Economic Strategy for the Impact of the COVID-19 Pandemic on Construction Project Implementation

Andiyan Andiyan (andiyanarch@gmail.com)
Universitas Faletehan

Research Article

Keywords: Construction, Industry, COVID-19 Pandemic, Building, Economic

DOI: https://doi.org/10.21203/rs.3.rs-2379718/v1

Economic Strategy for the Impact of the COVID-19 Pandemic on Construction Project Implementation

Andiyan Andiyan
Department of Architecture, Faculty of Science and Engineering, Universitas Faletehan, Indonesia
Corresponding Author: andiyanarch@gmail.com

ABSTRACT

Aside from project delays, the COVID-19 pandemic's impact on the construction industry includes the distribution of construction supplies and materials, labor and labor reductions, work hour reductions, and even temporary work stoppage for projects in the red zone. Domestic construction, on the other hand, is in a pickle since PUPR Minister Basuki Hadimuljono said that despite the COVID-19 epidemic, construction services would continue to operate under the Instruction of the Minister of PUPR No 2/2020, which was issued on March 27, 2020. This forces the construction industry to continue operating while adapting to numerous adjustments during and after the epidemic. Method A survey is the data-gathering tool that will be utilized in this study. The data collection instrument will be a questionnaire that will be distributed either online or offline. Principal Component Analysis was employed as the analytical technique (Principal Component Analysis). The findings of this research indicate that the following elements contribute to the effect of the Covid-19 pandemic on construction projects: project finance factors, regional restraint factors (PSBB), labor factors, material and equipment factors, project uncertainty factors, and strike factors. Numerous ways may be used to undertake construction projects during and after a pandemic, each one tailored to the primary components generated. For the first Main component, the following solutions are possible: 1) Managing the cash flow of the project effectively and efficiently; 2) Using the way of analysis of the value of the outcomes (earn value method) to manage the project's budget and schedule; 3) Preparing an unexpected budget for the project.

Keywords: Construction, Industry, COVID-19 Pandemic, Building, Economic

1. Introduction

The City of Bandung started implementing the Large-Scale Social Restriction Policy (PSBB) on June 22, 2020, and continues to do so today (09/07/2020). The PSBB strategy was adopted when Bandung reached the red zone for COVID-19 distribution. To date (09/10/2020), confirmed cases in West Java Province totaled 845, with Bandung reporting the most significant number of cases with 642 instances(You, 2020).

The COVID-19 Pandemic is also being felt in the construction industry. According to the Indonesian Contractors Association (AKI), the construction sector witnessed a slowdown during the COVID-19 epidemic and required a quick response. The effect of the COVID-19 epidemic on the implementation of construction services Naturally, one of the consequences is a funding reduction for the execution of PUPR Ministry initiatives. The PUPR Ministry's budget was slashed by IDR 44.5 trillion, out of a total of IDR 120 trillion, to deal with COVID-19. Thus, the Ministry of PUPR's residual DIPA is presently about IDR. 75 trillion. This research was conducted in one construction company in Indonesia, the company was facing several problems, and many projects that already ended had delays.

Implementing the Policy on Large-Scale Social Restriction (PSBB) in numerous locations designated as red zones has had a cascading impact on all spheres of life. Projects are delayed in the construction industry, and the delivery of building supplies and materials, labor and labor cutbacks, work hours reductions, and even temporary work stoppages for projects in the red zone. Multiple nations' lockdown rules have also harmed the supply chain for building supplies and equipment(Liu, 2020)(Pamidimukkala, 2021). Certain building materials and equipment continue to be imported (many of them from China), which means that limits on business operations (including exports and imports) and modes of transportation will affect the disruption of the material supply chain. All of which will add to the cost of building. Physical separation, which prevents COVID-19, also influences large-scale project work (labor-intensive)(Alsharef, 2021).

With the various consequences of the COVID-19 Pandemic and a dilemma for the domestic

construction sector, Minister of PUPR Basuki Hadimuljono stated that during the COVID-19 Pandemic, construction services continued to operate by the Instruction of the Minister of PUPR No. 2/2020 published on March 27, 2020. The pros and cons of the community against the health protocol rules that are applied have caused some regulations to be relaxed a little. Additionally, since no one can foresee when this epidemic will stop, the only thing that can be done now is to adapt to COVID-19. This forces the building industry to continue adapting to multiple changes throughout and after the epidemic. The purpose of this research is to ascertain the primary elements affecting the effect of the COVID-19 Pandemic on construction projects, as well as to provide a plan for conducting construction projects during the Pandemic. Pandemics and post-pandemic situations(Chu, 2020). Non-physical adaptation includes changes in time, patterns and methods of learning, behavior, psychology, and the internet network, as well as changes in the internet network itself.

