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Analysis of Critical Project Success Factors—Sustainable Management of the Fast-Track Construction Industry

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Abstract: Fast-track construction has recently become the prevailing construction approach globally. It enables owners and developers to make rapid returns on investment through shortened construction periods. This strategy has many effects on the industry; therefore, four groups of factors were studied in this project: (1) financial, (2) logistics and finance, (3) management, and (4) legal. A 22-question survey was distributed to 155 professionals in the construction industry, who evaluated the impact of the stated factors on a 5-point scale. The results revealed a high level of consistency determined through Cronbach's alpha, and a positive correlation was found by Spearman's rank coefficient. The Relative Importance Index was used to rank the factors based the evaluation by the professionals, resulting in the following impact ranking: (1) poor communication among design and construction teams, (2) large amounts of rework, (3) low quality of work by the contractor, (4) design errors, (5) late or insufficient payment according to terms agreed with the client, and (6) unavailability of materials in the market. By providing a quantitative RII model to evaluate fast-track project management performance with the use of corresponding performance indicators, this study will benefit industry practitioners and researchers as it identifies the most significant factors that impact fast-tract project management performance.

Keywords: critical project success factors; project management; fast-track; key performance indicator; delay; cost overrun; risk assessment; sustainable construction; planning; relative importance index

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1. Introduction

Construction is an important industry and a key component of economic growth and development. As an industry that creates, for example, factories for production, hospitals for treatment, schools for education, and homes for living, it plays a major role in sustaining key social structures and practices. However, the construction industry is well-known for its unpredictability with regard to costs and time. While it attracts significant quantities of investment, investors usually look for fast returns and thus push for faster construction. As a result, the concept of "fast-track construction" is becoming more and more prevalent.

Huge competition among investors explains why fast-track construction projects prevail today. Rapid project completion times generate larger profits over shorter periods, similar to the case discussed in [1], or by allowing owners to commence planned investments earlier and recoup their costs sooner [2].

While fast-track projects require extensive utilization of resources and materials, professional, well-informed, and experienced management is required to govern their efficient utilization [3]. However, adequate management of resources alone cannot deliver a successful project; a comprehensive approach to the management of all aspects of a project must prevail [4], from quality and finance to timelines and contracts.

Typically, fast-track construction methods are vulnerable to disruptions that may occur regarding the quality or sequencing of work, and they require sharp attention to

the financial status of the project [5]. Fast-tracking a project means that the contractor needs to expend a larger amount of money over a shorter period—without proper financial management, this potentially entails significant financial risk [5].

A list of factors and risks was drawn up and analyzed for this study to identify which factors have the most impact on fast-track construction process and the potential practices used to assess and manage them. The goal was to use the performance characteristics that have an impact on fast-track construction to develop a quantitative assessment model capable of measuring the efficiency of fast-track project management. By providing a quantitative RII model to evaluate fast-track project management performance with the use of fast-track performance indicators, this study adds to our understanding of construction management.

Furthermore, the concept of sustainability has been found to be applicable to the management field from a social development perspective, and not only with respect to green buildings and climate change, as it has been found that focusing on success factors can lead to sustainable construction practices [6] and further studies in the literature confirm that sustainable development is highly associated with efficient and successful project management practices and leadership, especially when dealing with rapid and complex situations [7]—which is often the case with fast track construction.

1.1. Literature Review

Finishing ahead of schedule is rarely observed in construction [8]; therefore, fast-tracking has been a commonly used technique to accelerate project completion, returning significant benefits to project owners [9]. Fast-track construction is associated with risks and adverse impacts, with the risks being identified as uncertainties that affect the project with unpredictable effects on project duration and costs [10].

The fast-track technique is based on overlapping the different stages of the project that can be performed simultaneously (e.g., design with construction). Therefore, with the fast-track construction strategy, activities can be conducted concurrently. The strategy can be applied between project phases such as design, procurement, and construction. This makes a project more complex [2] and may result in many design or construction errors, which in turn may affect the project's objectives, in addition to the major safety challenges that can arise as a result of these concurrent activities [11]. Therefore, when a fast-track approach is applied, extensive monitoring is necessary to mitigate these risks [9].

On the other hand, fast-track construction is sometimes essential to deliver certain objectives. For example, Qatar has witnessed the widespread adoption of fast-track construction strategies to deliver the infrastructure for the FIFA World Cup 2022. One case study of an $11 million fast-track fit-out project [2] examined the challenges in delivering and managing fast-track projects in Qatar. To meet the required completion time, the design and construction phases overlapped by three months. The study used a questionnaire that was distributed to professionals from the industry and identified 27 barriers to managing fast-track construction projects, with the most significant challenges being: (1) design errors and omissions, (2) lack of sufficient information, and (3) poor coordination between work packages [2].

Furthermore, according to the case study described above and similar findings in the literature, it can be concluded that a lack of sequences between the work packages has a significant impact on project management. Communication among the project teams is crucial, in addition to managing complex client requirements and expectations during both the design stage and the change orders later on. In addition, poor cost estimation for the project arose as a result of overlapping work packages, a factor that can lead to poor financial management. Further, the research study revealed a knowledge effect. This was explained by the lack of corporate experience working in this particular environment and limits to operational capacity [2].

Another study that examined fast-track methods applied to road construction in Indonesia emphasized the major role played by appropriate scheduling in delivering a

successful fast-track construction project [12]. Fast-tracking calls for some actions to be undertaken concurrently rather than consecutively, making scheduling critical.

