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The Impact of Covid-19 Pandemic to the Construction Industry in Malaysia

Yugashini Rajendran[1], Muhammad Fikri Bin Hasmori [2*]

[1]Faculty of Civil Engineering and Built Environment,
Universiti Tun Hussein Onn Malaysia, Parit Raja, Johor, 86400, MALAYSIA

[2]Faculty of Civil Engineering and Built Environment,
Universiti Tun Hussein Onn Malaysia, Parit Raja, Johor, 86400, MALAYSIA

*Corresponding Author Designation

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Abstract: The World Health Organization (WHO) declared the Covid-19 outbreak as a pandemic and it effect the construction industry due limitation in movement of people. Hence, this research was conducted to identify the impact of Covid-19 pandemic and to measure the effects of Covid-19 pandemic accordingly to the level of severity at Wilayah Persekutuan Kuala Lumpur, Peninsular Malaysia. Data collection was based on online questionnaires through google form and the findings were analyzed by descriptive statistics and Relative Importance Index (RII) method. Based on the result, resources deficiency, field work, project management and financial impact are the impacts of Covid-19 pandemic in the construction industry. Based on the relative importance index, cost overruns, restriction of movement at construction site, facing supply shortage of material, delays in preparation of drawings and materials samples and financial market instability are the main impacts in the construction industry and this help project stakeholders to realize the sequences of the sudden epidemic. Overall, the construction stage has severely affected by the Covid-19 pandemic in the Malaysia which is in shortage of material, skilled labour shortage and job losses and movement of workers are restricted in the construction site.

Keywords: Pandemics, Covid-19, Construction Industry

1. Introduction

On December 2019, a case of novel coronavirus pneumonia Covid-19 pandemic was reported in Wuhan, China [1]. In Malaysia, A sudden spike occurs in the number of positive cases for coronavirus disease because of a religious activity took placed in Sri Petaling, Kuala Lumpur [2]. Ever since the spike in positive cases of Covid-19, Prime minister of Malaysia declared Movement Control Order (MCO) and Standard Operation Procedure (SOP) has to be followed for 14 days to curb this outbreak [2]. Hence, this sudden announcement of movement control in Malaysia results in an economic turnover

*Corresponding author: mfikri@uthm.edu.my

and it effects the construction industry severely. The construction industry is slightly different from other industries where it needs the entire technical crew on site to build up correctly.

The construction industry severely affected because of the financial issues, project delivery and labor constraints. The loss of workforce and salary cut down at 30 per cent rate which was worth RM 3.3 billion and the decline in the use of construction material by 42 per cent worth RM 4.6 billion were also the factor on why the construction industry affected [3]. Furthermore, the cash flow in the whole supply was affected and usually, the claims will be given in two months but due to this pandemic, it has been delayed to three to six months. The situation worsens by the shortage of construction material supply [4]. Moreover, the social distancing and implementation of several measures to reduce the movement of people to avoid contact, has also affected the construction because it needs on-site work activity and the whole project team must be on the site to perform their work accordingly. Job losses are also the mainstream during this pandemic, especially in Malaysia. In the construction industry, most of the employees have lost their jobs. Most of the small construction company are not able to pay salaries during this lockdown and these results job losses [5].

The aim of this research is identifying the impact of Covid-19 pandemic and to measure the effects of Covid-19 pandemic accordingly to the level of severity at Wilayah Persekutuan Kuala Lumpur, Peninsular Malaysia. It is provident to address the effect of the pandemic at the beginning and end of the crisis to get ready for any future chance and gain lessons for plans. This study also helps to set awareness and also guidance for the construction industry to not severely affected in the future crisis.

2. Impacts of Covid-19 pandemic in the Construction Industry

Both developed and developing nations, the construction industry can be seen as the economic sector that transforms different resources into built facilities through planning, design, construction, maintenance and repair and operation [6]. The Malaysian construction sector covers the planning, design, conservation, demolition and repair aspects of different types of buildings and other field work involved in mechanical and civil engineering project [7]. Upon completion of large projects, development in the construction sector moderated, with a smaller scale and less new projects and an over-supply of assets. Construction sector growth representing primarily the completion and near completion of major infrastructure and mixed construction projects [8].

The construction sector has become an economic policy priority aimed at achieving price stability, low unemployment and balanced growth, as variations in the operation of the construction sector can seriously affect macroeconomic variables. On the other hand, the implementation of monetary and fiscal policy is influenced by fluctuations in construction sector activity [9]. In the first three phase of MCO, all work was ordered to stop unless vital services such as pharmacy stores, hospital centers and supermarkets were found to be essential. All construction work from railway projects to home renovations stopped to curb the outbreak. However, when the disease considered to be under control in Malaysia, the country reopened some sectors of the economy which includes construction industry [4].

The construction industry entirely effects include pre-construction phases, construction and post-construction phases [10]. In pre-construction phase, most activities are cancelled or moved to virtual, if necessary, from corporate meetings, forecasting sessions and permit-related problems, to less formal fishing/golfing tournaments and professional association gatherings. This delays prospects for business networking as well as pre-construction tasks such as estimation. Pre-construction tends to be a sector that hit hard during pandemics, but damage could be controllable [11]. Many pre-construction services may be conducted remotely and in compliance with social distancing guidelines, such as pre-planning meetings, team member selection, schematic design, scheduling/scope considerations and budgeting [12].

In construction phase, shortage of material, shortage skilled labor and restriction in movement of workers in sites are the effects of the Covid-19 pandemic in the construction industry. From the viewpoint of stakeholders, contractors were advised to supply supplies on schedule, while owners

should be responsible for prompt financing payments to avoid time overruns [13]. The MCO and the global lockdown both resulted in a major decrease in production of materials that result in serious delays in construction works. China is one of the largest building materials suppliers in the world. During its national lockdown, its reduced manufacturing production affected construction on a global scale. In Malaysia, most of the structural steel materials (except for steel bars), sanitary and tile products, as well as some equipment and construction machinery are imported from China. Construction materials are not available at stable prices to supply for the general construction industry because decreased production and logistics issues [11]. In terms of job losses, construction economists claim that 975,000 jobs lost and it is the most extreme one-month drop ever [14]. Furthermore, the primary cause of transmission at construction sites has been identified as the movement of workers between construction sites. The condition of the construction sites, worker accommodation and their movement from one site to another are crucial elements to look at when dealing with Covid-19 spread on sites [15].

In other hand, post construction also faced some challenges and effect the construction industry due to Covid-19 pandemic. Force Majeure is a standard provision intended to shield all the contracting parties from liabilities in most construction contracts. This will come into effect if, in situations such as wars, riots, strikes, civil commotions, natural disasters, epidemics, riots, strikes, government interference, etc., a certain party is prevented from fulfilling its contractual duty due to unexpected events outside the control of both parties. There are four major Malaysian standard forms of contract commonly used in Malaysia which is Public Works Department (PWD) Form 203A 2007/2010, Persatuan Arkitek Malaysia (PAM) Contract 2006/2018, Asian International Arbitration Centre (AIAC) Standard Form of Contract 2019 and Construction Industry and Development Board (CIDB) Standard Form of Contract 2000 [16]. These kinds of contracts applied when project was delayed. When contractors fail to deliver on time, the ability of property developers to deliver to their customers at the scheduled hand-over date could be compromised, particularly for housing projects, which account for a significant portion of the construction industry [17].

3. Methods

The method used for data collection is through a quantitative method which is an online questionnaire and through google form. The survey form comprises 3 sections where section A is the demographic information, section B is set to identify the impact of Covid-19 pandemic to the construction industry and section C is set to measure the effects of Covid-19 pandemic accordingly to the level of severity in the construction industry based on 5-point Likert scale. The evaluation is based on 5-point Likert scale, which includes very unlikely to very likely. The data collected was analyzed by Social Science Statistics Package (SPSS) and calculated using the formulas and equations to meet the objectives of this study. The method used in size sampling of this study is the probability sampling method which named as random sampling technique. The sample size used for this research was 119 respondents based on Enshassi's sample size formula [18].

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

$$SS = \frac{1.96^2 \, x \, 0.5(1-0.5)}{0.09^2} \quad = 119 \text{ respondents}$$

Where, of

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, 2013)

Section A comprises of respondent's demographic. Respondent characteristics that have been included in section A are category of organization, profession in company, highest level of education,

years of experiences and type of organization. Table 3.1 shows the summary of the respondent's demography for this study.

Table 3.1: Respondent's demography of the study

Category	Items	Frequency	Percentage (%)
Category of Organization	Government	56	46.7
	Private	44	36.7
	Other category	20	16.7
Profession in Company	Site Engineer	43	35.8
	Contractor	18	15.0
	Architect	23	19.2
	Project Manager	24	20.0
	Other Roles	12	10.0
Years of Experiences	0-10 years	37	30.8
	11-20 years	38	31.7
	21-30 years	41	34.2
	Above 31 years	4	3.3
Level of Education	Diploma	10	8.3
	Degree	55	45.8
	Master	32	26.7
	PhD	16	13.3
	Others	7	5.8
Type of Organization	Consultant	29	24.2
	Construction	66	55
	Other Parties	25	20.8

Based on the Table 3.1, majority of the respondents are from government sector whereby it records 43.8% and majority respondents are working as site engineer which 43 respondents (35.8%). Furthermore, the years of experiences range of respondents is dominated by the 21-30 years with 41 respondents (34.2%) and majority of respondents are degree holders which is 55 respondents (45.8%). The respondents are dominated from construction company which is 66 respondents (55.0%).

3.1 Reliability test (Pilot study)

Pilot study is the most important element to obtain a good study design. Pilot study will not guarantee success in a study but it will increase the likelihood of success. Pilot study will fulfill the important functions and can provide valuable insights for researches [19]. The reliability is based on the idea that individual items or sets of items must produce consistent results with the overall questionnaire as stated in statistical terms. The reliability is much more accurate if the coefficient is found to be equal to or greater than 0.70, the internal consistency based on the value of Cronbach's alpha. The reliability of the questionnaire is based on Cronbach Alpha value, where higher value means the better quality of the items used. This questionnaire was first distributed to 12 respondents to conduct the pilot study. The Cronbach's alpha coefficient for all items that been obtained through pilot study is more than 0.7 which is with acceptable internal consistency.

3.2 Descriptive statistics

The normality test is also done under descriptive statistics to determine the sample size distribution. This is significant to understand whether the sample collected falls within an appropriate range and its skewness. According to Brown, values that fall within the range of -2 to +2 for the Skewness test, and -3 to +3 for the Kurtosis test are considered within the normal range. In this study, no extreme outliers were found in the findings, all fell within the acceptable range after the normality tests. Table 3.3 shows

the summary of mean, standard deviation, skewness and kurtosis for all the category and the category's name was simplified as shown in Table 3.2.

Table 3.2 Category name

Item	Item name
RD1	Equipment shortage
RD2	Low quality of construction materials
RD3	Facing supply shortage of materials to support projects
RD4	Labour shortage
RD5	Loss of labour productivity
FW1	Restriction of movement at construction site
FW2	Lack of communication between project parties
FW3	Concerned about safety measures at fieldwork
FW4	Weather conditions
FW5	Poor supervision of the site by contractor
PM1	Delays in preparation of drawings and material samples
PM2	Improper planning and scheduling of project
PM3	Subcontractor's schedules interference/delays
PM4	Interruption of contractual terms
PM5	Slow decision-making process
FI1	Cost overruns
FI2	Financial market instability
FI3	Inflation rate on materials and labour wages
FI4	Increment on foreign exchange rate on materials and equipment

Table 3.3: The Summary of Mean, Standard Deviation, Skewness and Kurtosis of each item according to category

Category	Item	Mean	St. Deviation	Skewness	Kurtosis
Resources Deficiency	RD1	3.467	1.076	-0.200	-0.650
	RD2	3.250	1.006	-0.421	-0.279
	RD3	3.825	2.945	1.057	2.501
	RD4	3.567	0.932	-0.166	-0.529
	RD5	3.483	1.069	-0.481	-0.290
Field Work	FW1	3.775	0.983	-0.505	-0.013
	FW2	3.533	0.995	-0.250	-0.568
	FW3	3.583	0.958	-0.183	-0.628
	FW4	3.625	1.021	-0.201	-0.865
	FW5	3.600	1.126	-0.451	-0.581
Project Management	PM1	3.567	1.043	-0.180	-0.595
	PM2	3.400	1.148	-0.259	-0.940
	PM3	3.558	1.242	-0.470	-0.740
	PM4	3.508	1.138	-0.265	-1.014
	PM5	3.483	1.181	-0.333	-0.865
Financial Impact	FI1	3.867	0.869	-0.596	0.611
	FI2	3.700	0.885	-0.036	-0.812
	FI3	3.600	1.072	-0.389	-0.484
	FI4	3.625	1.062	-0.484	-0.365
	FI5	3.592	0.948	-0.479	-0.206

Frequency analysis was conducted to ascertain if the gathered data in this research was normally distributed and to show which item was the most contributing factor for this research purpose by getting the number of occurrences of each response chosen by respondents. The frequency tables are interpreted with mean score. All the data are classified by each category which is resources deficiency, field work, project management. However, all these factor's mean value is in the range of three as shown in Table 3.3. Hence, it can be concluded as all the listed effects are impact of Covid-19 pandemic to the construction industry.

Figure 3.1 shows the comparison chart based on the Likert scale for the resource's deficiency category. Overall majority have agreed that all the listed impacts possible, likely and very likely effected the construction industry during Covid-19 pandemic.

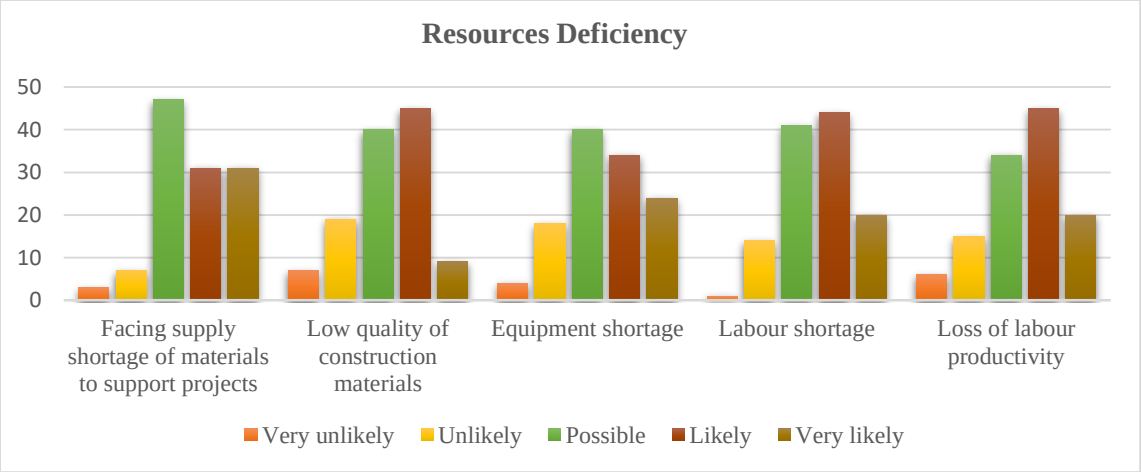

Figure 3.1 Comparison Chart of Resources Deficiency

3.3 Relative important index

Data gathered from the Section C in the questionnaire have been analyzed by using Relative Important Index to rank the level of severity according to their relative importance [20]. RII is calculated using the following formula:

$$RI = \sum \frac{W}{A\ x\ N}$$

Where,

W = weighting as assigned by each respondent on a scale of one to five with one implying the least and five the highest.
A = the highest weight
N = the total number of samples.

Relative index analysis was applied to rank the level of severity according to their relative importance. The analysis conducted based on four category which is resources deficiency, field work, project management and financial impact. Table 3.4 shows the overall RII for each category.

Table 3.4: Relative Importance Index value for each category

Variables	Item	RII
Resources Deficiency	RD1	0.775
	RD2	0.708
	RD3	0.705
	RD4	0.742

	RD5	0.730
Field Work	FW1	0.782
	FW2	0.732
	FW3	0.720
	FW4	0.703
	FW5	0.715
Project Management	PM1	0.743
	PM2	0.682
	PM3	0.728
	PM4	0.735
	PM5	0.740
Financial Impact	FI1	0.783
	FI2	0.743
	FI3	0.746
	FI4	0.712
	FI5	0.727

4. Results and Discussion

Based on the Table 3.4, these are the top five effects impacted the construction industry during Covid-19 pandemic. All these ranking is based on the RII result. The top five highest RII value indicates that those effects are highly impacted the construction industry during Covid-19 pandemic. According to Akadiri, Olomolaiye, & Chinyio,, all the RII for the top five values are high-medium category [20].