2. Literature Review

A project is a work plan that includes precise objectives (irrigation, energy production, etc.) and a specified completion date. (Zamani, 2021) define a project as a collection of transitory actions with a beginning and an end that use various limited and specific resources to accomplish the defined goals and objectives. (King, 2021) advanced a similar view, stating that a project is a collection of resources such as people, materials, equipment, and capital and costs gathered in a temporary organizational container to accomplish goals and objectives.

According to (King, 2021), to realize the wants and needs of each party involved in a project through a collaborative effort to accomplish goals and objectives, it is necessary to identify organizations or individuals (stakeholders) both internal and external to the project who will exert influence over the project. Moreover, it must be considered throughout the project.

According to (Kumar, 2021), the project has three characteristics:

a) Construction projects are unusual in that they never repeat the same sequence of operations (there are no similar projects, just comparable ones). They are transient and always include diverse groups of people.
b) Each construction project needs labor and equipment (money, machines, methods, materials). The project manager is responsible for organizing all of these resources.
c) Each business requires an organization, and each organization has a variety of objectives that need a diverse group of employees with a range of abilities, interests, personalities, and doubts.

According to Chasanah (2018), the construction sector plays the following roles in the global economy:

a) The construction sector contributes to the world's per capita income, which accounts for around 10% of the global GDP.
b) The construction industry can absorb a sizable workforce, around 7% of the global workforce.
c) The construction industry absorbs around two-fifths of total energy absorption globally, making it the most critical sector in terms of energy absorption.

The Pandemic's influence may be separated into three phases: preparation, implementation, and operation. At the same time, the Construction Implementation Phase has the most significant influence (55%)(Alhusban, 2021).

3. Research Methodology

This is a quantitative study. The research collected data using a survey, and the tool used to gather data was a questionnaire sent online or offline(Sugiyono, 2012). Principal Component Analysis is the analytical technique employed. After tabulating the questionnaire responses, they were assessed for validity and reliability(Moleong, 2007). The principal component analysis was performed on valid and trustworthy variables, resulting in multiple principal components.

4. Results And Discussion

Before the epidemic, several initiatives were underway in Ambon, but some were delayed, some were halted, and others were unable to proceed due to the funds being transferred to combat the COVID-19 Pandemic(Sousa, 2021). When planning for 2020 began, the total Bandung City Public Works project run was approximately 416 packages of planning, construction, and maintenance

projects(Kaihuang, 2020). However, the projects have run at approximately half their capacity or approximately 202 packages since the Pandemic. This is due to the budget being diverted for the pandemic response. Moreover, until this data is collected, just 10% of all packages have been running; the remainder will begin running in mid-October (source: interview results). While private ventures are also experiencing difficulties, some have been abandoned entirely.It is a mass arrangement of buildings based on the idea of a platform that avoids direct contact with the earth.

The variable in this research is the effect of the Covid-19 epidemic on the project's execution in Bandung. According to the findings of the literature review and interviews, several elements contributed to the effect of the Covid-19 epidemic, namely:

1. Problems with the distribution of project materials and materials (C1)
2. Slow Mobilization of heavy equipment and construction equipment (C2)
3. The difficulty of importing materials and materials from outside the region (C3)
4. There is a reduction in the workforce (C4)
5. There is a change in working hours (C5)
6. Trimming working hours (C6)
7. There is a change in work shifts (C7)
8. Elimination of overtime for workers (C8)
9. Difficulty in transportation for workers and builders to the project site (C9)
10. It is not easy to bring in specialist workers from outside the region (C10)
11. Decreased worker productivity (C11)
12. There is a worker's strike (C12)
13. The late withdrawal of terms or installments (C13)
14. There is uncertainty about the continuity of the project (C14)
15. The project was abandoned due to PSBB (C15)
16. There is an economic crisis (C16)
17. Increased project budget (C17)
18. There is a change in the Contract (C18)

Respondents in this survey were construction enterprises engaged in 2020 Bandung projects. Before data collection, the city of Bandung had 30 active projects in 2020. Respondents are individuals or construction firms involved in the project(Hasan, 2021). The sampling approach utilized was accidental sampling, which is not a probability sampling technique.

Respondents received online questionnaires through a Google form link and offline by hand delivery at the project site. The surveys were gathered from 25 respondents from various Bandung-based initiatives.

