



COVID-19 Pandemic and its Impact on Delay in Construction Projects.

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ABSTRACT

In this paper, Time is a crucial consideration throughout the project management life cycle and can be considered one of the most critical parameters of a project as well as the driving force of project success. As a result, the spread of the COVID-19 pandemic has had an influence on the global economy as well as the building industry in Saudi Arabia. Due to the COVID-19 epidemic, many projects experienced time and expense overruns. Work on the site came to a halt, and productivity stagnated. With that in mind, this study was based on first-hand knowledge of the COVID-19 pandemic and how it has affected the construction industry. The consequences of the COVID-19 epidemic on construction projects in Saudi Arabia were explored in this study. This study seeks to identify, investigate, and rank elements considered to impact delays in Saudi building projects in terms of their relative importance in order to provide viable solutions to this phenomenon. To accomplish this goal, the researcher recruited practitioners and experts from a statistically representative sample to take part in a structured questionnaire survey. Brainstorming was used, and a variety of delay reasons in building projects were found as a result. The survey was carried out with the participation of specialists and representatives from private, public, and local general construction businesses. The Relative Importance Index (RII), ranking, and basic percentages were used to examine the data. The impact of factors and categories on delay was indicated by ranking them. According to the case study findings, the most significant contributing elements and categories (those that require attention) to delays were reviewed, as well as some recommendations provided to prevent and control delays in building projects. This document can also serve as a reference for all construction partners with effective management in construction projects to reach a competitive level of quality and a project that is completed on time.

Keywords: Construction projects, delay Factors, COVID-19, cost management, time management, Relative Importance Index RII (Rank).

1 INTRODUCTION

The construction industry in Saudi Arabia is an important sector because of its significant contribution to the country's economic growth. This is in terms of job opportunities and attracting Foreign Direct Investment, both of which contribute significantly to the country's GDP. However, many construction projects are likely to be delayed owing to the country's geographical, political, social, and financial status. These delay causes can only be prevented if the variables and their sources are first identified.

Construction delays are a key source of worry in the KSA private project construction industry. Given that construction delays are nothing more than a waste of time and money, research was done to discover the elements that cause construction delays. As a result, three groups of consultants, contractors, and owners were questioned. Manpower shortage (skilled, semi- skilled, unskilled labor), Delay in the consultant engineer's approval of contractor submissions, The most prominent causes that create delays in the private projects sector in KSA are a lack of materials and the interaction between the schedules of various subcontractors. Furthermore, a one-way ANOVA analysis was performed to identify parameters that shared agreement across the three groups.

2 PROBLEM STATEMENT

Many elements may contribute to construction projects divided delay into two categories:

1. Internal reasons originating among project stakeholders (clients, contractors and consultants).
2. External influences that develop as a consequence of unforeseeable events. These are not project participants' factors. They are known as acts of God and might include meteorological conditions, natural disasters, government activities, and material supply.

Furthermore, construction delays were divided into three types Excusable but not communicable is one of them. This is due to circumstances that cannot be ascribed to project stakeholders or participants.

A comparable delay. This arises as a consequence of the client's or someone else's activities for which the owner is accountable. Delays are inexcusable. This is due to the contractor's Own responsibility, or even the responsibility of his subcontractors or supplies. This might be due to a lack of experience.

The primary objective of this research is to identify the primary reasons for construction project delays, since this is a widespread issue in the worldwide construction industry, impacting the growth

of the construction industry in particular and the broader economy of nations in general. Construction delays are a common issue encountered while carrying out construction projects. Many scholars and practitioners are interested in it. Previously, research focused only on ranking the reasons for delays and analyzing the whole construction project. The primary goal of this research is to the most visible effects of COVID-19 are project suspensions, such as labor impact and loss of jobs, schedule overruns, cost overruns, and financial repercussions. The results also assist project stakeholders in understanding the sequences of the unexpected pandemic and preparing for the worst-case scenario at the building project planning stage. Considering delay reasons and assessing the amount of influence of delay groups on the completion of building projects, which might be tied more to laws and administrative processes. This research identified project completion delay issues in the final list of the most crucial delay factors after the COVID-19 pandemic. The study's findings revealed that the three most influential factors in project completion are: information delays and a lack of information exchange between parties; an incompetent owner; and an incompetent supervision consultant, as well as variance in perceptions of the major parties in any construction project (consultants, contractors, and owners). The majority of control over the delay is based on the contractor and owner groupings of elements since they have the greatest impact on the project's completion. The research's results may assist the parties engaged in construction projects in providing suitable strategies to mitigate the delay.