Uncertainties and risks in fast-track construction are common [13] and were investigated in a case study in South Africa [14]. This study aimed to examine and analyze the management behaviors and techniques involved in controlling uncertainties and costs during both the design and construction phases of a fast-track construction project. Findings from this study include the fact that fast-tracking leads to less predictability in the project outcomes and is dependent on the experience and knowledge of the project team, the availability of resources, and project team alignment. The research also shows that the estimated completion periods of fast-track construction projects usually tend to be overly optimistic, with, for example, the commencement date of construction delayed due to a delay in the design, or the completion date pushed back because of the necessity for rework or improper management of the sequence of activities, which has been also studied by [3,15,16]. The authors also pointed out the risks associated with financial management. In their case study, for example, the project team did not consider provisions for cost contingencies. Cost contingency is an amount that is calculated within the budget for construction activities that are required but cannot be predicted or foreseen. If these occur in a fast-track construction project, the contractor will be required to rapidly expend money beyond the predetermined budget; therefore, the contractor must have solid financial management standards to be able to accommodate such risks [14].

Ref. [17] researched 17 different case studies in order to investigate the factors impacting schedules in fast-track construction. A key finding was that the most significant risks in fast-track construction that may cause delays are errors in cost estimation, design errors and change orders, and unprofessional scheduling practices, which were found to be one of the most influential factors due to the overlapping phases of the project. The author noted that the frequency and complexity of change orders are proportional to the number of consultants involved in a project [17].

Ref. [18] studied the relationships between the risks associated with the management of fast-track projects in Pakistan. They grouped the risks in fast-track projects and ranked them in developing economies as follows: (1) financial, (2) managerial, (3) technical, (4) legal, (5) environmental, and (6) social. However, the ranking is not the same for developed economies, in which the results showed a prioritizing of managerial over financial risks. Therefore, it can be concluded from this study that risks vary among countries for several reasons, including variations in the political environment. Overall, the individual ranking of risks that was categorized by [18], which can be found in Table 1 of their paper, is as follows: (1) rework, (2) design errors, (3) unrealistic schedule, (4) numerous change orders, and (5) construction accidents [18].

Another study by [19] examined the influence of information complexity on the quality of construction. The findings demonstrated that the following factors, among others, have a major impact on construction and reduce quality performance: ineffective communication, contract changes, and information delays. The following significant causative factors were shortlisted from this study and included in our research.

- Lack of an appropriate communication medium;
- Absence of support for advanced communication technologies;
- Not getting the necessary information at the right time;
- Poor communication skills;
- Frequent changes in the project contract;
- Slow information flow between parties;
- Defects and quality errors causing repetitive rework.

Ref. [20] studied client-related rework in Egypt and the potential practices for its reduction. The study was based on a questionnaire, revealing that client-related rework is extremely common in fast-track construction and leads to approximately a 20 percent increase in cost and a 23 percent delay in schedules. Regarding the causes of rework, the study concluded that the three main reasons are:

- Clients' financial problems;
- Obstacles in prompting decision-making processes;
- Client requests for changes in materials.

These factors were also ranked the highest in the severity index of the study. The study also highlighted additional root causes, like poor communication with the design [20] team and a client's lack of experience, as well as repetitive scope changes made by clients. The study concluded that building information management (BIM) potentially offers a means of resolving many of these issues. By providing visual representations of built environments for clients, this technology makes it easier for them to visualize their decisions, reducing the probability that they will require changes in future.

Ref. [21] conducted a deep study on oil and gas construction and concluded that the major impacts on construction processes include, but are not limited to, frequent change orders by the owner, inadequate planning and scheduling practices, design errors, and poor estimation practices.

Furthermore, due to the required speed of fast-track projects, it is possible to do less testing and commissioning in the early design stages but then conduct rapid testing during the construction phase. When testing and commissioning are ignored, operational issues are highly likely to arise [2].

1.2. Findings of the Literature Review

Studies in the literature show that having a fast-track construction strategy helps to compress the time schedule of construction; however, it is associated with many effects on the construction process. These effects are various in their type and impact [22]. However, each previous study in the literature has studied certain sets of factors separately. Therefore, this research gathers the different prominent factors from the other studies and casts light on these impacts to study them from the field professionals' point of view in order to evaluate them against each other and recommend practices to overcome their negative impact on the process of construction. The factors were then categorized based on the shortlisted factors from the literature to facilitate the analysis based on their type and area of impact. Table 1 shows a list of project management factors relevant to fast-track construction. This list serves as a basis for survey development and data analysis in the coming sections.

Table 1. List of Studied Factors.

Group		Factors	References
Technical	1.	Poor communication among design and construction teams of the contractor	[18–20]
	2.	Low quality of work by the contractor	[9,18]
	3.	Poor selection of methods and equipment by the contractor	[2,9]
	4.	Design errors	[17,18,21]
	5.	Limited/insufficient period of testing and commissioning	[2]
	6.	Large amount of rework	[3,16,18–20]
	7.	Poor change order management by the contractor	[17–21]
	8.	Lack of technological advances	[2,18,19]

Table 1. *Cont.*

Group		Factors	References
Logistics and Financial Factors	9.	Lack of contractor's ability to respond to the owner's requests	[2]
	10.	Unavailability of materials in the market	[14,23]
	11.	High purchasing cost of materials and equipment	[9,18]
	12.	Poor financial management of the contractor	[2,9,14,17,23]
	13.	Late payments/inadequate payments with the required speed by the client	[9,18,20,23,24]
Management	14.	Poor decision-making mechanism of the contractor	[20]
	15.	Poor management of overtime and overmanning	[8]
	16.	Lack of fast-track experience of the contractor	[14,18,20]
	17.	Poor scheduling practices	[14,17,18,21,25,26]
	18.	Poor organizational skills by the contractor	[2]
	19.	Poor safety management practices by the contractor	[2,9,11,18]
Legal	20.	Delay in authority inspections	[17]
	21.	Delay in client's approvals	[19,23]
	22.	Delays caused by consultant's approvals	[17,19]

2. Research Methodology

2.1. Detailed Methodology and Data Collection

In this section, the research project methodology is explained in detail, starting with the author's site observation. An overall process map of the project is shown in Figure 1.

