The Status of the Saudi Construction Industry during the COVID-19 Pandemic

Saud Almutairi 1,*, Mudthir Bakri 1,2,*, Abdullatif A. AlMunifi 1,3, Mohammed Algahtany 4 and Saud Aldalbahy 5

Abstract: The outbreak of COVID-19 has had a profound impact on the Saudi construction industry as well as the country’s economy. The pandemic jeopardized the positive perspectives and growth in megaproject numbers, as it has amplified the constraints that prevent the construction sector from realizing growth. This research work is intended to evaluate the status of the Saudi construction industry during the COVID-19 pandemic. In order to achieve this objective, a three-phased methodology was developed. In the first part of the research, semi-structured interviews with forty industry experts were conducted. The gathered data from both, the literature review and interviews were synthesized. This process resulted in four domains to be explored: project performance measurement, workforce, supply chain, and financial management. The outcomes from phase one were then utilized to develop a questionnaire survey that was communicated to construction firms all over Saudi Arabia, for which 124 responses were received. Data analysis was carried out, and the obtained results were clarified and triangulated through a focus group discussion in the third phase of the research. The outcomes from the mixed-methods research methodology were aggregated to enrich and interpret findings and draw conclusions and recommendations. The findings indicate that the pandemic has had a total of ten core impacts. The highly impacted areas in the industry were the technical performance of projects, reduction in productivity, risk management practices, downsizing the scope of ongoing projects, reduction in new projects or contracts, material shortage, recruitment of manpower in the construction firms and affiliated projects, and the financial performance of the organization. In the meantime, it was found that the government implemented mitigation measures from which the sector benefited, where 27% of contractors obtained Saned system assistance, 51% received cash compensation and 22% received tax postponement. The scope of this study is limited to exploring the status of the Saudi construction industry (SCI) during the COVID-19 pandemic. The study findings are of added value and represent a significant contribution to the body of knowledge in the field. However, further research on the exit strategies bringing the industry to the new normal, including the use of cutting-edge technologies in the age of multi-faceted disruption would be of great importance.

Keywords: COVID-19; construction sector; supply chain; workforce mobility; productivity

1. Introduction

The Saudi construction industry entered 2020 with good perspectives after the 2019 growth in megaproject numbers. The outbreak of COVID-19 greatly affected the sector, with a good portion completely stopping work due to the interruption of its employees...
engaging in activities throughout the period of severe restrictions and precautions during the 2020 second quarter [1]. The COVID-19 pandemic has amplified the constraints that prevent the construction sector from realizing growth, such as the regulations, the heavy dependence upon expatriate labor for work on large infrastructure projects, the lack of enough domestic workers to meet the labor force’s needs, and the insufficient production of building materials domestically [2].

The labor-intensive nature of the construction sector, which employs more than 3.5 million workers, adds financial strain on contractors to maintain their workforce while also facing mobility restrictions [3]. It is to be pointed out that the foreign workers in the building and construction sector represent more than 88% of the total. The majority of them live in very crowded buildings. This increased the viral infection and consequently increased the number of infected cases. This led authorities to issue regulation for workers’ housing [3,4]. While the trend in the international construction markets was to build, convert, facilitate and manage spaces to mitigate the coronavirus pandemic impacts [5–7], the SCI response was not comparable. The Saudi construction industry faced enormous hurdles in 2020 as a consequence of the COVID-19 pandemic and considerable decreases in state income due to reduced oil prices. Numerous project owners and operators experienced government-mandated health and safety measures, financial constraints, interruptions in global supply chains, limitations in workforce capacities, and movement restrictions.

A study [8] by the US–Saudi Business Council (USSBC), reveals that this resulted in the lowest value of granted contracts in 2020, which amounts to 80 billion Saudi Riyals. The USSBC Contract Awards Index (CAI) decreased to 95.4 points in the fourth quarter of 2020, indicating that projects nearing completion would likely stall. The decline in approved contracts, along with a rise in project delays and cancellations throughout the design and feasibility stages, caused the CAI to decrease below the 100-point mark. In the face of a worldwide pandemic and unpredictable crisis, the construction industry saw sharp decreases in the number of granted contracts as well as the execution of current projects. Companies struggled with low demand and major interruptions to global supply networks, which harmed the financial and human capital conditions of building projects. To meet the demand for humanitarian assistance, the Saudi government was forced to slash funding in various sectors.

The Saudi contractors’ authority survey in May 2020 of 600 Saudi contractors, revealed the most common challenges, namely; the impact on cash flow (90%), project delay and stoppage (86%), and supply chain disruption (70%). Recent studies reported that the largest percentage of bankruptcy companies are construction companies [2,9,10].

Good efforts have been made by a number of researchers to explore the impact of the COVID-19 pandemic on the economy and industrial sectors [1,9,11,12]. Fernandez, N. [13] investigated the economic consequences of the pandemic outbreak on the economies of 30 nations and found that the GDP is likely to be affected by 3–6% and the economies of some countries may contract by up to 13%. The study included the service-oriented economy, which was damaged and where jobs were at high risk. In addition to that, the countries that depend on exports and international trade are expected to have their GDP negatively affected [14]. Hao et al. [15] and Harari [11] stated that the COVID-19 pandemic is the largest disaster of the generation and it could take years to recover, and determined action must be used to subsidize and design strategies to prevent the exertion of humanity.