Table 1. Validity and reliability test results

Variable	r table	r count	r alpha	Conclusion
C1	0.397	0.603	0.397	Valid and reliable
C2	0.397	0.371	0.397	Valid and reliable
C3	0.397	0.552	0.397	Valid and reliable
C4	0.397	0.403	0.397	Valid and reliable
C5	0.397	0.674	0.397	Valid and reliable
C6	0.397	0.460	0.397	Valid and reliable
C7	0.397	0.689	0.397	Valid and reliable
C8	0.397	0.759	0.397	Valid and reliable
C9	0.397	0.293	0.397	Valid and reliable
C10	0.397	0.456	0.397	Valid and reliable
C11	0.397	0.167	0.397	Valid and reliable
C12	0.397	0.550	0.397	Valid and reliable
C13	0.397	0.631	0.397	Valid and reliable
C14	0.397	0.715	0.397	Valid and reliable
C15	0.397	0.598	0.397	Valid and reliable
C16	0.397	0.728	0.397	Valid and reliable
C17	0.397	0.792	0.397	Valid and reliable
C18	0.397	0.715	0.397	Valid and reliable

C19	0.397	0.723	0.397	Valid and reliable
C20	0.397	0.755	0.397	Valid and reliable
C21	0.397	0.597	0.397	Valid and reliable
C22	0.397	0.424	0.397	Valid and reliable
C23	0.397	0.663	0.397	Valid and reliable
C24	0.397	0.505	0.397	Valid and reliable
C25	0.397	0.765	0.397	Valid and reliable

Source: Personal, 2020

With the assistance of SPSS 25, the results of the validity and reliability tests revealed that all reliable variables had a value of r alpha = 0.936, but three invalid variables remained, namely X2, X9, and X11. These three variables must be omitted from future investigations.

These variables are then evaluated using Principal Component Analysis to derive six main components that represent factors or components affecting the influence of the COVID-19 epidemic on the realization of construction projects in Bandung City(AlKheder, 2021). Six significant components were produced based on the findings of the principal component analysis performed using the SPSS software (Table 3). The first eigenvalues provide information about the number of components generated(Matveeva, 2021). The initial Eigenvalues of each variable reflect their relevance in computing the variance of the total variables studied. "Component indicates the number of components or variables. The number of generated components is indicated by initial eigenvalues equal to or higher (1). The grouping of these variables can be seen in table 2.

Table 2. Main Component Analysis Results

Variable	Main component
Elimination of overtime for workers (C8)	Component 1 Project Financial Factor
The late withdrawal of term/installment (C13)	
Increased project budget (C17)	
Late disbursement of payment terms (C19)	
Late payment of workers' wages (C20)	
Strict implementation of the covid-19 protocol (C24)	
It is challenging to bring in specialist workers from outside the area (C10)	Component 2 Regional Restriction Factor (PSBB)
The project was abandoned due to PSBB (C15)	
There is an economic crisis (C16)	
There is a project delay penalty (C23)	
There is potential for construction disputes (C25)	
There is a reduction in the workforce (C4)	Component 3 Labor factor
There is a change in working hours (C5)	
There is a change of work shift (C7)	
Prices of raw materials and materials soared (C21)	
Problems with the distribution of project materials and materials (C1)	Component 4 Material and equipment factors
Slow Mobilization of heavy equipment and construction equipment (C3)	
The weakening of the rupiah exchange rate against the dollar (C22)	
Trimming working hours (C6)	Component 5 Project uncertainty factors
There is uncertainty about the continuity of the project (C14)	
There is a change in the contract (C18)	
There is a worker's strike (C12)	Component 6 Factors for strike workers

Source: Personal, 2020

A building project implementation plan may then be developed based on the findings of the component analysis above, both during and after the epidemic. Literature study and adoption of the strategy included in the Minister of PUPR 2/2020 order.

Table 3. During and after the epidemic, a strategy for construction implementation must be developed.