3 RESEARCH METHODOLOGY

Based on the results of all of the reviewed studies, especially the Saudi construction projects, we developed a set of factors that might lead to delays in Saudi construction projects (private projects) and divided them into three primary groups. A questionnaire was created to evaluate the frequency of occurrence and impact of the aforementioned factors. The questionnaire was created using references from Assaf and Al-Hejji (2006) and Sweis (2008), and it is based on Drewin's Open Conversion System. By examining qualitative data from individual interviews with contractor businesses, it is found the Pandemic's effect on various kinds of construction projects. Due to the pandemic, various challenges have arisen in the building construction industry, including project timing, labor, logistics, late payments, higher costs, and decreased projects .

These are the same challenges that have been recognized for infrastructure construction: cost, revenue, procedure, and management .

The building process, according to Drewin, is impacted by technology as well as both exterior and interior settings. As a consequence of combining Drewin's open conversion approach with delay reasons revealed in prior research, the prospective project's delay factors are categorized into three broad groups (as shown in Figure 1).

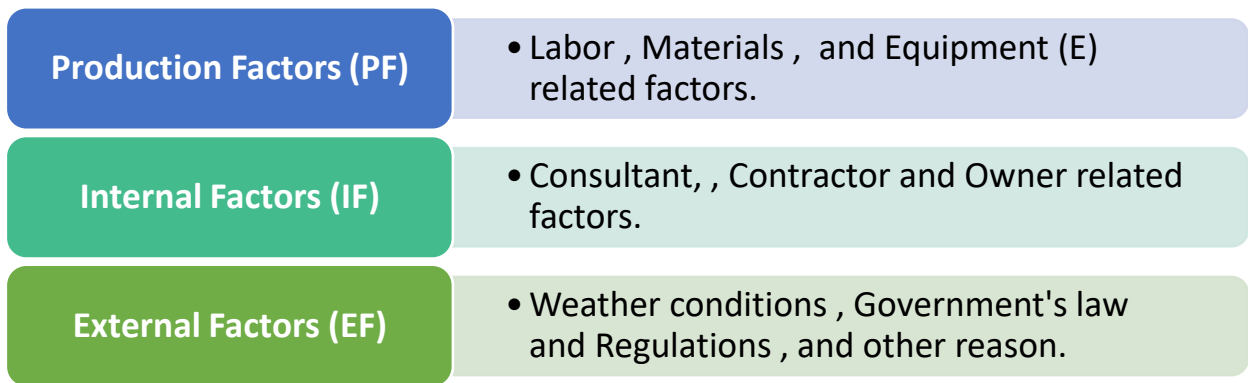


Figure 1: Three groups of delay factors in construction project

4. DATA ANALYSIS

The construction industry is viewed as complicated, fragmented, time-bound, and resource-intensive. A successful project is one that finished on schedule, within budget, and fulfills the quality standards that are acceptable to the clients and all stakeholders involved. The completion of the project on time is a factor for project success. Similarly, several construction institutions and organizations defined this procedure and considered it as a primary issue of any begun building projects, For example - Chartered Institute of Building construction project cost estimation has been recognized as a major issue through which predicted costs and resources are allocated. Moreover, the Association for the advancement of cost engineering considers it as a basic process for project planning and management, scheduling and costing control as well as financial budget planning. Similarly, the Project Management Institute the process of estimating how much money and resources will be expected to accomplish a project's operations within the allotted time frame.

. The delays were evaluated by calculating the average of responses of each particular party (consultant, contractor, and owner), then calculating the average of the three groups individually. According to the highest average in the group answer, the resultant averages were listed in decreasing order. The rankings are shown in tables 1, 2, and 3 correspondingly.