Figure 1. Research Methodology.

A comprehensive literature review was conducted in order to shortlist the influential factors and risks of the construction process during fast-track construction. These factors are listed and referenced in Table 1.

These factors were organized into four groups to facilitate analysis: (1) technical, (2) logistics and finance, (3) management, and (4) legal.

Next, a questionnaire was developed based on the literature review findings that explored the impact of the above factors, using questions with a 5-point response scale. This questionnaire was distributed to professionals from the construction industry to evaluate the impact of the listed factors. The participants were targeted by the authors of this study, through other professional platforms (e.g., LinkedIn), and by targeting the staff of some construction projects worldwide. The resulting data were analyzed in preparation for ranking the factors and developing recommendations.

The questionnaire aimed to evaluate the impact of the factors on the construction process based on the experience of construction professionals. It was composed of two main sections and sub-sections, as presented in Figure 2. The first section aimed to obtain overall background information about the respondent to evaluate the reliability of the

provided answers. This also helped to categorize the respondents into different groups for comparison purposes.

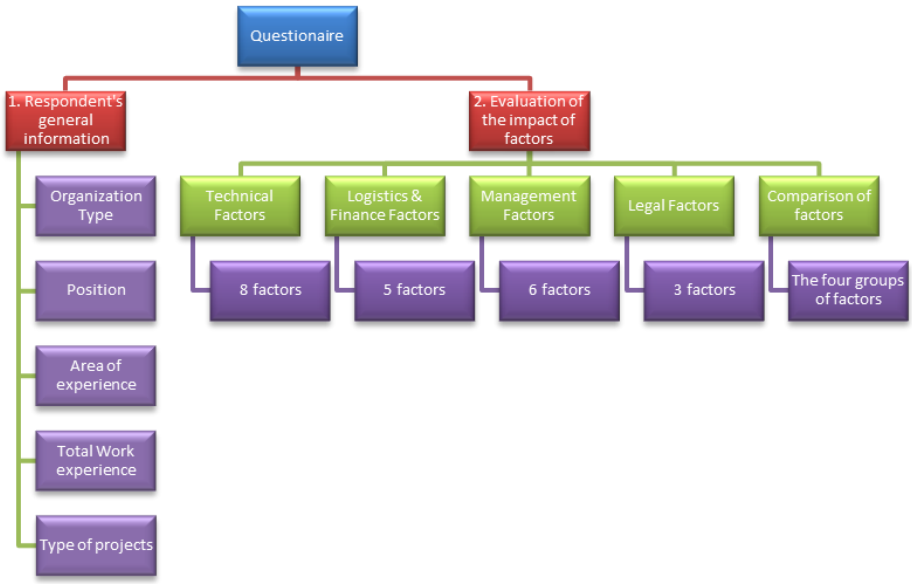

Figure 2. Questionnaire design.

The second section included 22 influential factors that impact the construction process and respondents were asked to evaluate the "impact" of these factors ("What is the impact of the mentioned factor on the management of fast-track projects?") on a 5-point scale. Respondents were then asked to evaluate the impact of the different groups under which the different factors were classified.

The questionnaire was sent worldwide to professionals in the construction industry from different organizations and designations, as well as to academic staff whose area of research is construction and engineering management. The questionnaire was distributed via email to the author's social network from the construction industry, LinkedIn, and the academic field. A total of 155 complete responses were collected, and incomplete surveys were eliminated to ensure matching data analysis.

In the following paragraphs, the qualitative and quantitative tools and techniques that were used in this study are described, along with the necessary equations and their background literature. These tools were used to determine the consistency of the questionnaire, analyze and rank the influencing factors, and examine the consistency of responses among respondents from different backgrounds.

2.2. Evaluation of the Impact Factors

The questionnaire aimed to investigate how professionals in the construction industry evaluate the impact of certain factors on the management of fast-track construction. According to the questionnaire's design, the respondents were requested to rate the impact using a 5-point scale and the following techniques were followed to evaluate the efficiency of the data.

2.2.1. Cronbach's Alpha

This coefficient was calculated in order to determine the consistency of the collected data.

$$A = \left[\frac{K}{K-1}\right] \times \left[1 - \frac{\sum S_Y^2}{S_X^2}\right], \quad (1)$$

K = Number of respondents
S_Y^2: Sum of items variance

S_X^2: Total variances of the total score

The value of this coefficient varies between 0 to 1.

2.2.2. Relative Importance Index (RII)

The RII is a reliable index through which the factors of this study can be ranked, and it is a common tool that is used worldwide for classifications: Ref. [27] used RII to evaluate the key performance indicators for the construction industry in Egypt and it has also been used to rank the factors in relation to employer satisfaction with industrial training [27,28].

The following equation is used in this project for calculating *RII*:

$$RII = \frac{\sum W_i}{A.N} = \frac{1n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_5}{5.N}, \quad (2)$$

where

W = the respondent's weighting of each factor, which can range from 1 to 5
n_i = the number of respondents for value of i
A = the highest weight (in this project is 5)
N = the total number of respondents on the questionnaire

After calculating the *RII* value, which ranges from 0 to 1, the ranking process takes place, with the highest *RII* value indicating the most influential factor. *RII* was used in this study to help rank the factors based on the respondents' scoring.

2.2.3. Spearman's Rank Correlation Test

Spearman's rank correlation is a commonly used coefficient to determine the overall precision of data. For example, Gunduz et al. [29] used this coefficient to measure the consistency of data values while studying construction safety factors. It is a non-parametric test that does not require normality and it is calculated with the following equation:

$$r = 1 - \frac{6\sum d^2}{n^3 - n}, \quad (3)$$

where

r: Spearman's rank correlation coefficient
d: Difference between ranks assigned to variables for each factor
n: Number of identified factors in the study (in this project it is 22)

The coefficient value may range between +1 and −1, where +1 indicates a perfect relationship and −1 indicates a perfect negative relationship. To calculate the Spearman's rank correlation coefficient, separate rankings for specific groups of respondents must be performed. Correlations among the highest number of respondents need to be studied and the groups with low numbers of respondents need to be omitted.

3. Data Collection and Analysis

In this section, the collected data from the questionnaire is summarized and a detailed analysis is performed based on the qualitative and quantitative tools used in the research methodology.

3.1. Respondents' Profile

This section presents general information about the respondents based on the organization that they represent, position, area of experience, total years of experience, and project specialisms. The distribution of respondents according to these categories is shown in the following figures.

3.1.1. Type of Organization

Figure 3 shows that the contractor type of organization is the most common, followed by clients and then consultants. The limited number of participants in the "Others" category were from the academic sector or real estate development companies. This is a good indicator, as most of the influential factors within construction initially affect the contractor and are subsequently raised to the consultant and then the client. This means that the results of the questionnaire are likely to stem from practical experience.

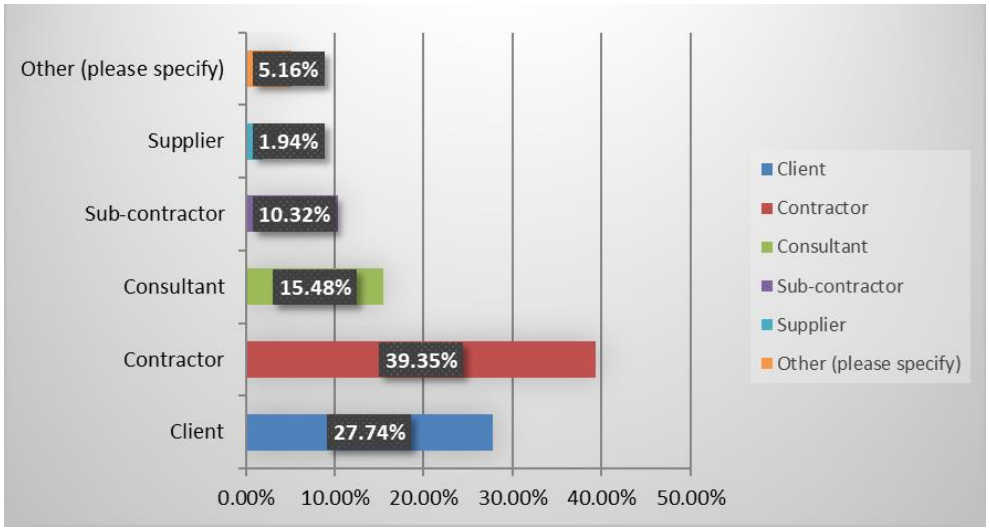

Figure 3. Respondents distribution based on organization type.

3.1.2. Respondents' Positions

The Figure 4 shows that almost half of the respondents (70) are engineers or supervisors, while 16 percent are project managers. The distribution of the other positions is shown in the following figure. It should be noted that the 3.23% under the "Other" category comprises instructors, safety professionals, environmental and stakeholder management experts.

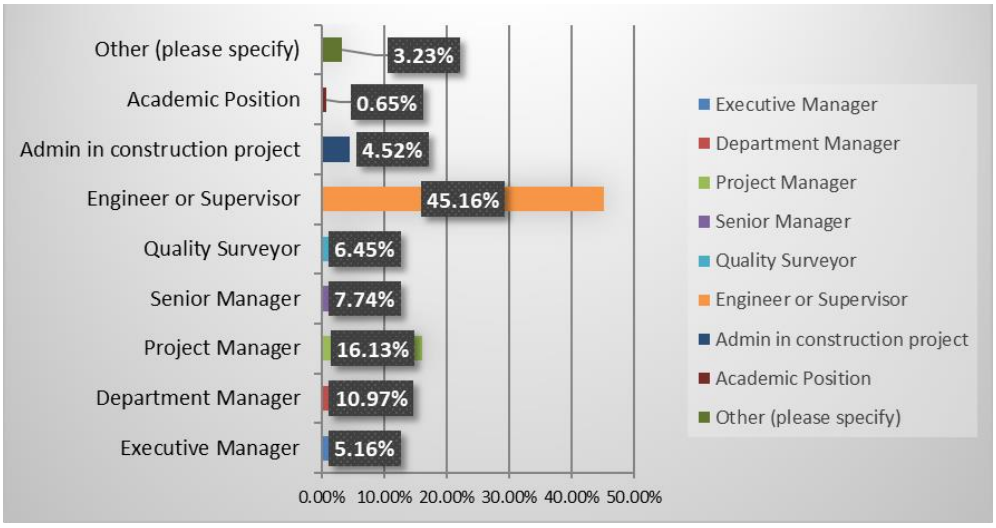

Figure 4. Respondents' distribution as per their positions.