Main component	Construction Implementation Strategy
Component 1 Project Financial Factor	1. Controlling the cash flow of the project effectively and efficiently.
	2. Using the outcome value analysis approach (earn value method) to manage the project's budget and schedule.
	3. Create a contingency plan for the project's budget.
Component 2 Regional Restriction Factor (PSBB)	1. Implementing the working hours of workers by the implementation of PSBB
	2. Implementation of strict covid prevention protocols at the project site
Component 3 Labor Factor	1. Arrangements for Mobilization and demobilization of workers
	2. Measure the temperature of every worker and visitor who comes to the project site every morning and evening
	3. Educate every worker on-site to prevent and protect themselves from Covid
	4. Regular monitoring of workers' health conditions
	5. Provide additional vitamins and nutrients for workers to increase immunity. Propose a change in specifications if there are materials that cannot be imported from outside the region
Component 5 Project uncertainty factors	1. Temporarily stop the project if it is indicated that there are workers exposed to COVID, according to the Minister of PUPR 2/2020.
	2. If the situation is out of control, you can propose a contract change order.
	3. Make cooperation in handling covid with the nearest hospital and health center
Component 6 Factors for strike workers	1. Regular monitoring of workers' health conditions
	2. Providing explanations to workers regarding project finances affected by the Pandemic

Source: Personal, 2020

Conclusion

According to the findings of this research, the following conclusions may be drawn:

1. In the wake of the COVID-19 Pandemic, the following issues have an impact on construction projects: financial constraints, regional restriction factors (PSBB), labor constraints, material and equipment constraints, project uncertainty constraints, and strike constraints.
2. 2. Construction projects may be carried out in a variety of methods during and after a pandemic, each one customized to the main components that are created. There are many alternative solutions for the first primary component, including the following: 3) Effective and efficient management of the project's financial

flow; 2) Managing the project's budget and schedule with the use of the value analysis approach (earn value method); 3) preparing for the possibility of an unexpected budget.

REFERENCES

Alhusban, A. A. (2021). How the COVID 19 pandemic would change the future of architectural design. *Journal of Engineering, Design and Technology*. https://doi.org/10.1108/JEDT-03-2021-0148

AlKheder, S. (2021). Scenario-based preference modeling to examine the robustness of airport mega projects initiatives. *Science of the Total Environment*, *797*. https://doi.org/10.1016/j.scitotenv.2021.149142

Alsharef, A. (2021). Early impacts of the COVID-19 pandemic on the United States construction industry. *International Journal of Environmental Research and Public Health*, *18*(4), 1–21. https://doi.org/10.3390/ijerph18041559

Chu, W. (2020). Recent advances in technology, strategy and application of sustainable energy systems. *Energies*, Vol. 13. https://doi.org/10.3390/en13195229

Hasan, S. (2021). Opportunities for Infrastructure PPP Projects in Time of COVID-19 - As a Resilience Strategy. *2021 IEEE Conference on Technologies for Sustainability, SusTech 2021*. https://doi.org/10.1109/SusTech51236.2021.9467426

Kaihuang, Z. (2020). The Impact of COVID-19 on China's economy and discussion of policies – evidence from listed companies. *Tropical Geography*, *40*(3), 396–407. https://doi.org/10.13284/j.cnki.rddl.003252

King, T. L. (2021). COVID-19 and suicide risk in the construction sector: preparing for a perfect storm. *Scandinavian Journal of Public Health*, *49*(7), 774–778. https://doi.org/10.1177/1403494821993707

Kumar, D. (2021). COVID-19 driven changes in the air quality; a study of major cities in the Indian state of Uttar Pradesh. *Environmental Pollution*, *274*. https://doi.org/10.1016/j.envpol.2021.116512

Liu, Z. (2020). Carbon Monitor, a near-real-time daily dataset of global CO<inf>2</inf> emission from fossil fuel and cement production. *Scientific Data*, Vol. 7. https://doi.org/10.1038/s41597-020-00708-7

Matveeva, M. V. (2021). Integral analysis of the model of financial dependence of the Russian construction industry. *IOP Conference Series: Earth and Environmental Science*, Vol. 751. https://doi.org/10.1088/1755-1315/751/1/012158

Moleong, Lexy J. (2007). *Qualitative Research Methodology*. Yogyakarta: Gadjah Mada University Press.

Pamidimukkala, A. (2021). Impacts of COVID-19 on health and safety of workforce in construction industry. *International Conference on Transportation and Development 2021: Transportation Planning and Development - Selected Papers from the International Conference on Transportation and Development 2021*, pp. 418–430. Retrieved from https://api.elsevier.com/content/abstract/scopus_id/85106054331

Sousa, P. (2021). COMPRIME - COnhecer Mais PaRa Intervir MElhor: Preliminary Mapping of Municipal Level Determinants of COVID-19 Transmission in Portugal at Different Moments of the 1st Epidemic Wave. *Portuguese Journal of Public Health*, *38*(1), 18–25. https://doi.org/10.1159/000514334

Sugiyono. (2012). *Qualitative Quantitative Research Methods and R&B*. