analysis, we identified a total of 12 significant factors that contribute to delays in construction projects. To further investigate these factors, we employed a combination of questionnaire techniques and discussions with a sample size of 40 construction engineers. Experts have reported that Iraq has acquired an additional 44 elements that contribute to the delay, beside the current 12 criteria that were previously prioritized. The researcher successfully identified 10 criteria by selecting 5 out of 12 factors related to the assets of libraries and 5 out of 44 factors recommended by experts, based on a prioritization process. During this phase, a comprehensive reassessment of 10 criteria was conducted, with experts being consulted to derive the ultimate selection of 5 factors. These reasons include payment delays to contractors for finished work, design issues, construction-related problems, neighbor-related issues, and the utilization of new contractors.

To assess the influence of several variables on the time delay experienced in the construction of educational facilities for 12th-grade institutions in the Najaf region, a representative sample of 30 finished projects was procured from official records. The projects were chosen to serve as representations of the statistically representative sample of building projects in 12th-grade educational institutions. These projects were selected based on their construction characteristics, contract type, level of government engagement, and dimensions [21]. The projects' closeness in these areas contributes to the sample's credibility about the statistically representative population [22]. It has been observed that the project paperwork does not specify the extent of delay caused by the contractor's lack of experience. Hence, it can be concluded that there is no substantial correlation between this element and the time delay observed in building projects. Consequently, the examination of this factor has been excluded, leading to a reduction in the number of factors under study to four, which are presented under the designation of "four factors." Nonetheless, the projects have encountered unexplained delays, potentially because of the contractor's lack of experience.

However, it is challenging to substantiate this claim, as the delays can be attributed to other issues. We also gathered information from the project's paperwork about factors including contractor ranks, project managers' expertise, the number of engineers involved, and the number of skilled laborers used.

5. CASE STUDIES AND RESULTS

In previous studies, it has been observed that when a particular component causes a significant or insignificant delay, the delays caused by other variables tend to be of a comparable magnitude. This observation is supported by the results obtained from analyzing the delay times associated with five influential factors. The primary cause of the contractor's payment delay can be mostly traced to the delays experienced in the project. However, this issue may be a result of either the employer system's negligence or the contractor's lack of experience. One of the issues that can affect a project is the issue of neighbors, which is contingent upon the project's location and specific circumstances. Consequently, certain projects may have no delays attributed to this aspect, while others may encounter significant delays. The significant dispersion of data created by the agent is attributed to our actions, which renders the average an unsuitable criterion for showing and describing the data. Consequently, comparable criteria can be employed for both the media and the box plot.

The findings indicate that the duration of the delay is primarily influenced by two key factors: the timeliness of contractor compensation and issues emerging from adjacent parties. These two parameters demonstrate more variability in comparison to the remaining components. However, it is important to highlight that the median value depicted in the box plot pertaining to neighbor-related difficulties is somewhat lower when compared to the medians of the other four categories. This result indicates that an estimated 50% of the documented delays associated with issues involving neighbors can be categorized as relatively insignificant. One supporting piece of evidence for this assertion is that the lower whisker of the box plot linked with matters pertaining to neighbors aligns with the first quartile. This finding suggests that around 25% of the projects do not experience any schedule delays that can be attributed to issues with surrounding organizations. The box diagram depicting the impact of delayed payment on the contractor highlights that the median value is observed in the center portion, indicating the highest occurrence.

This assertion is corroborated by the data presented in Figures 2 and 3 of the box plots, which demonstrate that the data points located beyond the interquartile range and in the upper quartile exhibit more dispersion as a result of data elongation. In several projects, it has been observed that project delays caused by delayed payments to contractors are considerable, hence making a significant contribution to the overall project delay. In the analysis of the four factors, it was observed that design defects and differences had the lowest degree of variability in delay statistics across a sample of 30 projects. The delay figures observed in the projects investigated suggest a slight discrepancy, which can be attributable to issues connected to design. Based on empirical evidence, it can be deduced that the challenges in design were not significantly influenced by the varying circumstances of project implementation undertaken by different contractors. Consequently, delays were observed in every project of similar magnitude.

The bar charts depicting the historical background of the contractor's and employer's management team, along with the rank of the contractor in the company, exhibit a significant correlation with the delays associated with five specific criteria. Fundamentally, an elevation in the contractor's status or a rise in the expertise of the contractor's project management team leads to a decrease in delays associated with these variables. It is vital to recognize that a significant association exists between a company's ranking and the frequency of delays resulting from complications with nearby companies. It has been noted that issues concerning neighboring communities tend to occur with greater frequency in rural development initiatives in rural regions, particularly those that have an influence on indigenous populations. Organizations that have positive ratings in these specific locations generally demonstrate reduced levels of activity, whereas organizations ranked 5th or 4th in these zones see a higher frequency of issues arising from nearby entities.

Moreover, it is important to acknowledge that experienced managers typically opt not to seek employment with organizations that possess low rankings. Consequently, individuals may encounter challenges in efficiently engaging in communication with their counterparts in neighboring organizations, perhaps resulting in delays. Evaluating the engineers' collective impact on the project proves challenging due to the absence of quantifiable indicators that comprehensively capture their total count. The objective of this study is to anticipate the potential impact of engineers on latency durations. Nevertheless, it is evident that the reduction in latency becomes more pronounced with the presence of more engineers in both teams. The imperative to increase the quantity of competent personnel to mitigate the adverse impact of errors on construction timelines is of utmost importance. Nevertheless, recent findings have revealed that the impact of these occurrences on neighboring entities and interconnected components is negligible.

The graphical representation illustrates various aspects that impact the project, including the punctuality of payments made to the contractor, design-related issues, construction errors, and conflicts arising with neighboring entities. The opening sequence of images presents a visual representation that demonstrates the hierarchical significance of each component contributing to the delay. It is noteworthy to mention that each project is assigned a numerical value ranging from 1 to 30, which signifies its position in the schedule of inspections at the site. The subsequent part will employ box plot diagrams to visually represent the influence of several factors on data delays, so facilitating a comprehensive understanding of the extent of the challenge. As previously mentioned, it is imperative to acknowledge the existence of additional variables that the researcher may not be cognizant of and hence does not necessitate further investigation.

Table 2. Linear comparison of the delay caused by the following five components

Factors affecting parameters	The occurrence of a payment delay to the contractor	Design faults and discrepancies	Errors related to the length of constructors	Issues pertaining to neighbors	There are further aspects to consider
The central position or point within a given context or framework	14	10	11	7	9
The initial quarter	9	7	6	0	5
The line above	37	28	29	37	30
The lower boundary	2	2	0	0	0
The third quarter	26	12	18	20	17

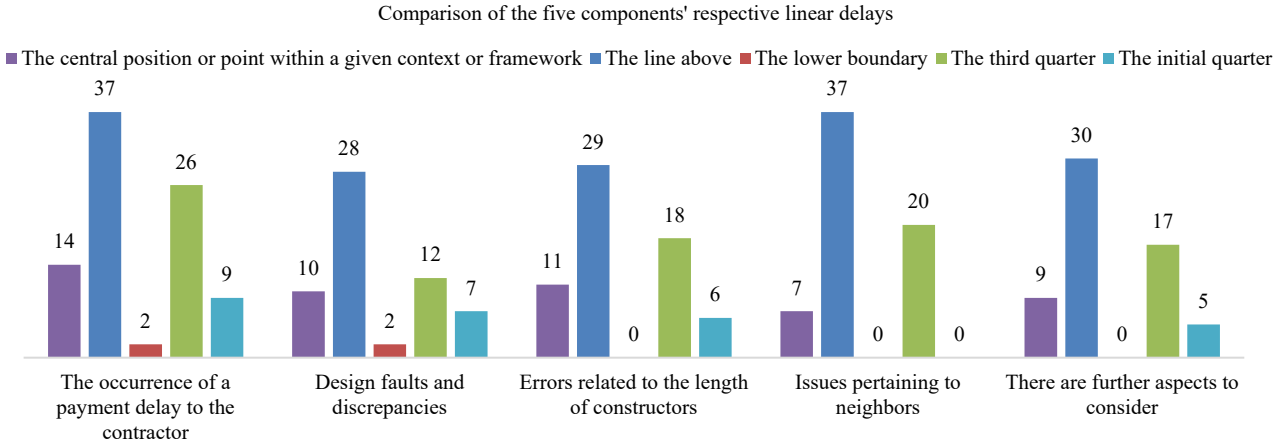

Figure 2. Comparison of the five components' respective linear delays

The diagrams depicted in Tables 3 and 4 Figures 3 and 4, illustrate the selection process of five criteria from a pool of 44 suggestions provided by elite individuals and engineers. These factors were chosen based on their frequency of occurrence and are presented in the table provided above and shown in Figure 2. The methodology involved initially gathering delay factors from specialists. Subsequently, 44 specific variables were returned to these individuals, who were tasked with selecting 5 significant factors from this set. Finally, the 5 factors with the highest recurrence rate were identified from the entire pool of factors. The provided text is as follows:

The issues identified in the discourse include:

a) Challenges pertaining to neighboring parties.

b) Modifications made by the employer during the execution stage.

c) Engagement of contractors lacking sufficient experience.

d) Concerns related to security; and (5) an illogical contractual duration.

Table 3. Compare the amount of delay brought on by the four factors in one Year

	January	February	March	April	May	June	July	August	September	October	November	December
Delay in payments	65	15	24	80	76	31	4	96	96	11	69	42
Error Design	73	56	10	11	62	29	5	11	88	99	35	79
Mistakes during Construction	11	95	97	80	70	13	83	44	28	1	53	99
Other problems	95	27	20	93	31	69	44	73	39	35	76	58

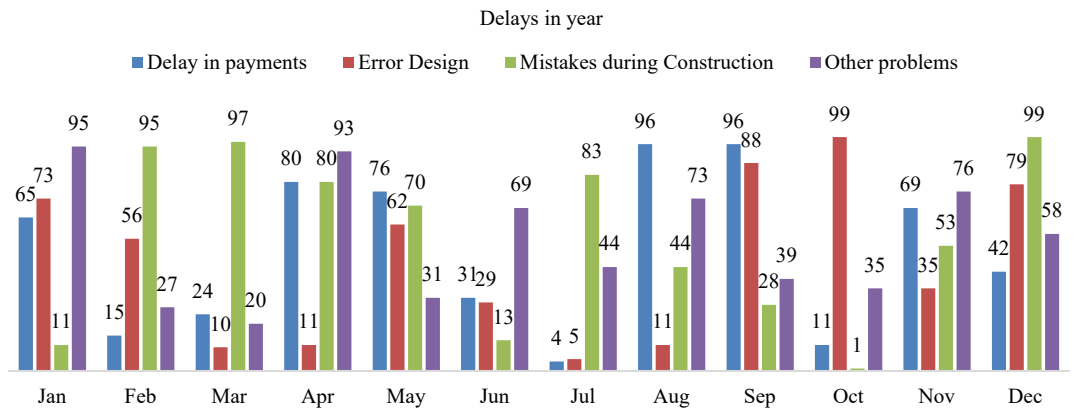

Figure 3. Compare the amount of delay brought on by the four factors in a Year

Table 4. The overall delay caused by five factors over 30 projects

	Pr1	Pr2	Pr3	Pr4	Pr5	Pr6	Pr7	Pr8	Pr9	Pr10	Pr11	Pr12	Pr13	Pr14	Pr15	Pr16	Pr17	Pr18	Pr19	Pr20	Pr21	Pr22	Pr23	Pr24	Pr25	Pr26	Pr27	Pr28	Pr29	Pr30
Delay in payments	68	82	85	10	98	67	96	72	33	63	4	6	1	32	14	18	3	10	36	31	10	97	37	3	26	12	27	84	26	37
Error Design	81	17	68	38	28	11	50	90	41	15	10	5	84	33	6	71	27	80	10	50	96	15	80	71	36	5	88	3	93	37
Mistakes during Construction	84	89	9	8	5	7	36	90	70	58	98	59	71	23	87	15	33	78	11	25	40	94	28	19	55	11	91	19	83	33
Problems with neighbors	68	66	19	6	5	80	57	35	0	86	85	75	17	11	74	41	95	34	99	6	26	26	63	32	38	77	83	84	12	8
Other problems	86	74	79	45	83	29	82	45	17	71	46	49	79	58	73	48	83	39	82	80	24	69	27	66	15	56	48	98	91	73