Table 4.1 Top Five Highest Relative Importance Index

No	Items	Relative Importance Index (RII)	Rank	Category
1	FI1	0.783	1	High-Medium
2	FW1	0.782	2	High-Medium
3	RD3	0.775	3	High-Medium
4	PM1	0.743	4	High-Medium
5	FI2	0.743	5	High-Medium

Based on the table 4.4, the cost overruns hold the first place in the ranking with 0.783 RII value because contractors bid projects according to material cost for steady supply of materials supplied by China and other affected countries. Thus, Covid-19 pandemic affected those supplies and cause in increase of the cost. Followed by the restriction of movement at construction site which shows 0.782 RII value. This effect will be upmost impact because the construction site needs the manpower to make the construction process smooth but ever since Standard Operating Procedure (SOP) must be followed in the construction site to curb the Covid-19 pandemic, the number of workers will be reduced and the movement of the workers will be restricted.

Thirdly, shortage of materials to support the projects hold the third place with RII value of 0.775. This is because if the cost overruns effects severely it will directly give impact to the material cost also. Furthermore, China is one of the largest building materials suppliers in the world. During its national lockdown, its reduced manufacturing production affected construction on a global scale. Construction materials are not available at stable prices to supply for the general construction industry because decreased production and logistics issues (CIDB, 2020). Fourthly, delays in preparation of drawings and materials samples holds the fourth place with RII value 0.743. This is because the workers are reluctant, and told not to come to the office in certain regions. Virtual work is encouraged during this pandemic to curb the Covid-19 from spreading one person to another person.

Lastly, financial market instability holds the fifth place in overall study with RII value of 0.743. Since the market was instable, the results ended up with shortage of materials, increase cost in machinery and job losses among workers. Overall, all the RII value are in between 0.6 to 0.8. Hence, all the category are classified as high-medium category. These are the top five impacts in the construction industry during the Covid-19 pandemic.

5. Conclusion

This study has successfully achieved the first objective which is to identify the effects of Covid-19 pandemic to construction industry in Malaysia. Literature review was performed to understand and identify the effects of Covid-19 pandemic to construction industry in Malaysia. The effects divide into four category which are resources deficiency, field work, project management and financial impact. The overall score for each variable was obtained by averaging the response to the appropriate items. The means of all the computed items are above 3.00. This is an indication that many of the respondents agreed with the impacts based on the four categories which includes resources deficiency, field work, project management and financial impact. The second objective which is to measure the effects of Covid-19 pandemic accordingly to the level of severity in the construction industry. This was done by analyzing all the 20 impacts in the questionnaire. Those 20 impacts were divided and classified into four categories which includes resources deficiency, field work, project management and financial impact. Based on the frequency analysis that been obtained by Likert scale, we can identify which item has more effects of Covid-19 pandemic to the construction industry. Those impacts have been evaluated based relative importance index (RII). Top five listed impacts have been listed by considering the top five highest Relative Importance Index (RII). In conclude, cost overruns, restriction of movement at construction site, shortage of materials, delays in preparation of drawings and financial market instability are the items that has most effect the construction industry during Covid-19 pandemic.

In general, this study has been able to achieve its objectives. However, this study still has weakness that need to be improved due to the problems that arise during the course of this study. Thus, to improve the strength of further study of this chapter suggested that increase the number of questionnaires to all the states in Malaysia. Through this, it will further strengthen data obtained. To add on, focus on more open-ended answers regarding the impacts of Covid-19 pandemic to increase the justification towards the findings of the study.

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References

[1] World Health Organization, "Coronavirus disease (COVID-19) pandemic," Who.int, 2021. https://www.who.int/emergencies/diseases/novel-coronavirus-2019.

[2] A. Elengoe, "COVID-19 Outbreak in Malaysia," Osong Public Health and Research Perspectives, vol. 11, no. 3, pp. 93–100, Jun. 2020, doi: 10.24171/j.phrp.2020.11.3.08.

[3] H. N. Harun and S. A. Razak, "Malaysia's construction industry suffers record decline | New Straits Times," NST Online, Sep. 23, 2020. https://www.nst.com.my/news/nation/2020/09/626530/malaysias-construction-industry-suffers-record-decline.

[4] Hermesauto, "Malaysia's construction industry records $6b losses in first three lockdown phases," The Straits Times, Sep. 22, 2020. https://www.straitstimes.com/asia/se-asia/malaysias-construction-industry-records-s6-bil-losses-in-first-three-lockdown-phases.

[5] A. Khanna, "Impact of Migration of Labour Force due to Global COVID-19 Pandemic with Reference to India," Journal of Health Management, vol. 22, no. 2, pp. 181–191, Jun. 2020, doi: 10.1177/0972063420935542.

[6] R. A. Khan, M. S. Liew, and Z. B. Ghazali, "Malaysian Construction Sector and Malaysia Vision 2020: Developed Nation Status," Procedia - Social and Behavioral Sciences, vol. 109, pp. 507–513, Jan. 2014, doi: 10.1016/j.sbspro.2013.12.498.

[7] "Malaysian Construction Industry Sector Economics Essay," UKEssays.com, 2018. https://www.ukessays.com/essays/economics/malaysian-construction-industry-sector-economics-essay.php.

[8] "BNM Annual Reports 2019," www.bnm.gov.my. https://www.bnm.gov.my/o/annual-report/index.html.

[9] L. S. Pheng and L. S. Hou, "The Economy and the Construction Industry," Construction Quality and the Economy, pp. 21–54, Jan. 2019, doi: 10.1007/978-981-13-5847-0_2.

[10] N. M. Saifullah and F. Ismail, "Integration of Occupational Safety and Health during Pre-construction Stage in Malaysia," Procedia - Social and Behavioral Sciences, vol. 35, pp. 603–610, 2012, doi: 10.1016/j.sbspro.2012.02.127.

[11] "CIDB Annual Report 2015," CIDB Malaysia, https://www.cidb.gov.my/sites/default/files/2020/03/CIDB%20Annual%20Report%202015.pdf, 2015.

[12] K. Al-Reshaid, N. Kartam, N. Tewari, and H. Al-Bader, "A project control process in pre-construction phases," Engineering, Construction and Architectural Management, vol. 12, no. 4, pp. 351–372, Aug. 2005, doi: 10.1108/09699980510608811.

[13] M. Sambasivan and Y. W. Soon, "Causes and effects of delays in Malaysian construction industry," International Journal of Project Management, vol. 25, no. 5, pp. 517–526, Jul. 2007, doi: 10.1016/j.ijproman.2006.11.007.

[14] "Construction Jobs Flat in April, But Unemployment Rate Falls," www.enr.com. https://www.enr.com/articles/51712-construction-jobs-flat-in-april-but-unemployment-rate-falls (accessed Jun. 29, 2021).

[15] Bernama, "Construction industry badly hit by Covid-19, chalks up huge losses," Free Malaysia https://www.freemalaysiatoday.com/category/nation/2020/12/22/construction-industry-badly-hit-by-covid-19-chalks-up-huge-losses/.

[16] S. Mohd Zin, N. E. Rahmat, A. M. Abdul Razak, N. H. Fathi, and I. N. Putu Budiartha, "A Proposed Pandemic Clause for Force Majeure Events under Construction Contracts in Malaysia," Environment-Behaviour Proceedings Journal, vol. 6, no. 16, pp. 33–37, Mar. 2021, doi: 10.21834/ebpj.v6i16.2733.

[17] National House Buyers Association, "What is the impact of COVID-19 on Malaysia's construction industry & what can be done?," iproperty.com.my, May 05, 2020. https://www.iproperty.com.my/news/covid-19-impact-malaysia-construction-industry-what-can-be-done/.

[18] G. Strip, A. Enshassi, E. Al, and Swaity, "Key Stressors Leading to Construction Professionals' Stress in the," Journal of Construction in Developing Countries, vol. 20, no. 2, pp. 53–79, 2015, Accessed: Jun. 29, 2021. [Online]. Available: https://core.ac.uk/download/pdf/199244287.pdf.

[19] E. van Teijlingen and V. Hundley, "The importance of pilot studies," *Nursing Standard*, vol. 16, no. 40, pp. 33–36, Jun. 2002, doi: 10.7748/ns2002.06.16.40.33.c3214.

[20] P. O. Akadiri, P. O. Olomolaiye, and E. A. Chinyio, "Multi-criteria evaluation model for the selection of sustainable materials for building projects," Automation in Construction, vol. 30, pp. 113–125, Mar. 2013, doi: 10.1016/j.autcon.2012.10.004.