A number of studies have demonstrated that the greatest negative effect occurred within the commerce, tourism and trade sectors [16–20]. However, Nicola et al. [21] stated that the constraints directed by the authorities resulted in less movement, triggering several industries to go out of business. Consequently job losses were recorded and caused an influence on socioeconomics [21]. Ivanov, D. [9] investigated the impact of the COVID-19 pandemic on the supply chain in the construction sector and concludes that the industry has been negatively impacted and the restoration will take longer than anticipated. It was found that putting in place ways to keep track of the supply chain and keeping in touch with key players enabled supply to be managed well during the pandemic and other similar
crises [10]. Helm, D [12] also pointed out that the total lockdown induced by the COVID-19 pandemic has seriously shortened economic activities. Researchers examined the impacts of the coronavirus pandemic on the building sector [1,5,10,22]. Furthermore, several studies have modelled the connection between COVID-19 pandemic safety regulations and the economic performance of projects, and between social capital, knowledge production, and construction productivity amid the COVID-19 pandemic [11,15,18]. The outcomes indicated that there is a need to concentrate on projects’ implications, establish sufficient financial plans, and ensure that the required resources as well as systems are available. During COVID-19, organizational administration and information transmission, as well as projects’ workforces should be strengthened.

There is a lack of studies and research on the impact of the COVID-19 pandemic on the SCI and the outlook on facing crises. Alhammadi’s study [4], was limited to investigating the variables that affect how Riyadh’s construction industry is managed [23]. Almohassen et al. [24] mainly explored the consequences of COVID-19 on the safety measures used in construction projects in Saudi Arabia. The aforementioned studies are also lacking the connection between the COVID-19 pandemic’s impacts and industry’s response. Industry stakeholders and policymakers may benefit from a better synthesis between the effects and the response methods. Therefore, this research gap along with the scarcity of research on the SCI performance amid the COVID-19 pandemic should be filled. This will contribute to synthesizing data and building knowledge on the status of the Saudi construction industry during the COVID-19 pandemic and any future disruptions.

1.1. Research Questions

To understand how the COVID-19 pandemic has affected the SCI in different ways, the following questions were asked: How has the COVID-19 pandemic affected the SCI? And, to what degree did the industry respond to the issues that arose in the COVID-19 pandemic in a timely manner and with the appropriate tools?

1.2. Research Objectives

The outbreak of the COVID-19 pandemic has greatly affected the Saudi construction sector as well as the overall economy. The Saudi construction sector has chronic challenges, and the COVID-19 pandemic has amplified these challenges. Based on the previously stated questions and in light of the most beneficial practices, this research aims to study, in-depth, the status of the Saudi construction industry in the COVID-19 pandemic.

The research sections are organized as follows: an introduction on the status of the Saudi construction industry, and a review of relevant previous studies to recognize the research gap and what the contribution of this study would be to building knowledge in the field. The research methodology components are listed and described in detail. A thorough and systematic analysis of the collected data was carried out. This was followed up by discussing and triangulating the findings in a mixed-methods research approach to enrich and discuss the outcomes, as well as to provide solid conclusions and recommendations.

2. Research Methodology

2.1. Research Design

In order to obtain a solid response from the SCI on the main effects of the COVID-19 pandemic and to evaluate measures taken by the industry to mitigate the negative impacts on the performance of firms operating in this sector, this research followed the principles of a mixed-research methods approach. This method comprises collecting quantitative and qualitative data simultaneously or sequentially in a single study and integrating the data at one or more stages of the research process [25,26]. The combination of quantitative and qualitative approaches, which has gained popularity, provides an expanded understanding of research problems [25,27]. Our research efforts went through three phases as illustrated in Figure 1, the research methodology framework. This approach will give a broader
understanding of the research subject and will answer the research exploratory questions of “how” and “to what extent”.

**Start**

**Literature Review**

**Phase 1**

- **Pilot Interviews**
  - Forty semi-structured to uncover new COVID-19 effects and response tactics

**Study Domains**

**Phase 2**

- **Research Questionnaire**

**Phase 3**

- **Statistical Analysis of Collected Data from Questionnaires**
- **Focus Group Discussion**
- **Triangulation and clarifying findings and discussions**

**Conclusion and recommendations**

**Figure 1.** Schematic presentation of the research methodology framework.

2.2. **Phase 1. Semi-Structured Interviews**

The main domains of this study were developed through reviewing relevant previous studies and conducting remote semi-structured interviews that enabled researchers to attain descriptions of the circumstances resulting from the COVID-19 pandemic within the construction business of the interviewees. The interviewer, on the other hand, has a large say in how the conversation goes in areas that are important to the study [26, 28]. The profiles of the participants in the semi-structured interviews are shown in Table 1. The interviews that were comprised of the questions that are listed hereunder (Table 2), were
conducted with forty professionals in various capacities in the construction industry, and are located in different regions in the Kingdom of Saudi Arabia. The interviewees offered first-hand information on how the COVID-19 pandemic is influencing daily business, what remediation actions have been taken, and what measures the industry has adopted to mitigate the pandemic impacts.

Table 1. Profiles of participants in the semi-structured interviews.

<table>
<thead>
<tr>
<th>Categorization</th>
<th>Component</th>
<th>Frequency</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work experience</td>
<td>1–5 years</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>5–10 years</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>10–15 years</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>More than 15 years</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>Category</td>
<td>Contractors</td>
<td>26</td>
<td>65.0</td>
</tr>
<tr>
<td></td>
<td>Consultants</td>
<td>7</td>
<td>17.5</td>
</tr>
<tr>
<td></td>
<td>Owners</td>
<td>7</td>
<td>17.5</td>
</tr>
<tr>
<td>Role in the organization</td>
<td>Executive engineer</td>
<td>9</td>
<td>22.5</td>
</tr>
<tr>
<td></td>
<td>Project manager</td>
<td>22</td>
<td>55.0</td>
</tr>
<tr>
<td></td>
<td>Design engineer</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td>Enterprise owner</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>Financial officer</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Business type of the organization</td>
<td>Building contracting</td>
<td>18</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Infrastructure contracting (roads and bridges)</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td>Water and sewage infrastructure contracting</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Consultancy (design and supervision)</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Construction project management</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>