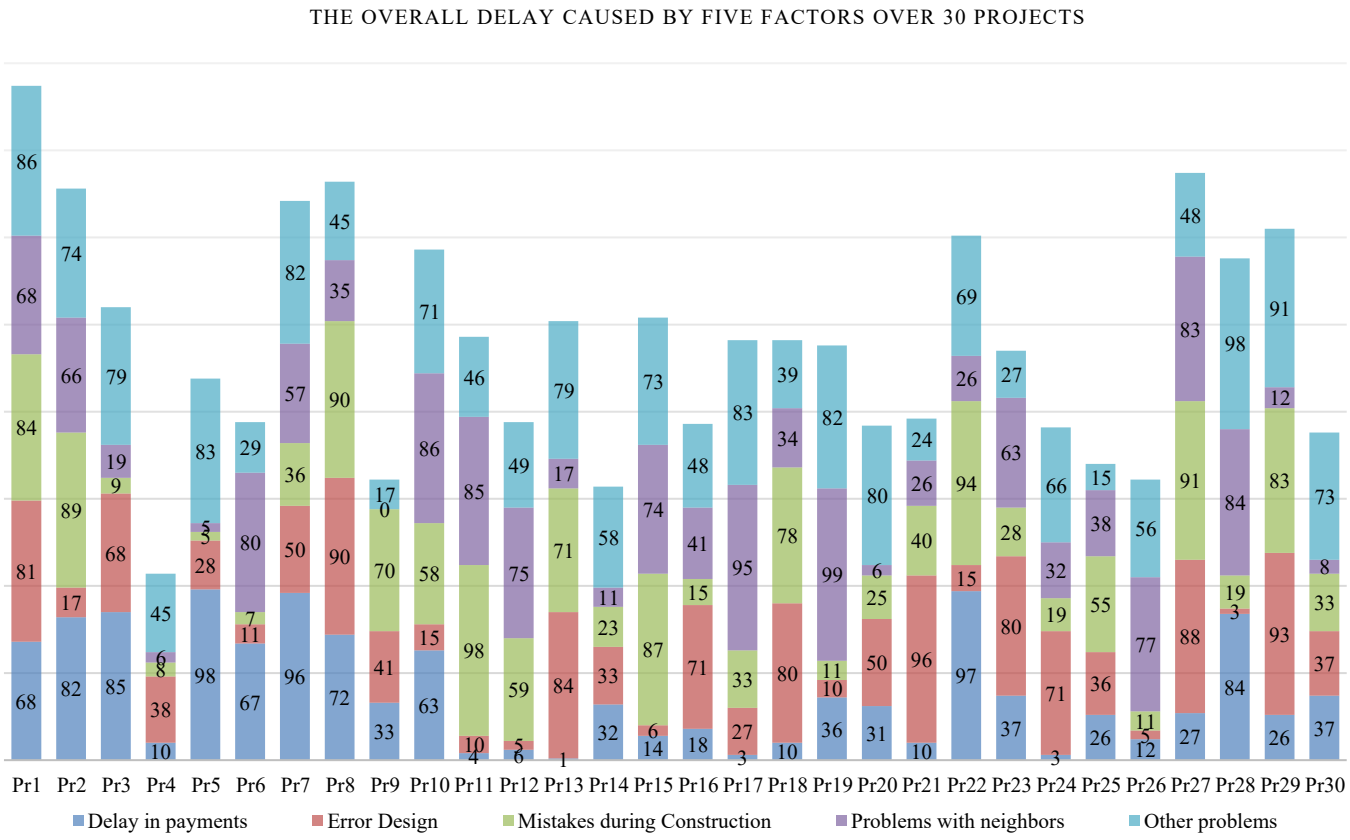

Figure 4. A line graph showing the overall delay caused by five factors over 30 projects

6. CONCLUSIONS

In summary, the implementation of well-structured projects mitigates the delay resulting from individual attributes. This leads to a reduction in overall project delays. There is a lack of correlation observed between the level of experience had by project managers, the accessibility of engineers and experienced workers, and the reputation of the contracting organization. These aspects have been acknowledged as potential contributors to the occurrence of delays. There is a lack of evidence suggesting that the level of expertise and competency of the consultants chosen for the project has a substantial impact on the probability of design errors occurring. Certain conditions, such as those pertaining to nearby individuals or organizations, might exert a substantial influence on the system, even if they transpire seldom. The presence of a proficient project team, including of efficient project managers, a competent contracting team, and skilled individuals engaged in the project, has the potential to alleviate the delays caused by the challenges identified in the research.

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BIOGRAPHIES

Name: **Saeed**
Middle Name: **Thamer**
Surname: **Alnaseri**
Birthday: 15.11.1996
Birthplace: Baghdad, Iraq
Bachelor: Civil Engineering, Al Kufa University, Najaf, Iraq, 2018
Master: Student, Civil Engineering, Altinbas University, Istanbul, Turkey, Since 2022
Research Interests: Construction Management, Project Delay

Name: **Sepanta**
Surname: **Naimi**
Birthday: 12.06.1976
Birthplace: Esfahan, Iran
Bachelor: Mechanical Engineering Department, Islamic Azad University, Esfahan, Iran, 2001
Bachelor: Civil Engineering Department, Beykent University, Istanbul, Turkey, 2010
Master: Mechanical Engineering Department, Eastern Mediterranean University, Gazimagusa, Northern Cyprus, 2007
Doctorate: Civil Engineering Department, Eastern Mediterranean University, Gazimagusa, Northern Cyprus, 2013
The Last Scientific Position: Assoc. Prof., Altinbas University, Istanbul, Turkey, Since 2019
Research Interests: Steel Structures, Finite Element Analysis, Construction Management

Scientific Publications: 34 Papers, 1 Book, 35 Theses
Scientific Memberships: Union of Chambers of Turkish Engineers

Name: **Zainab**
Middle Name: **Ali**
Surname: **Alrubaye**
Birthday: 28.09.1983
Birthplace: Baghdad, Iraq

Bachelor: Civil Engineering, Al Mustansiriyah University, Baghdad, Iraq, 2005
Master: Civil Engineering, Altinbas University, Istanbul, Turkey, 2021
Research Interests: Construction Management, Finite Element Analysis, FIDIC, BIM
Scientific Publications: 2 Papers
Scientific Memberships: Union of Iraqi Engineers