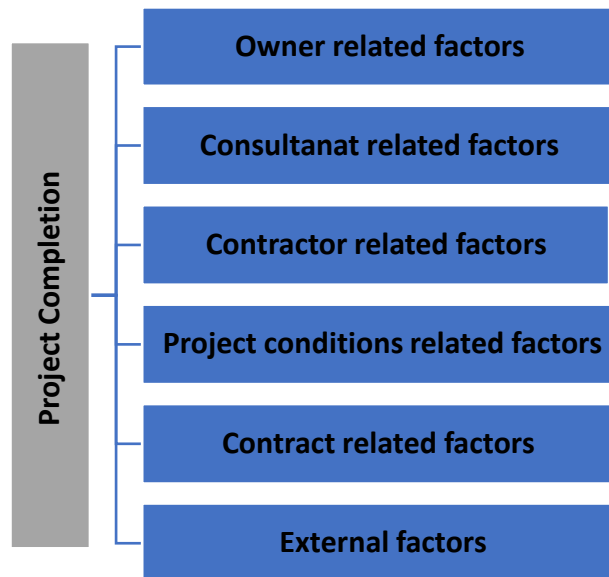


Figure 2. Project completion factors

COVID-19 has had widespread effects, the most visible of which are the halting of projects, the impact on workers and the loss of jobs, delays and increased costs, and monetary repercussions. Findings also aid project stakeholders in understanding the dynamics of an unexpected pandemic and preparing for the worst case scenario. The rankings are shown in Tables 4.

Table 1: Reasons for Consultant ranking

REASON	Category	Sub Category	Avg. rate
Manpower shortage (skilled, semiskilled, unskilled labor)	Productive Factors (PF)	Labor (L)	3.5
Variation orders from the owner	Internal Factors (IF)	Owner	3.4
Owner's payments delays to the project's contractor	Internal Factors (IF)	Owner	3.3
lack of cooperation and coordination among the parties by the contractor	Internal Factors (IF)	Contractor	3.3
Equipment shortage	Productive Factors (PF)	Equipment (E)	3.3
The owner's decision-making process is too slow.	Internal Factors (IF)	Owner	3.3
Cash flow by the owner during construction	Internal Factors (IF)	Contractor	3.2
Materials shortage	Productive Factors (PF)	Materials (M)	3.2
Delay consultant engineer's approval for contractor submissions	Internal Factors (IF)	Consultant / Designer	3.1
Preparation and approval of shop drawings and material submittals.	Internal Factors (IF)	Consultant / Designer	3.1
Payment delays from the contractor to the subcontractors	Internal Factors (IF)	Contractor	3.1
Delay in materials procurements	Productive Factors (PF)	Materials (M)	3.1
Labor productivity	Productive Factors (PF)	Labor (L)	3.1
The contractor's project planning and schedule were insufficient.	Internal Factors (IF)	Contractor	3.0
The coordination between several subcontractors' schedules	Internal Factors (IF)	Contractor	3.0
Lack of qualified technical professionals in the contractor's staff	Internal Factors (IF)	Contractor	3.0
Inadequate equipment	Productive Factors (PF)	Equipment (E)	3.0
Labor shortage	Productive Factors (PF)	Labor (L)	3.0
Weather conditions on site	External Factors (EF)	Weather	2.9
Issues in soil investigation	Internal Factors (IF)	Consultant / Designer	2.9
Discover unexpected foundation conditions on the site	Internal Factors (IF)	Consultant / Designer	2.9
The consulting engineer's response time for testing and inspection seemed slow.	Internal Factors (IF)	Consultant / Designer	2.9
Cash flow by the contractor during execution.	Internal Factors (IF)	Owner	2.9
Over-design raises the total cost	Internal Factors (IF)	Consultant / Designer	2.7
Failure to use tools to manage the project in a symmetrical professional way	Internal Factors (IF)	Owner	2.7
Site preparation delay	Internal Factors (IF)	Owner	2.7
Unrealistic project schedule	Internal Factors (IF)	Contractor	2.7
Leakage leadership from the sub-contractors side	Internal Factors (IF)	Contractor	2.7
Leakage in communication with suppliers	Internal Factors (IF)	Contractor	2.7
Using improper construction techniques by the contractor	Internal Factors (IF)	Contractor	2.7
Failure of equipment	Productive Factors (PF)	Equipment (E)	2.7

Reason	Category	Sub Category	Avg. rate
Variation orders of construction materials and specifications during execution.	Productive Factors (PF)	Materials (M)	2.7
Insignificant technical study (bidding stage) by the project's contractor	Internal Factors (IF)	Contractors	2.6
Difficulties in obtaining work permits	External Factors (EF)	Regulation of Government	2.6
Insignificant feasibility study of the project	Internal Factors (IF)	Designer /Consultant	2.6
Lack of communication with consultant / owner	Internal Factors (IF)	Contractors	2.6
Contracts and agreements are written poorly	Internal Factors (IF)	Consultant / Designer	2.5
Lack of relevant data in estimating phase for duration , and resources	Internal Factors (IF)	Contractors	2.5
Mobilization delay	Internal Factors (IF)	Contractors	2.5
Government regulations and laws are changing.	External Factors (EF)	Regulation of Government	2.4
Using obsolete technology	Internal Factors (IF)	Contractors	2.4
Construction accidents	External Factors (EF)	Others	2.2
A large number of project participants project during the implementation phase	Internal Factors (IF)	Contractors	2.2
The contractor's organization doesn't follow to safety regulations.	Internal Factors (IF)	Contractor	2.0
Problem with neighbors	External Factors (EF)	Other	1.8

Table 2: Reasons for Contractor ranking

REASON	Category	Sub Category	Avg. rate
Manpower shortage (skilled, semiskilled , and unskilled labor)	Productive Factors (PF)	Labor (L)	3.6
consultant engineer's delay to approve (material or drawings) submissions for contractor	Internal Factors (IF)	Consultant / Designer	3.4
Difficulties in getting construction permits	External Factors (EF)	Government Regulations	3.3
The owner's decision-making process is too slow.	Internal Factors (IF)	Owner	3.3
Variation orders (design – material selections) from the owner's side	Internal Factors (IF)	Owner	3.3
Preparation and approval of shop drawings and material submittals.	Internal Factors (IF)	Consultant / Designer	3.3
Equipment shortage	Productive Factors (PF)	Equipment (E)	3.3
Materials shortage	Productive Factors (PF)	Materials (M)	3.3
Labor productivity	Productive Factors (PF)	Labor (L)	3.3
Shortage in labor	Productive Factors (PF)	Labor (L)	3.2
Cash flow by the owner during construction	Internal Factors (IF)	Contractor	3.1
The coordination between several subcontractors' schedules	Internal Factors (IF)	Contractor	3.1

Delay in materials procurements	Productive Factors (PF)	Materials (M)	3.1
Insignificant technical study (bidding stage) by the project's contractor	Internal Factors (IF)	Contractor	3.0
The slow response by the consultant engineer regarding testing and inspection	Internal Factors (IF)	Consultant / Designer	3.0
Financing by the contractor during construction	Internal Factors (IF)	Owner	3.0
Insufficient coordination among the parties by the contractor	Internal Factors (IF)	Contractor	3.0
Lack of qualified technical professionals in the contractor's staff	Internal Factors (IF)	Contractor	3.0

REASON	Category	Sub Category	Avg. rate
Equipment failure	Productive Factors (PF)	Equipment (E)	3.0
Unexpected conditions of the foundation encountered in site	Internal Factors (IF)	Consultant / projects Designer	2.9
Cash flow by the contractor to subcontractors during execution.	Internal Factors (IF)	Contractor	2.9
Lack of qualified technical professionals in the contractor's staff	Internal Factors (IF)	Contractor	2.9
Inadequate equipment	Productive Factors (PF)	Equipment (E)	2.9
Cash flow by the owner during construction to the contractor	Internal Factors (IF)	Owner	2.8
Over design requirements raise the project's total cost	Internal Factors (IF)	Consultant / Designer	2.8
The contractor's project planning and schedule were insufficient.	Internal Factors (IF)	Contractor	2.8
Mobilization delay	Internal Factors (IF)	Contractor	2.8
Variation orders of construction materials and specifications during execution.	Productive Factors (PF)	Materials (M)	2.8
Government regulations and laws are changing.	External Factors (EF)	Government Regulations	2.7
Weather conditions on site	External Factors (EF)	Weather conditions	2.7
Unrealistic project time schedule	Internal Factors (IF)	Contractor	2.7
Coordination and communication among several subcontractors' schedules	Internal Factors (IF)	Contractor	2.7
Lack of relevant data in estimating phase for duration , and resources	Internal Factors (IF)	Contractor	2.7
Site preparation delay	Internal Factors (IF)	Owner	2.6
Contracts and agreements are written poorly	Internal Factors (IF)	Consultant / Designer	2.6
Insignificant feasibility study of the project	Internal Factors (IF)	Consultant / Designer	2.6
Issues in soil investigation	Internal Factors (IF)	Consultant / Designer	2.6
A large number of participants in project implementation	Internal Factors (IF)	Contractor	2.6
Leakage in communication with consultant/owner	Internal Factors (IF)	Contractor	2.6
The contractor's organization doesn't follow safety regulations.	Internal Factors (IF)	Contractor	2.6
Leakage in communication with suppliers	Internal Factors (IF)	Contractor	2.4

Issues with neighbors	External Factors (EF)	Other	2.4
Failure to use tools to manage the project in a symmetrical professional way	Internal Factors (IF)	Owner	2.4
Using obsolete technology	Internal Factors (IF)	Contractor	2.4
Construction accidents	External Factors (EF)	Other	2.3

Table 3: Reasons for Owner ranking

REASON	Category	Sub Category	Avg. rate
Shortage of materials and procurement	Productive Factors (PF)	Materials (M)	3.3
Coordination and communication among several subcontractors' schedules	Internal Factors (IF)	Contractor	3.3
Over-design raises the total cost	Internal Factors (IF)	Consultant / Projects Designer	3.2
consultant engineer's delay to approve (material or drawings) submissions for contractor	Internal Factors (IF)	Consultant / Projects Designer	3.1
Approval of shop drawings and material submittals.	Internal Factors (IF)	Consultant // Projects Designer	3.1

REASON	Category	Sub Category	Avg. rate
The owner's decision-making process is too slow.	Internal Factors (IF)	Owner	3.0
The contractor's lack of cooperation and coordination among the parties	Internal Factors (IF)	Contractor	3.0
Cash flow by the owner during construction	Internal Factors (IF)	Owner	2.9
Variation orders from the owner	Internal Factors (IF)	Owner	2.9
The consulting engineer's response time for testing and inspection seemed slow.	Internal Factors (IF)	Consultant // Projects Designer	2.9
A large number of project parties project during the implementation phase	Internal Factors (IF)	Contractor	2.9
Manpower shortage (skilled, semiskilled, unskilled labor)	Productive Factors (PF)	Labor (L)	2.8
Contracts and agreements are written poorly	Internal Factors (IF)	Consultant / Designer	2.8
Discover unexpected foundation conditions on the site	Internal Factors (IF)	Consultant / Designer	2.8
Leakage in communication with suppliers	Internal Factors (IF)	Contractor	2.8
Labor productivity	Productive Factors (PF)	Labor (L)	2.8
Labor Shortage	Productive Factors (PF)	Labor (L)	2.7
Owner's payments (cash flow) delays to the contractor	Internal Factors (IF)	Owner	2.7
Lack of relevant data and database of estimating phase for duration , and resources	Internal Factors (IF)	Contractor	2.7
Using improper construction techniques by the contractor	Internal Factors (IF)	Contractor	2.7

Mobilization delay	Internal Factors (IF)	Contractor	2.6
Difficulties in obtaining work permits	External Factors (EF)	Government Regulations	2.6
Weather conditions on site	External Factors (EF)	Weather	2.6
Insignificant technical study (bidding stage) by the project's contractor	Internal Factors (IF)	Contractor	2.6
Equipment failure	Productive Factors (PF)	Equipment (E)	2.6
Variation orders of construction materials and specifications during execution.	Productive Factors (PF)	Materials (M)	2.5
Delay in materials procurements	Productive Factors (PF)	Materials (M)	2.5
Lack of qualified technical professionals in the contractor's staff	Internal Factors (IF)	Contractor	2.5
Equipment failure	Productive Factors (PF)	Equipment (E)	2.4
Failure to use tools to manage the project in a symmetrical professional way	Internal Factors (IF)	Owner	2.4
Poor leadership on part of the sub-contractors	Internal Factors (IF)	Contractor	2.4
Financing by the contractor during construction	Internal Factors (IF)	Contractor	2.4
The contractor's project planning and schedule were insufficient.	Internal Factors (IF)	Contractor	2.3
Government regulations and laws are changing.	External Factors (EF)	Government Regulations	2.3
Delays in site preparation	Internal Factors (IF)	Owner	2.3
Insignificant feasibility study of the project	Internal Factors (IF)	Consultant / Designer	2.3
The contractor's organization doesn't follow safety regulations.	Internal Factors (IF)	Contractor	2.3
Equipment shortage	Productive Factors (PF)	Equipment (E)	2.3
Issues in soil investigation	Internal Factors (IF)	Consultant / Designer	2.2