The study domains:
The review of the relevant previous studies along with the data collected from the semi-structured interviews enabled the researchers to draft the main domains of this study, namely: project performance measurement, workforce, supply chain, and financial management, as illustrated in Figure 2.
Table 2. The main research domains, questions, and quantitative data to be collected.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Questions</th>
<th>Data Acquired through the Questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project performance measurement</td>
<td>To what degree has COVID-19 impacted: the technical performance of the firm’s projects; the technical performance of the organization; the rate of implementation; the construction schedule changes; the risk management strategies; downsizing the project scope.</td>
<td>The COVID-19 pandemic seriously affected control and monitoring and caused a deficiency in supervision as a result of adaptive lockdown management and unclear safety conditions and procedures. This situation is expected to cause schedule changes, poor and clear recovery plans, disruption and slowness of work and workflow, and the downsizing of ongoing projects.</td>
</tr>
<tr>
<td>Workforce</td>
<td>To what degree has the COVID-19 pandemic: reduced the workforce’s productivity; caused difficulties in recruiting and employing manpower for the firm and its affiliated projects.</td>
<td>To find out how the Corona virus pandemic affected the workforce, the following points were investigated: labor shortage and mobility; increase in workload and its negative impact on labor productivity; and lack of expertise.</td>
</tr>
<tr>
<td>Supply chain</td>
<td>To what degree has the COVID-19 pandemic: affected the purchase of construction materials and supply systems used in construction operations; caused serious shortage of construction materials.</td>
<td>The consequences of the COVID-19 pandemic on the supply chain were investigated to understand to what extent the shortage of available materials in the local market increased during COVID-19 and if there was an absence of new suppliers during the pandemic.</td>
</tr>
<tr>
<td>Financial issues</td>
<td>To what extent has the COVID-19 pandemic: impacted the financial performance of the firms; the cash flow and payments.</td>
<td>The financial issues associated with the COVID-19 pandemic in the construction industry are expected to be an increase in expenses in the project’s and firm’s administration as the cost of material and equipment increased and unstable cash flows from due projects led some firms to bankruptcy.</td>
</tr>
</tbody>
</table>

2.3. Phase 2. Questionnaire Survey

Grounded on the qualitative findings, a quantitative instrument (a questionnaire survey) was appropriately structured to provide a more comprehensive data set. The benefit of a structured questionnaire is that responses will be made according to domains that have already been set up. This means that the data will be consistent, and the data analysis will be well-organized [29]. Closed-ended questions were designed to elicit predominantly quantitative data, with the participant choosing from a predetermined set of answer alternatives. The main domains, along with questions, are shown in Table 2. These were inserted into an e-template and communicated to participants through electronic means.

2.3.1. Conducting a Pilot Test and Refining the Questionnaire

A pilot test can identify design and instrumentation shortcomings in a questionnaire [30]. The results of the qualitative interviews were used to create the items that describe how the COVID-19 pandemic crisis affected the construction industry, so that a more accurate and useful picture of the industry could be made. Each item was measured on a five-point Likert scale, with 1 indicating the least degree of impact and 5 representing the most. Additionally, the pilot test’s input is essential for refining the questionnaire’s quality and estimating the time required for completion [27,30,31]. The pilot testing was performed to refine and improve the survey questions. Consequently, a pilot test was carried out in two stages, initially with four college professors, and later with fifteen project managers of different project sizes, and experts from consulting firms. In addition, each
participant in the pilot research had more than ten years of experience in the SCI. Respondents to the pilot test were requested to provide comments and suggestions on the survey in terms of questions that needed to be added and/or removed, clarification necessary for consistent comprehension across all respondents, and typos or mistakes present in the survey. Ultimately, the authors re-evaluated all respondents’ suggestions and modified the survey appropriately. This method of pilot testing permitted the researchers to assure additional response alternatives, add further questions linked to characterizing the sample, eliminate redundancies, and ensure the comprehension of all survey respondents. It is crucial to highlight that data from pilot testing was excluded from the final sample to ensure that data collection and analysis were performed identically each time [32].

2.3.2. Population, Sampling Technique and Sample Size Determination

The population is defined as the set of respondents who meet the specific criteria provided for the purpose of study analysis. The study’s cohort consisted of professionals in the construction industry, namely project managers, office engineers, site engineers, and contractors. According to the Saudi contractors authority, the number of classified contractors reached a total of 2500 in the year 2022 [4,5]. The utilization of a random sampling technique was implemented to guarantee the representativeness of the population, thereby ensuring the reliability of the analysis. The researchers determined the sample size of the participants by utilizing the equation for a 95% confidence level [6,7].

\[ S = s'/(1+s' / n) \]

where, \( S \): total number of the population; \( n \): sample size from a finite population; \( s' \): sample size from an infinite population, \( SV \): variance of the elements in the population, and \( SR \) is the standard error of the sampling population (usually, \( SV = 0.5 \) and \( SR = 0.0437 \)).

Consequently, \( s' = 100 \) for \( Population = 2500 \); hence, \( n = 124.39 \), thus \( \approx 124 \) respondents reach a 95% confidence level. It was calculated that a 124 respondent responses should be received. Therefore, 180 questionnaires were sent out, and once the responses reached 124, the online questionnaire was closed. The margin of error (ME) for the quantitative analysis was calculated using the following expression [19]

\[ ME = z \times \sqrt{(1 - \hat{p})\hat{p}/n} \]

and found to be equal to 4.38%.