3.1.3. Respondents' Areas of Expertise

The following Figure 5 shows that the engineering and project management areas of expertise have an equal number of respondents (33 each), followed by site execution, with

21 respondents. Only 9 responses fell under the "other" category, with areas of expertise that included strategic planning, admin, and facility management.

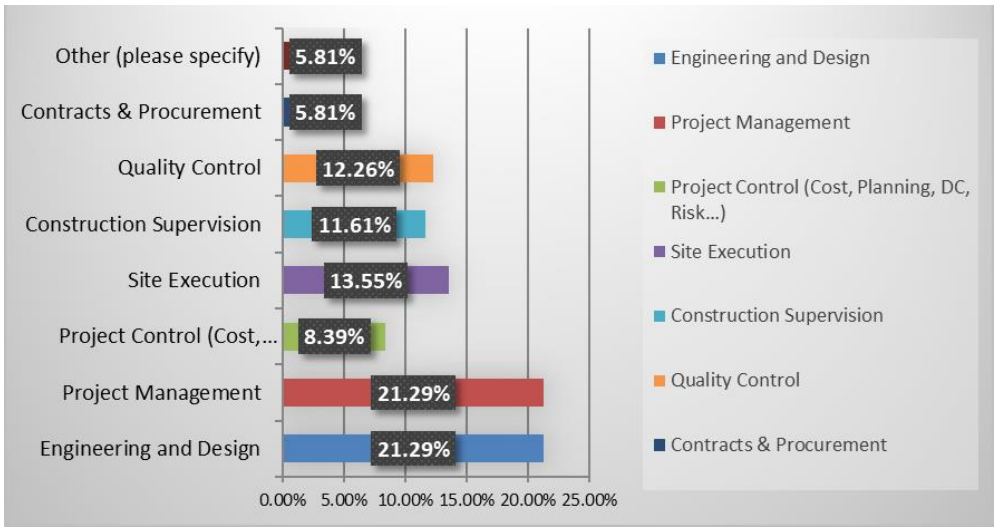

Figure 5. Respondents' distribution as per their area of expertise.

3.1.4. Respondents' Total Work Experience

The below Figure 6 shows that almost 75 percent of the respondents have more than 5 years of experience, which is a strong indicator of the reliability of the collected data.

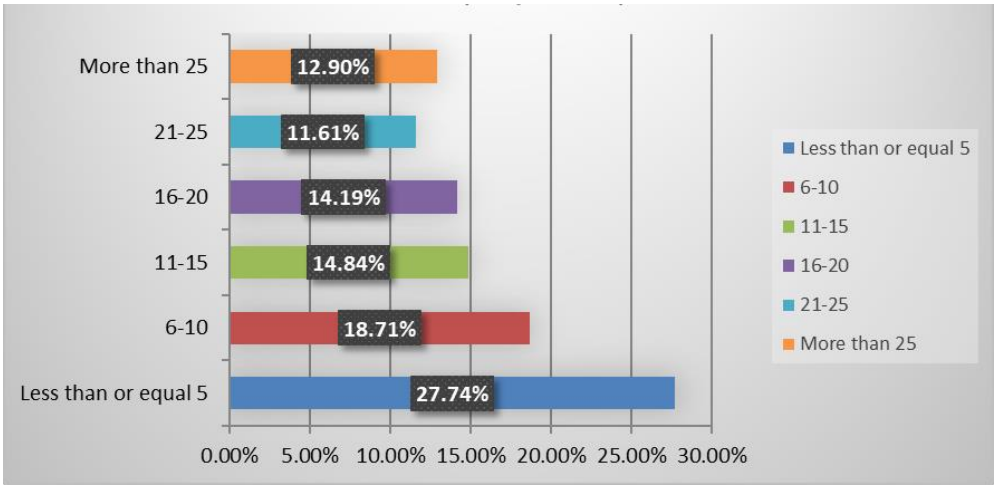

Figure 6. Respondents' distribution based on their total work experience.

3.1.5. Respondents' Types of Projects

Figure 7 shows that half of the respondents come from building construction and almost a third have an infrastructure background. This is a good indicator, as most of the fast-track construction projects are buildings. They are the main players in investments or infrastructure and require significant site disruption; therefore, they are more likely to be fast-track projects. A very small percentage of projects, 4.52%, comprised the "other" category, and most of the projects in this category consisted of oil and gas project and other related construction fields like suppliers.

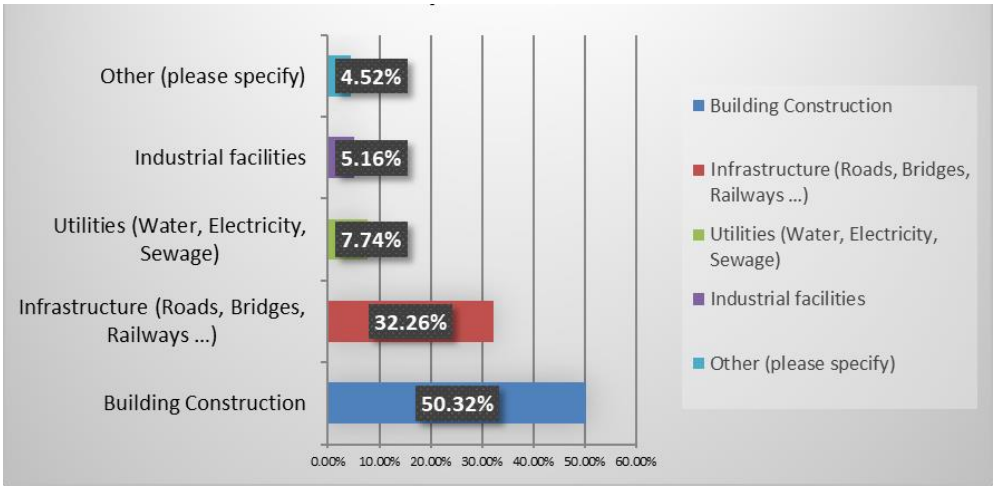

Figure 7. Respondents' distribution based on the types of their projects.

3.2. Evaluation of the Impact of the Studied Factors on the Management of Fast-Track Construction

The questionnaire aimed to investigate how professionals in the construction industry evaluate the impact of certain factors on the management of fast-track construction. According to the questionnaire design, the respondents were requested to rate the impacts using a 5-point scale.

3.2.1. Cronbach's Alpha

This coefficient was calculated in order to determine the consistency of the collected data.

The value of this coefficient varies between 0 to 1. Table 2 shows the calculations:

Table 2. Cronbach's Alpha.

Variables	Description	Values	Internal Consistency
K	number of respondents	155	
$\sum S_y^2$	sum of the item's variance	24.64	
S_x^2	Variance of the total score	241.54	
Alpha	Cronbach's alpha	0.9038	Excellent

The value of Cronbach's alpha indicates that the internal consistency of the data is excellent, which in turn indicates that the results of the questionnaire are reliable.

3.2.2. Relative Importance Index (RII)

Table 3 shows the ranking of all factors individually. In addition, participants were asked to evaluate the importance of the different groups of related factors in order to evaluate their impacts. Table 4 shows the ranking of the four categories studied in the survey.

Table 3. Impact Rating of the Factors.

No.	ID	Factor	RII	RII Rank
1	TE01	Poor communication among design and construction teams of the contractor	0.843871	1
2	TE02	Low quality of work by the contractor	0.818065	3
3	TE03	Poor selection of methods and equipment by the contractor	0.763871	13
4	TE04	Design errors	0.818065	3
5	TE05	Limited/insufficient period of testing and commissioning	0.740645	19
6	TE06	Large amount of rework	0.832258	2
7	TE07	Poor change order management by the contractor	0.757419	15
8	TE08	Lack of technological advances	0.696774	22

Table 3. *Cont.*

No.	ID	Factor	RII	RII Rank
9	LF01	Lack of contractor's ability to respond to the owner's requests	0.754839	16
10	LF02	Unavailability of materials in the market	0.809032	6
11	LF03	High purchasing cost of materials and equipment	0.698065	21
12	LF04	Poor financial management of the contractor	0.772903	12
13	LF05	Late payments/inadequate payments with the required speed by the client	0.810323	5
14	MG01	Poor decision-making mechanism of the contractor	0.789677	9
15	MG02	Poor management of overtime and overmanning	0.753548	17
16	MG03	Lack of fast-track experience of the contractor	0.803871	8
17	MG04	Poor scheduling practices	0.787097	10
18	MG05	Poor organizational skills by the contractor	0.753548	17
19	MG06	Poor safety management practices by the contractor	0.703226	20
20	LE01	Delay in authority inspections	0.76129	14
21	LE02	Delay in client's approvals	0.805161	7
22	LE03	Delays caused by consultant's approvals	0.779355	11

Table 4. Factor Comparisons.

No.	ID	Factor	RII	RII Rank
1	FA01	Technical factors	0.76	3
2	FA02	Logistics and finance factors	0.769032	2
3	FA03	Management factors	0.821935	1
4	FA04	Legal factors	0.732903	4

3.2.3. Spearman's Rank Correlation Test

The strengths of the values in between are presented in Table 5.

Table 5. Spearman's Strength Dependence.

Value of the Spearman's Coefficient | Absolute Value |	Strength of Correlation
0.00–0.19	Very Weak
0.20–0.39	Weak
0.40–0.59	Moderate
0.60–0.79	Strong
0.80–1.00	Very Strong

To calculate the Spearman's rank correlation coefficient, separate rankings for specific groups of respondents must be performed. Correlations among the highest number of respondents were studied and the groups with low numbers of respondents were omitted. Table 6 shows the captured relationships, which are moderate to very strong, according to the Spearman's test.

Table 6. Various Spearman's Coefficient Values.