REASON	Category	Sub Category	Avg. rate
Using obsolete technology	Internal Factors (IF)	Contractor	2.2
Lack of communication with consultant / owner	Internal Factors (IF)	Contractor	2.2
Cash flow by the contractor during execution to subcontractors	Internal Factors (IF)	Contractor	2.1
Issues with neighbors	External Factors (EF)	Others	2.0
Unrealistic project time schedule	Internal Factors (IF)	Contractor	2.0
Construction accidents	External Factors (EF)	Others	1.9

Table 4: The identified delay factors on construction projects due to the COVID-19 pandemic

SN	Delay factors	Factor definitions
1	Legal difficulties (F1)	If shipping is late, the client may seek legal recourse. When construction projects fail to generate enough revenue, the contractors involved often struggle to meet their financial obligations. Real estate that has been hypothetical and might potentially result in a large loss could lead to the bank taking action to seal the property.
2	Material delay (F2)	Many industries had to close, either temporarily or permanently, because of the lockdown, which caused a lack of raw materials. In that area, interstate traffic has ceased, halting the transfer of products between states. another
3	Customer marketing (F3)	The Quarantine prevents contractors from frequently canvassing their sites, limiting their marketing efforts. Neither a building nor a home exhibition could be planned. Less time spent chatting face-to-face.
4	Cautious buyers (F4)	Job insecurity and pay cuts have resulted in a financial crisis. prompting prospective purchasers to put their property purchases on the wait
5	Shortage of labor (F5)	With the implementation of COVID-19, migrant workers clamored to return to their respective home nations, resulting in a severe labor shortage.
6	Impact on dependent businesses (F6)	Construction activity has a significant impact on the iron and steel industry, wood industry, fabrication units, sanitary products, electrical fittings, and interior design enterprises.
7	Project delay (F7)	Huge project delays occurred as a result of issues in the supply chain caused by a lack of workers, a delay in materials, quarantine regulations, and financial difficulties for both customers and the company.
8	Uncertainty of demands (F8)	Prospective purchasers will be hesitant to make large purchases since their future is not guaranteed, either financially or medically, until a vaccine is developed. Companies have a tough time predicting consumer demand, which means that developers will be wary about starting new initiatives.
9	Deterioration in material quality (F9)	Current inventory, such as iron and steel, would have corroded and rusted throughout the lockdown time, decreasing their tensile strength. Cement, when exposed to moisture, would build up.
10	Insufficient usage renewable resources (F10)	The lockdown has resulted in the inactivity of extremely costly and large machinery used for pilling or hauling, resulting in the premature failure of moving components and the waste of man hours. Assembled lockdown, first. Even after going into lockdown, it was necessary to cut staff numbers.
11	Financial loss (F11)	Firms paid employees to keep them from leaving, while contractors took out massive loans to pay for the expensive equipment and staff they needed. And they will have a hard time repaying it while they are unemployed.

4 Conceptual design checklist of critical delay factors that may affect construction projects

- According to the average of the three groups, we find that a lack of available labor (regardless of whether that labor is skilled, semi-skilled, or unskilled) is the leading reason for the delay in private projects in KSA. The lack of materials was the most common reason given by the owner, and it was also one of the top four reasons given by the other three categories, as a result of the high rates required to attract and retain competent international workers, Saudi Arabia's construction sector is forced to rely on low-cost, unskilled labor from elsewhere in the Middle East region.
- The delay in the consultant engineer's approval of contractor submissions is a major source of contractor complaints and, from their perspective, the second most significant cause of project delays. The project usually runs behind schedule since the contractor can't begin or end work without the engineer's approval. We've seen that some contracts give the engineer a limited amount of time to approve the contractor's work (24 hours, for example), which causes significant delays since the contractor is unable to begin work until they've received the necessary go-ahead. Moreover, there are situations in which the engineer has the power to require the contractor to redo work that was begun without consent.
- From the perspectives of the contractor, the consultant, and the owner, a lack of materials is the third most common reason, while the most common reason from the owner's perspective is a delay in the project's progress. And the significant rise in the cost of materials might be the crucial factor here; this could be due to the rising demand for a particular material, the monopolization of that material, or import/export issues that make it difficult to get sufficient material quantities.
- Regarding relationship among several subcontractors' schedules as the list in three groups, is one of the most significant delay factors. This reason is critical and one of the most important delay causes indicated by the consultant was "insufficient coordination among the parties by the contractor," and one of the most important delay causes indicated by the owner was "the connection among the various subcontractors' schedules." As a consequence, both the consultant and the owner fault the contractor for inadequate project execution, coordination, and planning. Furthermore, there is broad agreement among participants on some of the lowest causes, such as "accidents during building," "neighbor issues," and "changes in government laws and legislation."

