



## Research Article

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# The Impact of Pandemic Crisis on the Survival of Construction Industry: A Case of COVID-19

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### Abstract

Since the World Health Organization (WHO) announced the coronavirus 2019 (COVID-19) outbreak as a pandemic, many countries have declared a complete national lockdown after a remarkable spike in COVID 19 cases. These decisions have restricted the movement of people and resulted in a complete shutdown of many businesses across many sectors. The construction industry, as a significant growth driver of the economy with no exception, has also been completely shut down. All the developments and projects were postponed until further notice. It is, therefore, a prudent to address the impact of the pandemic at the outset and end of the crisis to prepare for any future possibility and gain lessons for plans. This study aims to investigate the effect of COVID 19 on the construction industry's survival. The impacts and fallout have been determined and evaluated through the recruitment of construction experts and practitioners. The impacts have been classified into different groups which include economic, human resources. The study implied two methods include exploratory interviews and questionnaire surveys. The study found the most prominent impacts of COVID 19 are the suspension of projects, labour impact and job loss, time overrun, cost overrun, and financial implications. The findings of this study shed light on the consequences of the sudden occurrence of pandemic and raise awareness of the most critical impacts which can't be overlooked. The findings also help project stakeholders to realise the sequences of the sudden epidemic and prepare for the worst-case scenario during the planning stage of the construction projects.

**Keywords:** pandemics, COVID-19, construction industry

## 1. Introduction

The sudden appearance of Coronavirus disease in 2019 was firstly reported in Wuhan city in China, which is caused by severe acute respiratory syndrome (Hui et al., 2020). The disease is infectious and has been spreading drastically all over the world and considered by the World Health Organization (WHO) as a pandemic (WHO, 2020).

The COVID 19 pandemic has had by far-reaching very severe consequences since it has spread to all the countries. The economy, in general, faces a direct impact in the mid of COVID 19 outbreak. Many countries face recession and economic downturn. All the business activities have been shut down unless it falls under the essential categories as necessary supplies and medical sectors, in addition to a few vital projects which are necessary to support the health system and safety of the people. Relatively, it has limited the business around the world and companies have shifted to work Work-From-Home (WFH) concept remotely to accommodate and run the business and services.

However, in the construction industry, all the workers and technical engineers need to nearly work on-site either to perform activities or to monitor the work is done correctly (Financial times, 2020). The construction industry is far different from other industries which typically requires on-site involvement of all the project members. Hence, it is crucial to appreciate how the construction industry addresses this unforeseen situation.

During the pandemic, the situation drastically deteriorated by firstly shortage of construction material supply, which then impacted the construction industry. Following the spread of the virus, many countries started implementing several measures to reduce movement of people, and that has mainly obstructed the construction because it requires on-site work and every project member must be available to work, check, and monitor all the work activities.

Job loses is also a major disaster during the escalating situation of the pandemic. Globally, millions of employees have lost their jobs amid the COVID 19 crisis. In the construction industry, all the employees lost their jobs and most of the small enterprises are not able to pay salaries during lockdowns. Literature in the subject of the pandemic is still scarce, especially in the construction industry sector. Hence, it is crucial to investigate the impact of the epidemic in the construction industry. This article aims to identify the impact and assess them based on their level of severity.

## 2. Literature Review

Several studies have attempted to investigate the impact of COVID-19 on the economy and industrial sectors. The reviews are not yet adequate due to the uncertainty of the current situation. Of these studies, a study by Fernandes, N. (2020) which addressed the economical impact of the pandemic outbreak on the economy of 30 countries and the study found that the gross domestic product (GDP) is likely to be hit by 3-6% or might fall to 15% in some countries. The study also outlined the service-oriented economy are negatively impacted and jobs are at risk and the countries that depend on the foreign trade are likely to be affected the most in their GDP. Another study by Ayittey et al. (2020) shows that commerce, tourism and trade are the most impacted sectors. Whereas, Nicola et al. (2020) reported that the restrictions implied by the authorities had reduced the mobility causing many industries to shut down the business and resulted in job loss and the essential supplies like food and medical supplies which led to a socio-economic impact on each individual. In a different aspect, Ivanov, D. (2020) studied the effect of the outbreak on the supply chain and found that the sector has been impacted negatively and it may take a longer time to recover. Harari (2020) also expressed that COVID-19 pandemic is the biggest crisis of the generation and it may take years to recover and action must be taken decisively to subsidize and plan new strategies to avoid the travail of humankind. Another study by Venkitachalam, J. (2020) found that the Indian real estate sector has been severely affected and declination has been considerably recorded. Helm, D. (2020) also pointed out that the total lockdown caused by COVID-19 has severely curtailed economic activities. The construction industry with no exception have been severely affected by the COVID-19 pandemic and there is no study exclusively reported as the date of April 2020 focusing on the impact of the pandemic on the construction industry hence this study is aimed to discover the effects.