2.4. Phase 3. Focus Group Discussions

A qualitative approach was utilized to supplement, triangulate, and clarify the findings. Focus groups have been used in qualitative research in many different fields and for many different purposes [33–35]. In addition, this approach may be used to investigate and unearth a clear insight into occurrences or instances [22,32]. It is accomplished through dialogic sessions in which power dynamics between researchers and research participants are considered [16,19]. The focus group discussions were held via Microsoft Teams 1.5 and Zoom 5.15, and the profiles of participants are shown in Table 3.
Table 3. Profiles of participants in the focus group discussions.

<table>
<thead>
<tr>
<th>Organization Type</th>
<th>Role</th>
<th>Years of Experience</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction contracting firms</td>
<td>Chief executive officer</td>
<td>18, 22</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Project managers</td>
<td>12–25</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Project planners</td>
<td>9, 14</td>
<td>2</td>
</tr>
<tr>
<td>Consultancy</td>
<td>Project managers</td>
<td>7–15</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Quality engineer</td>
<td>12</td>
<td>1</td>
</tr>
</tbody>
</table>

3. Analysis and Results

3.1. Reliability

Reliability tests determine the items and scales of internal consistency. Cronbach’s alpha adequacy is used to examine dependability and it is recommended that the range of Cronbach’s alpha be between 0.70 and 0.95 [36]. Cronbach’s alpha has been calculated for the collected data and found to be between 0.701 and 0.774 as shown in Table 4. This table shows that the responses on a five-point Likert scale are reliable at the 5% significance level, and consequently the collected data is reliable for sound analysis [23,36].

Table 4. Test of reliability for impacts of the COVID-19 pandemic on the SCI.

<table>
<thead>
<tr>
<th>Impact Factor</th>
<th>Corrected Item-Total Correlation</th>
<th>Cronbach’s Alpha if Item Deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ability to purchase the needed materials and systems used in construction operations</td>
<td>0.293</td>
<td>0.711</td>
</tr>
<tr>
<td>The financial performance of the firms’ projects</td>
<td>0.379</td>
<td>0.708</td>
</tr>
<tr>
<td>The technical performance of the firms</td>
<td>0.096</td>
<td>0.747</td>
</tr>
<tr>
<td>Reduction in workforce productivity</td>
<td>0.089</td>
<td>0.767</td>
</tr>
<tr>
<td>Review and change in risk management policies</td>
<td>0.427</td>
<td>0.712</td>
</tr>
<tr>
<td>Continuous schedule changes</td>
<td>0.603</td>
<td>0.753</td>
</tr>
<tr>
<td>Downsizing of current projects</td>
<td>0.342</td>
<td>0.704</td>
</tr>
<tr>
<td>The COVID-19 impact on cash flow and payments</td>
<td>0.513</td>
<td>0.726</td>
</tr>
<tr>
<td>Materials shortage</td>
<td>0.417</td>
<td>0.701</td>
</tr>
<tr>
<td>Recruit and employ manpower in the firm and its affiliated projects</td>
<td>0.533</td>
<td>0.745</td>
</tr>
</tbody>
</table>

3.2. The Sample Characteristics

The total number of responses received from the survey questionnaires was 124. All respondents work in civil engineering, architecture, or a closely related field to the construction industry. This ensured that the respondents had a solid academic and professional foundation.

Figure 3 shows the role and position of the respondents in the firms, where project managers represent 50.81% of the whole population; 30.65% construction engineers; 7.2% firm owners; 9.68% design engineers; and 1.61% administrative and financial officers. As stated earlier, the survey mainly targeted project managers and construction engineers, who comprised around 82% of the total respondents.

The respondents were working in a number of construction and consulting firms that are active in various fields. Figure 4 shows the types of business that firms are practicing. The vast majority of the respondents (45.5%) are in the building and construction sector. This includes commercial and office structures, as well as educational and health institutions. A total of 16.9% are active in roads and bridges, and 11.7% in water and sanitation projects. The construction project management firms that practice both, design
and supervision, represent 22.1%, while consulting firms that are active only in design are 18.2%, and 28.6% are in supervision.

![Figure 3](image1.png)

**Figure 3.** Roles of the respondents in the organizations.

The organization’s classification and size play a key role and are regularly pertinent to the capacity of contracts and complexity of projects that a company may simultaneously initiate. To assure contractors’ capabilities and performance, the Saudi government uses the low-bid delivery method and the contractor’s classification system as the foundation of the primary qualities contractors must possess for the vast majority of public contract work. Current grading criteria include seven categories and five levels. To determine a contractor’s categorization in a certain industry, classification grades are used. Through grades 1 through 5, the contractor will be restricted to a certain maximum financial value for a project, and he will be permitted to complete the project in his particular field. The contractor is not required to have a grade if the project does not exceed its upper limit [19,24,25]. As presented in Figure 5, the response to the questionnaire survey shows that 50% of the respondents fall within the first class. The consulting firms that responded to the questionnaire made up 20.16% of the total respondents, whereas 17.74% were classified and 2.42% were not. For the purpose of the analysis in this research, a sub-classification into large and medium size contractors, and consultants was adopted. Large size contractors (LSC) have a number of employees that is 500 or more, medium size contractors (MSC) have a number of employees that ranges from 50 to 500, and the consultants are as shown in Figure 6.

### 3.3. Impact of COVID-19 on the Saudi Arabian Construction Sector

The findings of the semi-structured interviews were used to create domains outlining the consequences of the COVID-19 pandemic crisis on the SCI. Table 5 summarizes answers by mean, standard deviation, and range. It reveals that the participants reached a considerable consensus on the impacts on the Saudi construction industry. The top six majorly affective factors amid the pandemic situation can be seen in Table 5 and Figure 7. These are technical performance reduction, reduction in new projects, the sharp reduction in productivity rate due to the restrictions on mobility of the workforce and restrictions on travel as well, the change in risk-tackling procedures, and the downsizing of the scope of the ongoing projects. Moderate impacts are the financial performance of the projects, and the ability to purchase the materials and systems needed for construction.
shown in Figure 6.

tractors (LSC) have a number of employees that is 500 or more, medium size contractors have a number of employees that is 500 or more, and 28.6% are in supervision.