	Groups		Spearman's Coefficient	RII Rank
Type of Organization	Client	Contractor	0.554489	Moderate
	Contractor	Consultant	0.572558	Moderate
Area of Expertise	Engineering and Design	Project Management	0.682665	Strong
	Construction Supervision	Engineering and Design	0.648786	Strong
	Engineering and Design	Project Control	0.594015	Moderate
	Construction Supervision	Project Management	0.83738	V. Strong
	Project Control	Project Management	0.5048	Moderate

Table 6. *Cont.*

	Groups		Spearman's Coefficient	RII Rank
Total Work Experience	6–10	11–15	0.814229	V. Strong
	6–10	16–20	0.791643	Strong
	6–10	21–25	0.76284	Strong
	6–10	More than 25	0.831733	V. Strong
	16–20	11–15	0.654433	Strong
	21–25	11–15	0.677583	Strong
	More than 25	11–15	0.671937	Strong
	16–20	21–25	0.626765	Strong
	16–20	More than 25	0.652739	Strong
Type of Project	Infrastructure	Utilities	0.70638	Strong
	Infrastructure	Building Construction	0.70695	Strong
	Utilities	Building Construction	0.80858	V. Strong

4. Discussion

In this section, a broader interpretation of findings and recommendations is provided, based on the findings from previous sections. This research study studied the impact of certain factors on the management of fast-track construction projects. The research problem was formulated after practical observations by the author as a project engineer in a contracting company. A comprehensive literature review was performed to shortlist the main factors to be studied in this project, and a 22-question survey was designed to obtain feedback from industry professionals in order to evaluate the impacts of the factors. The survey results underwent a comprehensive analysis to determine the relative importance of factors using the Relative Importance Index and Spearman's rank correlation, which identified the correlation level among the different backgrounds of participants.

The previous sections presented several sources of information, methods, and data that were used to deliver a meaningful conclusion. These were followed by analysis and presentations with regard to the project objectives. Recent information about the risks associated with fast-track construction was extracted from different articles and research, as indicated in the literature review section.

As per Table 3, the following factors show the greatest impacts on the management of fast-track construction:

(1) Poor communication among design and construction teams of the contractor;
(2) Large amount of rework;
(3) Low quality of work by the contractor;
(4) Design errors;
(5) Late payments/inadequate payments with the required speed by the client;
(6) Unavailability of materials in the market.

4.1. Poor Communication among Design and Construction Teams of the Contractor

The lack of proper communication among the project team members is a critical concern in technical, financial, and practical terms [18–20]. Poor communication might start with issues in the delivery of information from the technical office to the project construction team regarding building elements or processes. Such information is delivered through drawings, method statements, and inspection testing plans. A lack of detail or precision in any of these documents may lead to improper construction; in turn, this can result in rework and, hence, delays to the schedule. Another possible scenario concerns purchasing. For example, if the specifications and requirements of materials and equipment are not clear to the procurement department, incorrect materials may be delivered; such materials would not be acceptable and would result in re-purchasing. This lack of clarity can be related to the limited time available to finalize and deliver the information between teams.

4.2. Large Amount of Rework

Rework consumes both time and money. It can be related to many factors, such as the improper sequencing of work, whereby an activity is missed, or a lack of coordination between different specialties. Rework requires activities to be performed multiple times, which increases the costs of labor, materials, and equipment by a factor of two or more, in addition to delaying other dependent activities that may, in turn, be dependent on procurement schedules, payment terms, or milestone agreements.

Rework can arise as a result of fast-track construction and/or a lack of coordination between items or activities, as it is linear to the overlapping of activities [5], and can be severely detrimental to the completion of a project if it is found to be required at a late stage.

4.3. Low Quality of Work by the Contractor

Low quality can be caused by the limited time available for testing or inspecting the work. When fast-track projects are not accompanied by the required staffing and monitoring systems, the available staff will be overloaded with tasks. This may result in staff ignoring some of the assigned tasks or work being performed quickly to meet deadlines. The priority will be time over quality [18–20].

4.4. Design Errors

Design errors are common in all types of projects. Therefore, it is predictable that, in a fast-track project, errors will occur repeatedly, as there will be higher pressure for bringing the design to construction, even where there is a lack of proper coordination between disciplines [17]. Design errors could take the form of clashes encountered during construction or inaccurate specifications.

4.5. Late Payments/Inadequate Payments with the Required Speed by the Client

In fast-track projects, the contractor needs to be in a robust financial position, as they will be required to front larger sums in advance to pay sub-contractors on time [9,18,20]. As the construction industry is considered to have fewer assets compared to project budgets, a contractor needs to establish a good working relationship with a client to secure rapid payment with fair estimation to maintain financial stability until project completion. If the client does not support the contractor, the latter will be at financial risk, which may lead to bankruptcy. This in turn would stop the project, and it would be risky for any other contractor to resume the work with such a client.

4.6. Unavailability of Materials in the Market

This factor is crucial and typically uncontrolled when it occurs [14]. Usually, the contractor plans and issues a procurement schedule in advance; however, materials might be out of stock for various reasons. Also, extensive demand for materials can result in less availability.

5. Recommendations

The purpose of this research project is to provide the construction industry with pertinent information regarding the numerous challenges faced by project management professionals in fast-track construction. However, there are always opportunities for improvement and more research.

The following recommendations are directly related to the factors that were identified and studied through this research.

1. The first recommendation addresses the factor with the highest impact according to the derived RII values, which is poor communication among design and the construction teams of the contractor (TE01). To address this factor, a healthy, transparent, and trustworthy relationship between project teams must exist, since it encourages an efficient and motivating level of cooperation and support. At the same time, a clear and direct workflow should be addressed and monitored by the project manager

along with authority and flexibility in staffing, if needed, to minimize the load on employees and increase accuracy. The project manager should also clearly identify milestones for all teams and designate an auditing team for all activities. This is to ensure proper coordination among teams and disciplines with clearly defined roles and responsibilities;

2. To address large amounts of rework (TE06), which is the second highest factor in the study's RII ranking, the project team should ensure that the appropriate work is being done correctly without the need for remediation. Instead of fines, project teams should be rewarded for completing their work in compliance with requirements. The inability to complete a project by the deadline is likely to incur additional expenses, missed opportunities, and increased risks; linked costs from delays may exceed any incentives by a factor of more than two. As a result, incentives are a practical strategy. A specified portion of the project value should be kept and tied to contractual milestones in order to motivate the project teams to complete the job in line with standards. This could be challenging because it takes a while;
3. The third-ranked factor from the project's RII was low quality of work by the contractor (TE02). Low quality can be due to poor selection of materials or poor workmanship on site. Therefore, the project team should ensure adequate procurement and auditing with the necessary staff to cope with the project schedule and requirements. Detailed professional descriptions of materials and method statements should be applied along with an adequate auditing team to monitor the activities on site. Construction activities are known to be slow; hence, there is a higher probability of poor workmanship in fast-track projects operating to tighter deadlines. The auditing team should thus have sufficient staff to cover the compressed timeline of the project, and the auditing process should follow a strictly coordinated inspection and testing regime that is simple and easy to follow by all the project teams to ensure commitment;
4. To address the fourth-rated factor, design errors (TE04), a two-factor verification process should be applied to plans and coordination drawings during the design phase, such as in an engineering peer review. A clearly identified clearance process among the disciplines should be followed. Furthermore, Kavaliauskas et al. [30] studied the benefits of using BIM to minimize discrepancies in the design and to aid fast-tracking construction. This process should be simple and easy to apply in order to motivate personnel;
5. Late or inadequate payment (LF05) is a critical factor, and there should be a proactive approach from the contractor to performing due diligence on the financial performance of the client before bidding for projects along with maintaining an appropriate contracting strategy to secure the rights of both parties. Throughout the project, contractors must also ensure that the expenditure is within the amounts allocated to each milestone. Additionally, both parties should plan financial undertakings in advance, because when activities are overlapped, costs may increase;
6. An innovative procurement strategy must be maintained to ensure stock availability and pricing to cover the potential unavailability of materials in the market (LF02), which is the sixth factor based on RII values. A qualified procurement team must be employed to study the procurement risk of materials and ensure proper procurement and delivery management plans that match the project plan and the client's objective;
7. Delay in client approvals (LE02) was also a factor with high RII values. This is a time-consuming process since approval requests go to the client through the consultant and require lengthy documentation processes to be sent back to the contractor. Usually, the client is liable for this delay. However, for fast-track construction, the liability must be shared among the parties through an agreement on two specific issues: the required level of endorsement by the client and the maximum time for replies. In other words, when quick decisions are frequently needed in a fast-track project, the client must delegate more decision-making authority to the contractor, or to the consultant, based on a specific and clear list of requirements. In addition, there should be an agreement

among the parties on the maximum time permitted for documentation and approvals processes. For example, if a reply is not received within a designated period, the contractor has the authority to proceed;

8. It is believed that if the project teams (client, contractor, and consultant) have sufficient experience with fast-track projects, there will be clear mechanisms for the work. Therefore, the client should be cautious when selecting a suitably qualified contractor for such projects. In other words, while a contractor may have a robust financial profile and a reputation for high build quality, a lack of experience with fast-track techniques may compromise their ability to deliver projects of this nature;
9. Fast-track projects usually require rapid decision-making techniques and a lack of experience and lack of clarity regarding requirements in this respect may lead to poor decisions. Therefore, clear, and simple authorization must be given to specified persons in charge to ensure proper decision processes that are easy and quick to implement;
10. It is common that, given the limited time available for baseline execution, the amount of time needed for specific construction activities is incorrectly estimated. Since the baseline is a formal contractual document, an inaccurate estimation can result in disputes and financial fines that are applied to the contractor. Therefore, enough planning time must be given to the contractor to issue the baseline, and qualified, experienced planning professionals must be employed.

6. Conclusions

Recent years have seen a rise in the popularity of fast-track construction projects, which directly benefit their owners by providing a quick return on investment by cutting construction times in an industry known for its often extended and drawn-out production schedules. Four groups of factors were evaluated in this project: (1) financial, (2) logistics and finance, (3) management, and (4) legal. Fast-track techniques in construction affect the construction process in various ways. A survey with 22 questions was given to 155 experts in the construction business, who rated the importance of the mentioned criteria on a scale of 1 to 5.

By providing a quantitative RII model to quantitatively evaluate fast-track project management performance using fast-track performance indicators, this research increases our understanding of construction management. A questionnaire that allowed for the ranking of the elements based on their impact was used to analyze the factors impacting the management of fast-track projects and the factors were ranked based on the highest impact. Recommendations were suggested that aim to reduce the impact and optimize the fast-track construction process without any negative impacts. This is the addition made to the body of knowledge with this study.

The Relative Importance Index was used to rank the factors under study. A Cronbach's alpha coefficient of 0.9, which indicates a high degree of consistency between the results and the data gathered, was found during the validation of the results. A Spearman's rank correlation test was also run on several groups. It was discovered to be true in every instance, proving that the data are positively correlated. This study advances knowledge of the critical elements influencing the effectiveness of fast-track project management among academics and businesspeople.

7. Recommendation for Future Studies

There is potential to expand the research further to study the effect of factors on a broader level and to practically examine the efficiency of the suggested strategies, as the application of these strategies may result in other aspects, such as additional costs or the need for a more intense resource management strategy.

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