## 3. Methodology

This study adopted two methods to collect the data. The first method was by conducting an exploratory interview with ten selected experts from the construction industry sectors to share and express their insights and opinions on the current state of the construction industry in the mid of pandemic freely. Additionally, the experts were asked to share the impact of the pandemic on the construction industry. The interviews were conducted remotely using Skype due to the restriction of movement in the mid of epidemic. The second method is quantitative data by associating construction practitioners to assess the level of impact using a five Likert type scale. A total of 129 respondents participated in answering the questionnaire survey.

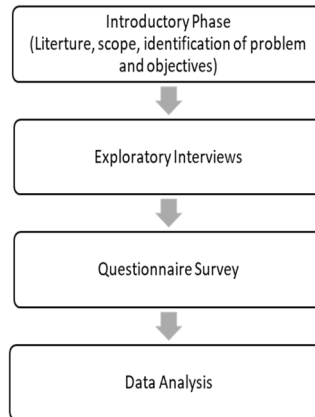


Figure 1: Methodology flowchart

Figure 1 demonstrates the process adopted to conduct the research. The introductory part focused on the literature to define and identify the scope, problem, and objectives of the study. The second part involves the process of exploratory interviews with construction experts to determine the impacts of the pandemic on the survival of the construction industry. The third phase is to evaluate the impacts by involving construction practitioners using a questionnaire survey. The respondents were asked to rank the level of effect using 5 Likert type scale. The data collected were then statistically analyzed using SPSS software. Descriptive analysis was used to rank the factor by the average importance index and standard deviation.

In this study, the experts were defined as stated on a study by (Gamil et al., 2017) which stated the attributes of construction experts to as a person who has been working in the industry for more than ten years, age of more than 30 years and has assigned to a managerial position within the construction industry firms. According to the findings, all the experts who participated in this research hold all the attributes of expert definition. Therefore, their inputs and opinions are significant in understanding the research issue. The thematic content analysis method was used to analyse the data.

Thematic analysis is a standard method used to analyse qualitative data of unknown phenomenon (Creswell, 2013; Maguire & Delahunt, 2017). It is a descriptive and interpretive method that uses themes and frequency of occurrence. Moreover, it is a method used to organise and scrutinise the collected data to draw understandable conclusions and findings (Turunen et al., 2013). The following consist of steps to carry out the analysis using a thematic approach (Petrona & Amanda, 2019):

- i. Getting Familiar with the Data: The first step is getting familiar with the data by reading the data several times, and that helps to structure and identify the pertinent information.
- ii. Categorising the Data: In this step, the data are coded into different themes and coherent categories to answer the main questions which are addressed in the interviews. Then the data are categorized accordingly from general questions to more narrow issues. The data are labelled and tabulated for each category.
- iii. Searching for Themes: In this step, themes need to be defined to discuss them individually based on the data collection explicitly. The main issues are established based on the subtheme's contexts.
- iv. Interpretation and Reporting Results: In this step, the data are transformed into meaningful sets of findings, and all categories emerge into a complete analysis of the issue. The method tends to make meaning across all the classes defined in step 2 by moving from capturing individual opinion from the respondent to identifying the themes and issues in the holistic picture. Third-party experts will then verify the data.