Figure 4.

3.3. Impact of COVID-19 on the Saudi Arabian Construction Sector

The responses according to the contractors' classification system.

This includes commercial and other services. A total of 16.9% are active in roads and bridges, and 11.7% in water and sanitation works. The respondents made up 20.16% of the total respondents, whereas 17.74% were classified as engineers.

Infrastructure Contracting (roads and bridges)

Infrastructure Contracting (water and sanitation works)

Others

45.50%

28.60%

22.10%

18.20%

16.90%

11.70%

11.70%

Figure 4. Construction and consulting firms’ activity fields.

Figure 5. The responses according to the contractors’ classification system.

The respondents were working in a number of construction and consulting firms according to size. Figure 5 shows the types of business that firms are practicing.

Building Contracting

Engineering consulting (supervision works)

Construction project management firms

Engineering consulting (Design works)

Infrastructure Contracting (roads and bridges)

Infrastructure Contracting (water and sanitation works)

Others

45.50% 28.60% 22.10% 18.20% 16.90% 11.70% 11.70%

0 0.1 0.2 0.3 0.4 0.5 0.6

Figure 6. The responses of the firms according to size.

The organization's classification and size play a key role and are regularly pertinent factors amid the pandemic situation. The top six findings of the semi-structured interviews were used to create domains outlining the consequences of the COVID-19 pandemic crisis on the SCI. Table 5 summarizes answers by mean, standard deviation, and range. It reveals that the participants reached a considerable consensus on the impacts on the Saudi construction industry.

The vast majority of the respondents (45.5%) are in the building and construction sector. The organization's classification was used as the foundation for this study. The construction and consulting firms are practicing. Engineering consulting (supervision works) and construction project management firms are 22.1% and 28.6% of the respondents, respectively.

The respondents were working in a number of construction and consulting firms according to size. Figure 5 shows the types of business that firms are practicing.

Building Contracting

Engineering consulting (supervision works)

Construction project management firms

Engineering consulting (Design works)

Infrastructure Contracting (roads and bridges)

Infrastructure Contracting (water and sanitation works)

Others

45.50% 28.60% 22.10% 18.20% 16.90% 11.70% 11.70%

0 0.1 0.2 0.3 0.4 0.5 0.6

Figure 6. The responses of the firms according to size.

The organization's classification and size play a key role and are regularly pertinent factors amid the pandemic situation. The top six findings of the semi-structured interviews were used to create domains outlining the consequences of the COVID-19 pandemic crisis on the SCI. Table 5 summarizes answers by mean, standard deviation, and range. It reveals that the participants reached a considerable consensus on the impacts on the Saudi construction industry.

The vast majority of the respondents (45.5%) are in the building and construction sector. The organization's classification was used as the foundation for this study. The construction and consulting firms are practicing. Engineering consulting (supervision works) and construction project management firms are 22.1% and 28.6% of the respondents, respectively.

Figure 5. The responses according to the contractors’ classification system.
Table 5. Impact of COVID-19 on the Saudi construction industry—test value = 3.5.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Impact Rank</th>
<th>Impact</th>
<th>Mean</th>
<th>T</th>
<th>Sig (2-Tailed)</th>
<th>Std. Deviation</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IM#2</td>
<td>The technical performance of the firm’s</td>
<td>4.315</td>
<td>10.56</td>
<td>0</td>
<td>0.859</td>
<td>0.662−0.967</td>
</tr>
<tr>
<td></td>
<td>IM#4</td>
<td>Review and change in risk management policies.</td>
<td>4.202</td>
<td>9.036</td>
<td>0</td>
<td>0.865</td>
<td>0.548−0.855</td>
</tr>
<tr>
<td></td>
<td>IM#6</td>
<td>Downsizing of current projects</td>
<td>4.097</td>
<td>7.909</td>
<td>0</td>
<td>0.84</td>
<td>0.447−0.746</td>
</tr>
<tr>
<td></td>
<td>IM#5</td>
<td>Continuous schedule changes</td>
<td>4.137</td>
<td>8.002</td>
<td>0</td>
<td>0.886</td>
<td>0.496−0.795</td>
</tr>
<tr>
<td>Work force</td>
<td>IM#3</td>
<td>Reduction in workforce productivity</td>
<td>4.226</td>
<td>8.72</td>
<td>0</td>
<td>0.927</td>
<td>0.561−0.891</td>
</tr>
<tr>
<td></td>
<td>IM#9</td>
<td>Recruitment and employing manpower in the firm and its affiliated projects</td>
<td>3.694</td>
<td>4.202</td>
<td>0</td>
<td>0.513</td>
<td>0.102−0.285</td>
</tr>
<tr>
<td>Supply chain</td>
<td>IM#8</td>
<td>Materials shortage</td>
<td>3.952</td>
<td>6.41</td>
<td>0</td>
<td>0.785</td>
<td>0.312−0.591</td>
</tr>
<tr>
<td></td>
<td>IM#1</td>
<td>Difficulties in purchasing materials and systems</td>
<td>4.669</td>
<td>22.4333</td>
<td>0</td>
<td>0.58</td>
<td>1.066−1.2725</td>
</tr>
<tr>
<td>Financial management</td>
<td>IM#10</td>
<td>The financial performance of the firm’s projects</td>
<td>3.073</td>
<td>−5.553</td>
<td>0</td>
<td>0.857</td>
<td>−0.58−−0.275</td>
</tr>
<tr>
<td></td>
<td>IM#7</td>
<td>The impact of COVID-19 on cash flow and Payments</td>
<td>3.976</td>
<td>5.579</td>
<td>0</td>
<td>0.95</td>
<td>0.307−0.645</td>
</tr>
</tbody>
</table>

Figure 7. Recognized impacts from the questionnaire.
4. Findings and Discussion

4.1. Project Performance Measurement

4.1.1. Technical Performance Reduction

Figure 8 shows different aspects of the performance of construction projects as a consequence of COVID-19; these aspects vary due to the suspension of some projects, where 52.47% reported that their projects were temporarily suspended amid COVID-19. Responses revealed that the temporary suspension was the government’s way of adapting to the spread of lockdown tactics in each region. The total stopped projects reached 30.65% because of problems with cash flow and payments from project owners, whose income was affected by COVID-19.

In addition, significant performance concerns have emanated from the COVID-19 pandemic, including hiring freezes and layoffs; salary freezes, rejected bonuses, and payment reduction; and greater employee stress and fatigue [27,36]. Construction workers who have managed to maintain their positions experienced salary freezes, forfeited bonuses, and compensation reductions. Employers had imposed 29% compensation reductions, 42% salary freezes, and 37% bonus cutbacks [26].

The absence of construction expertise during the pandemic period was a serious obstacle and had a substantial influence on the performance of the construction industry in general. It worsened the management capabilities and problem-solving capacities during the crisis. In order to properly handle any impending crisis, the management must prepare for the preservation and growth of these specialists.

Results from the questionnaire revealed that the level of impact had the same tendency in the groups of LSC, and MSC, as shown in Figure 9. The most obvious impacts are the total stoppage and temporary suspension of firms’ projects. Stoppage of projects had a minimal impact on consulting firms, since the ability to manage some consulting tasks remotely is feasible compared to field construction tasks.

4.1.2. Review and Change in Risk Management

As seen in Table 5, review and change in risk management had a significant impact on the project performance management. Whereas the mean of this impact was 4.202, the analysis revealed that COVID-19 created a number of emanating risks. Those risks lead construction firms to figure out and manage the risk as the situation changes [5].
to the spread of lockdown tactics in each region. The total stopped projects reached 30.65% because of problems with cash flow and payments from project owners, whose income was affected by COVID-19. In addition, significant performance concerns have emanated from the COVID-19 pandemic, including hiring freezes and layoffs; salary freezes, rejected bonuses, and payment reduction; and greater employee stress and fatigue [27,36]. Construction workers who have managed to maintain their positions experienced salary freezes, forfeited bonuses, and compensation reductions. Employers had imposed 29% compensation reductions, 42% salary freezes, and 37% bonus cutbacks [26].

Figure 8. Impacts on construction projects' performance during COVID-19.

The absence of construction expertise during the pandemic period was a serious obstacle and had a substantial influence on the performance of the construction industry in general. It worsened the management capabilities and problem-solving capacities during the crisis. In order to properly handle any impending crisis, the management must prepare for the preservation and growth of these specialists.

Results from the questionnaire revealed that the level of impact had the same tendency in the groups of LSC, and MSC, as shown in Figure 9. The most obvious impacts are the total stoppage and temporary suspension of firms' projects. Stoppage of projects had a minimal impact on consulting firms, since the ability to manage some consulting tasks remotely is feasible compared to field construction tasks.

Figure 9. Comparison of the COVID-19 impact on the technical performance according to firm size.

The respondents showed that they face different risks; first, completion risk in light of the fact that COVID-19 led to a severe lockdown that delayed projects' completion. The second is the commercial risk which involves increased labor costs, fluctuating commodity prices, and prolonged performance expenses. Third, contractual risk arose when contingencies from delays, disruptions, and commercial risk put pressure on agreements and allotted the party to reduce such risk.

4.1.3. Downsizing Project Scope

The COVID-19 pandemic had a high impact on ongoing construction projects, the mean of this impact was 4.097 as presented in Table 5. Most of the project owners decided to downsize the scope of the ongoing projects as a result of a lack of cash flow and a reduction in their income. Consequently, the contracting and consulting firms responded to the downsizing and its liquidity by laying off workers, suspending or closing branches and offices, and consolidating their work and workforce [28].

4.1.4. Continuous Schedule Changes

As COVID-19 spread, the scheduled activities began to be delayed and rescheduled. In the surveyed responses, it was found that 86.5% of large sized contractors and 61.1% of the medium sized contractors revealed that their projects were subjected to recurring schedule changes and delays due to lockdown, an increased number of infected laborers and other staff, and delays in materials and systems delivery due to supply chain issues [29–31]. The unclear situation considering material and resource shortages and financial constraints complicates the process of making recovery schedules.

4.2. Workforce

4.2.1. Workforce Mobility and Recruitment Difficulties

Focus group participants agreed that disruptions resulting from COVID-19 caused considerable impacts in the various sectors of the SCI. Figure 10, illustrates that 70% of LSC and 20% of MSC had difficulties recruiting and employing manpower for their affiliated projects during and after the pandemic. In response to government directions for monitoring COVID-19, 75% of respondents indicated they had been directed to reduce their workforce by 50 to 70 percent. Such a personnel loss has a significant impact on the projects' schedules, which can be greater than the proportion of the manpower drop.
The participants also identified the closure of borders with neighboring countries as a potential factor that contributed to the delay of these initiatives. In addition, restrictions on the mobility of the workforce, especially those who were on annual leave in their home countries before the outbreak of COVID-19, the inability of the workforce to come back to their jobs had negative consequences, taking into consideration that the sector is approximately 90% dependent on foreign labor [17]. Some participants emphasized that the limitation of travel between cities was a significant factor in the project delays. Almost all Saudi Arabian cities have implemented curfews to prevent the spread of COVID-19.

Employing the staff and continuing shift work was found to be the main solution suggested by participants, who emphasized that such a work plan sustained a steady work tempo and allowed all employees to remain at their jobs.

4.2.2. The Impact of the COVID-19 Pandemic on Productivity

The drop in productivity was ranked as the second most negative impact, as illustrated in Table 5, where the mean value for productivity was 4.22. The drop in productivity of construction workers was noticeable in LSC firms, where it was recorded to be high to very high in more than 70% of firms as shown in Figure 11. This assessment is based on the findings from the questionnaire as well as the focus group discussions, which revealed a significant decline in productivity as the number of daily reported cases increased. In addition, the productivity of labor on site depends on competencies, job performance, and job satisfaction. Construction workers were worried every day, due to the spread of the pandemic and their fear of infection and losing their job, which had a bad impact on productivity and business performance [37]. These are all important factors that can help workers be more productive.

The responders acknowledged that the plans and actions in place boosted the workers’ sector. The best course of action for construction organizations is to maintain the minimum permitted operating conditions at building sites and maximize worker engagement. If construction companies are not already operating in shifts, they must begin doing so and split their workforce in half for the first shift and half for the second. Working in shifts is another recommendation made by safe work Australia to reduce the danger of COVID-19 and support the resilience of construction industry workers [38]. If working in shifts is not possible or if an organization is already working in shifts but had to reduce the number of employees to follow government directives, it must come to an understanding with its employees and work to keep them engaged and employed, even at a reduced salary or with fewer working days to accommodate all the employees.
pandemic, and this called for considering other feasible alternatives in order to continue construction operations.

4.3. Supply Chain Disruptions

The participants suggested that losing employees is not in the firms’ best interests. A group of the respondents confirmed that the government’s action in the present circumstances is essential. Small and medium-sized firms have fewer financial resources available compared to large firms, which can often continue for a longer period [39–43]. In addition to receiving an assistance package, it is crucial for construction businesses to enhance the stability of labor productivity, remove fears and disturbance, and expeditiously handle any outstanding payments such as salaries, in order to maintain their operations and pay their staff.

4.3. Supply Chain Disruptions

The pandemic affected every part of the supply chain, from manufacturing to customs and the inspection of imported materials in the country of origin, to shipping. As soon as the first lockdown was reported in China, where most of the systems and raw materials used in building originate, problems with shipping, clearing customs, and driving also occurred [44,45]. Construction researchers found that one of the primary causes of construction project delays in different countries has been identified as material delivery delays and delays in the shipping process [9,11,39,46,47]. The difficulties in purchasing materials and systems from the local or international market were of the highest rank, as seen in Table 5 and Figure 7, where the mean purchasing impact factor was 4.669. The material shortage was 3.952, and all ongoing projects during the time of lockdown suffered from the above consequences. The material shortages and availability of materials, as well as system problems, were associated with a lack of funds and cash flows to secure the stability of the supply chain process. It was found that the impact of the supply chain had the same features for large and small size contractors as well as consulting firms, as shown in Figure 12. Developing a supply chain emergency strategy that involves the identification of backup suppliers and the formation of collaborations among logistical specialists in order to face supply chain interruption was difficult because the limits imposed by COVID-19 increased the likelihood of supply chain interruption, creating extra difficulties for firms [31,38,40,41]. Therefore, importing material has become more difficult during the pandemic, and this called for considering other feasible alternatives in order to continue construction operations.
Material shortages and delays are often regarded as one of the leading causes of construction project delays worldwide [31,40]. Scholars agree that there is an urgent need to formalize the supply chain, diversify the supply of services and products for companies that rely on outsourcing, implement performance measures that allow early detection of supply chain disruptions, manage stocks well, and promote proactive crisis resolution strategies [31,42,43].

4.4. Financial Management
4.4.1. Financial Performance and Cash-Flow

The financial performance of the construction firms was ranked relatively low (mean = 3.07). The main factors contributing to the negative consequences of financial performance were identified as follows: increased project costs, inflation rate, exaggerated cost of raw materials, disrupted cash flows, suspension or termination of funding, bankruptcy, and employees getting paid without work. Figure 13 shows clearly that MSC were affected more than LSC. This is because most contracts and construction activity for medium-sized contractors originated from the private sector, which was severely impacted in terms of financing by COVID-19. According to the focus group participants, both experienced and unskilled construction workers are seeing their earnings decrease, especially in the private sector. Because of significant capital outlays, cost flexibility, and intense rivalry, the construction industry is often susceptible to fluctuations in the economy, and this is particularly true during recessions [31,38,48,49]. In point of fact, these shifts rely on both internal and external causes (such as political instability and crises), which may lead to an increase in the likelihood of undesirable financial outcomes [48].

The outbreak of COVID-19 has a catastrophic impact on cash flow and payments, as it ranks seventh in impact (mean = 3.976). The outbreak was causing significant cash flow issues for those without significant cash reserves. This was the case for the small and medium size contractors. The medium size contractors and consulting firms with no cash reserve and a strong balance confront obvious difficulties concerning labor wages, material supply, and paying subcontractors. Another problem arose with contractors and consultants not getting their due payment for approximately 60 days according to contract conditions. Accelerating due payment was very difficult because owners also suffered from the same problem [50–54].
4.4.2. Government Initiatives to Minimize the Negative Impact

The SCI, in response to the negative impact of COVID-19, took a set of actions to sustain the industry through the pandemic. These actions fell into four areas as follows: protecting the workforce, managing financial resources with an emphasis on cash liquidity, risk proofing the supply chain, and contract revision. The government has provided financial assistance in the form of subsidies and grants to the employers, contractors, and other parties engaged. As a result of this, the interviewers ensure that the SCI was experiencing a fall in the earnings of skilled and unskilled employees, most notably in the medium size contractor and less in the large size contractors. Regarding construction loans, the respondents acknowledged that the pandemic had an effect on the borrowers’ (contractors and subcontractors) capacity to make their regular monthly payments on their construction loans [54–58].

The results from the questionnaires and focus group discussions revealed that the SCI has greatly benefited from different initiatives granted by the government to diminish the negative impact on economic activity. Figure 14 shows that 27% of the surveyed sector received support from the Saned system to bear 60% of salaries, and 51% benefited from the exemption from government fees against foreign workers. While 22% benefited from postponing different taxes, the government also assisted the contractors by postponing the collection of customs duties on imports during the lockdown period.

![Figure 13. COVID-19 financial losses of Saudi construction industry.](image)

![Figure 14. Benefits received from the different government initiatives.](image)
5. Conclusions and Recommendation

The study pursued finding out what the status of the SCI during the COVID-19 pandemic was. A three-phased methodology was adopted. In phase one, semi-structured interviews with industry professionals were conducted in which four domains of impact were investigated: project performance measurement, supply chain, workforce, and financial management. The outcomes from phase one were then used to develop a questionnaire tool that was communicated to construction firms all over Saudi Arabia, and responses were received from different key players in the industry. In phase 3, the gathered data and results from the analysis were shared and discussed with focus groups. The outcomes from this mixed-methods research approach were triangulated to augment and draw conclusions and recommendations.

Research results revealed that during the COVID-19 pandemic, the technical performance of construction projects was poor, with 52.42% of projects suspended and 31% totally stopped. This impact emanated from different contingencies, including hiring freezes and layoffs; salary freezes, rejected bonuses, project time and cost overruns; payment reduction; and greater employee stress and fatigue.

The workforce disruption has had a great impact on the SCI, where there was limited mobility, difficulties in recruiting and employing manpower in the industry. Firms were unable to locate and recruit labor or talents for their affiliated projects. The productivity of the construction workforce decreased to very low levels.

The supply chain was extremely disrupted. In this context, difficulties in purchasing materials and systems were ranked as having the highest impact on the SCI, and material shortages had a significant impact. The supply chain problems arose due to the fact that the process of bidding on raw resources, whether local or imported from abroad, involves lockdowns in factories, shipping, customs clearance, and land transport. Large sized contractors tend to develop a supply chain emergency strategy that involves the identification of backup suppliers and the formation of collaborations among logistical specialists in order to face supply chain interruption. Due to cash flow issues, the financial situation of medium-sized contracting firms was severely impacted, as the owners deferred the due payments. The consulting firms and large contractors were less inconvenienced since they were able to manage part of their work remotely online.

The Saudi construction industry has taken measures to survive the pandemic, including workforce protection, financial resource management, supply chain risk-proofing, and contract renewals. The government has provided financial assistance through subsidies and grants to employers and contractors. However, the industry has experienced a decline in skilled and unskilled employee earnings, particularly in medium-sized contractors. The government has also supported the sector by providing financial compensation, postponing taxes, and postponing customs duties collection during the lockdown.

6. Limitations and Future Research

This research work was limited to investigating the status of the SCI during the COVID-19 pandemic. Further research on the exit strategies for coming back to the new normal would be of great importance. Since 2020, the world has been trying to face challenges and survive the agonies that are imposed by multi-faceted disruptions on the construction industry. Extending this research to investigating the multi-dimensional impacts of these disruptions on the construction industry would be beneficial.

Author Contributions: Conceptualization, S.A. (Saud Almutairi), M.B. and A.A.A.; methodology, M.B. and A.A.A.; validation, S.A. (Saud Almutairi), A.A.A. and M.A.; formal analysis, M.B., A.A.A. and M.A.; investigation, M.B., A.A.A. and M.A.; resources, S.A. (Saud Almutairi), M.B. and A.A.A.; data curation, M.B. and A.A.A.; writing—original draft preparation, M.B. and A.A.A.; writing—review and editing A.A.A., and M.B.; visualization, S.A. (Saud Almutairi), M.A. and S.A. (Saud Aldalbahy), supervision; project administration, S.A. (Saud Almutairi) and M.B.; funding acquisition, S.A. (Saud Almutairi). All authors have read and agreed to the published version of the manuscript.
Funding: This research was funded by Qassim University, represented by the deanship of scientific research, grant number 10219-enuc-2020-1-3-I.

Institutional Review Board Statement: The research involved Qassim University stakeholders responding to the developed survey. Before publishing the survey, the study was approved by the Committee of Research Ethics, Deanship of Scientific Research, Qassim University (approval number 21-01-01).

Informed Consent Statement: The study was approved by the Committee of Research Ethics, Deanship of Scientific Research, Qassim University (approval number 21-01-01). Before starting to fill out the online questionnaire, informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding authors.

Acknowledgments: The authors gratefully acknowledge Qassim University, represented by the Deanship of Scientific Research, and the financial support for this research under the number (10219-enuc-2020-1-3-I) during the academic year 1441AH/2020AD.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

References
5. Alfadil, M.O.; Kassem, M.A.; Ali, K.N.; Alaghbari, W. Construction Industry from Perspective of Force Majeure and Environmental Risk Compared to the COVID-19 Outbreak: A Systematic Literature Review. Sustainability 2022, 14, 1135. [CrossRef]
20. Ilovan, O.-R. Qualitative Research in Regional Geography. A Methodological Approach Anthropologie Culturale View Project; Presa Universitară Clujeană: Cluj, Romania, 2017. [CrossRef]


41. Lopes, J.M.; Gomes, S.; Mané, L. Developing Knowledge of Supply Chain Resilience in Less-Developed Countries in the Pandemic Age. Logistics 2022, 6, 3. [CrossRef]


Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.