5 Checklist of delay factors with statistics results

Questionnaire Design:

In accordance with the study aim, the main purpose of this questionnaire was to study of the analysis the design of design Checklist of critical delay factors that may affect construction projects

• Statistical process:

The following statistical process and results through statistical software application (SPSS) were used:

- A one-way analysis of variance ANOVA was carried out among the means of responses from the three groups to see whether there were any significant variations in the groups' assessments of the relevance of the different delay factors.
- The mean values for such three groups, F statistics, and the P values at which the hypothesis of equal mean values across groups could be rejected were obtained.
- For 2° and 117° degrees of freedom, the tabular critical F value at the 0.05 level is roughly (3.074).
- According to the results of the study, there were statistically non-significant differences across the respondent groups for the following factors:

Delay Factor	F	P
Shortage in labor	1.65	0.196
Labor productivity	1.93	0.15
Materials Shortage	0.08	0.923
Delay in materials procurements	2.27	0.108
Variation orders in materials types and specifications during construction	0.4	0.674

The following causes have the highest F values which indicate a very strong agreement among the respondents from the three groups over the following sample of factors:

Delay Factor	F	P
Manpower Shortage (skilled, semiskilled , and unskilled labor)	3.33	0.039
Equipment Shortage	5.95	0.003
Safely rules and regulations aren't followed in contractors firm	4.47	0.013
Delays in contractor's cash flow payments to subcontractors	5.81	0.004
A large number of participants in project implementation	3.73	0.027

6 CONCLUSION

This research studied and analyzed the impacts of the COVID-19 pandemic on the construction industry, both private and public. It has been statistically demonstrated that the most critical factors are project suspension, manpower impact and job loss, schedule overrun, cost overrun, and financial impact. According to the interviews, the economic effect is enormous for all project stakeholders and the workforce.

- To minimize and delay the spread of the infectious virus, project developers are striving to mitigate the effect by minimizing the number of employees' on-site and encouraging off-site work.
- Overall, technology plays an enormous role in surviving these problems so firms should start embracing innovation. Using construction project management software, for instance, can help resolve labor shortage issues (through proper scheduling), low productivity rates, safety issues, and so on. So, consider digital solutions to assist your firm recover from construction challenges.
- In general, two of the three parties (Consultant and Contractor) had an agreement over the most important cause which is the shortage of manpower (skilled, semiskilled, unskilled labor), and there was an agreement between the two parties on the other top-ranked causes.

7 RECOMMENDATIONS

The following are some recommendations provided by all parties to mitigate, manage and mitigate delays in the construction project since all parties agree that as following:

1. The following are some considerations for consultants :
 - It is important to move quickly when reviewing and approving design papers and when providing the go-ahead to the contractor to begin construction.
2. The following are some considerations for contractors:
 - Labor shortage and low productivity: a sufficient number of labors should be allocated and motivated to enhance productivity.
 - Improve scheduling coordination among subcontractors.
 - Avoid the contractor's weak communication among the participants.
 - Financial payments and cash flow issues as a contractor should manage the project's financial resources and arrange for cash flow by using periodical payments.
3. The following are some considerations for Owners
 - Avoid making too several modifications (variation orders in the project's items after the bidding period have ended.
 - Make prompt decisions to avoid delaying the process.
 - Avoid payment delays for each contractor and consultant.
 - Before giving the contract to the lowest bidder, check for resources and capabilities.

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