However, the selection of sample size for a questionnaire survey was based random sampling technique. The random sampling technique is widely used in construction research where the sample

is randomly selected from the population-based on non-zero probability. This technique is considered adequate because it produces a sampling representative of the population by avoiding any voluntary response bias (Sandelowski, 2000). All population has the probability of equal chance of being selected as the sample and provide accurate representation for the broader population (Sharma, 2017). Therefore, this technique is adopted to select the participants for this study. The method to determine the sample size of an unlimited population is adopted from Enshassi & Al Swaity (2015) to calculate the sample size.

$$SS = \frac{Z^2 \times P (1-P)}{C^2} \tag{1}$$

Where,

SS = Sample Size

Z = Z value (1.96 for 95% confidence level)

P = percentage picking a choice expressed as a decimal (0.5 used for sample size needed)

C = margin of error (9 %), maximum error of estimation which can be 9 or 8% (Memon & Ismail, 2013)

$$SS = \frac{1.96^2 \times 0.5 (1-0.5)}{0.09^2} = 118.57 \cong \approx 119 \text{ ( As the minimum SS)}$$

To check the marginal error value, the following formula is being used (Enshassi & Al Swaity, 2015): The maximum margin of error for a 95% confidence level  $\approx \frac{1.96}{\sqrt{SS}} = \frac{1.96}{\sqrt{119}} = 0.18 > 0.09$ . Hence, the margin is acceptable. In this study, the final sample size obtained is 129 respondents.

Before the start of analyzing the data, the consistency and scale reliability is measured using Cronbach's Alpha which was calculated using SPSS and the outcome is 0.83 which is considered good internal consistency for the data.

#### 4. Respondents Profile

This section presents the demographics of participants for the pilot study. Table 1 shows the demographic data of organizations, which includes the type of, the category of organization, size of the project the company has undertaken, qualification, and years of experience.

**Table 1:** Participant's demography for the study

| Category                                  | Items               | Frequency | Percentage (%) |
|---|---------------------|-----------|----------------|
| Type of Organization                      | Consultant          | 51        | 39.53          |
|   | Contractor          | 62        | 48.06          |
|   | Client              | 16        | 12.40          |
|   | Other parties       | 0         | 0.00           |
| Category of organization                  | Government          | 21        | 16.28          |
|   | Private             | 108       | 83.72          |
|   | Other category      | 0         | 0.00           |
| Role of a participant in the organization | Company Director    | 18        | 13.95          |
|   | Project Manager     | 33        | 25.58          |
|   | Architect/ designer | 12        | 9.30           |
|   | Project engineer    | 52        | 40.31          |
|   | Site Engineer       | 12        | 9.30           |
|   | Other roles         | 2         | 1.55           |
| Highest level of education                | Diploma             | 31        | 24.03          |
|   | Degree              | 88        | 68.22          |
|   | Master              | 7         | 5.43           |
|   | PhD                 | 3         | 2.33           |
| Years of experience                       | 0-10 Years          | 50        | 38.76          |
|   | 11-20 Years         | 39        | 30.23          |
|   | 21-30 Years         | 26        | 20.16          |
|   | above 31 Years      | 14        | 10.85          |

Table 1 presents the demographical data of the respondents who participated in the pilot study. Most of the companies, they attached to, are a consultancy and private-based sector. Regarding the project size, 45.5% of the companies have undertaken projects which value more than RM 10 million. However, in this study, the contract value and group classification are not considered for further analysis because the main focus was on communication in any type of group. In respect to their roles in the organization, most participants work as architects. However, for the qualification, the data shows that most of the respondents obtained a bachelor's degree and have been working in construction for more than ten years; therefore, their responses and opinions regarding the evaluation of the relevancy for cause and effect factors are used for further analysis.

### 5. Results and Analysis

After analyzing the interview transcription, a few points are extracted from the transcription, which includes the following:

- i. The pandemic has entirely suspended the construction industry and only a few projects are still running which are considered essential for medical facilities expansion to cope with the high demand for spaces. The work under this situation lay based on difficulties in terms of the requirement for accelerated completion of the project and the restriction of movement. Additionally, workers and technical engineers are aware of the infectious disease and need to work with full consciousness and scrutiny.
- ii. For project participants who work off-site are required to be prepared with a complete list of tasks, maintain constant communication with all subcontractors, establish daily video meetings, manage all the orders, constantly reviewing shop drawings, coordinate with all the stakeholders for updates, and maintain proper communication with people onsite.
- iii. The way the construction industry was managed has to be modified to suit contingency time where it should accommodate all the needs to deal with all the sudden crisis.
- iv. Construction planning and scheduling are likely to be significantly impacted during the crisis. Hence, planners and schedulers should have backup plans in case of shut down.
- v. There are many impacts of the sudden shut down of projects. The impact is listed in table 2 for further analysis using statistical approaches.

### 6. Descriptive Analysis

This part introduces the analysis of the data collected through a questionnaire survey. Descriptive analysis was used to evaluate the degree of impact by calculating the average index and standard deviation.

**Table 2:** Assessment of the Impacts of Pandemic on construction Projects

| Identified Impacts from exploratory interviews  | Frequency of the Level of Impact |                       |             |                   |                        | AI    |
|---|----------------------------------|-----------------------|-------------|-------------------|------------------------|-------|
|   | Not impacted (1)                 | Slightly impacted (2) | Neutral (3) | Very impacted (4) | Extremely impacted (5) |       |
| 1. Suspension of projects   | 2                                | 3                     | 11          | 37                | 76                     | 4.411 |
| 2. Labor impact and job losing (workforce shortage)   | 7                                | 5                     | 2           | 41                | 74                     | 4.318 |
| 3. Time overrun   | 2                                | 7                     | 10          | 44                | 66                     | 4.279 |
| 4. Cost overrun   | 7                                | 3                     | 11          | 56                | 52                     | 4.109 |
| 5. Financial impact   | 7                                | 3                     | 8           | 81                | 30                     | 3.961 |
| 6. Supply shortage  | 9                                | 12                    | 9           | 51                | 48                     | 3.907 |
| 7. Interruption of Planning and scheduling  | 8                                | 13                    | 28          | 68                | 12                     | 3.488 |
| 8. Restriction of movement on the work and travel bans  | 15                               | 17                    | 31          | 29                | 37                     | 3.434 |
| 9. Shortage of materials to support running projects and sudden fluctuation of material price | 27                               | 6                     | 14          | 56                | 26                     | 3.372 |
| 10. Interruption of contractual terms (legal issues)  | 12                               | 16                    | 34          | 49                | 18                     | 3.349 |
| 11. Socioeconomics impact   | 14                               | 28                    | 21          | 36                | 30                     | 3.310 |
| 12. Impact on the existing accomplished activities  | 33                               | 12                    | 7           | 45                | 32                     | 3.240 |
| 13. Uncertainty of survival   | 22                               | 19                    | 44          | 18                | 26                     | 3.054 |
| 14. Impact on Research and technology   | 23                               | 47                    | 48          | 9                 | 2                      | 2.380 |

Table 1 shows the findings and demonstrates the assessment of the impacts based on the level of effect using Likert's type scale. The frequency of the impacts was counted and the average index was calculated. The average index shows the degree of the impact according to the number of scales. It is illustrated that suspension of the project is the most effected factor of pandemic occurrence with an average index of 4.41 which is justified due to the restriction of movement and shortage of supply. The second most affected part is labour impact and job losing which is duly to the suspension of the projects and the fear of gathering due to the spike spread of the contagious virus among workers. The decision comes to an end to avoid assemblies and upkeep social distancing. It is therefore impacted the workers in terms of finance and safety. The third impact is time overrun which is associated with the movement and measure control period. The longer the time required to fight the pandemic will undoubtedly require more time for the project to complete. The fourth is the financial impact which is caused by the economic deterioration of the state and also due to the suspension of the projects. Subcontractors' needs to pay machine tariffs and materials on-site may also be deteriorated and that is associated with additional; cost. Besides, contractors are obliged to pay salaries in which the work is not progressing. The findings raise the awareness to prepare the construction industry to cope with any sudden pandemic.

## 7. Conclusion

This article has investigated and assessed the consequences of pandemic COVID-19 on the construction industry either private or public sectors. It is statically proven that the most impacting factors are the suspension of projects, labour impact and job loss, time overrun, cost overrun, and financial impact. From the interviews, it was highlighted that the economic impact is significant to all the project stakeholders and the workforce. The project developers work hard to mitigate the impact by reducing the number of workers on-site and encouraging offsite work to avoid and slow the spread of the contagious virus. The contractors are also inevitable to face legal issues due to the nonconformity of contractual terms which is caused by the suspension of the project and sudden fluctuation of material price. These unforeseen impacts are indisputably perilous to maintain the stream of the project progress. While, projects that are still running due to the urgent need to expand medical facilities are also suitable to many challenges such as shortage of workers, the rise of materials price, and shortage of materials and supply chains. The findings of this article are introductory to the construction industry stakeholders and policymakers to understand the impact of the unforeseen and uncontrolled pandemic on the construction. This will help to improve the plans to cope with any encountered circumstances.

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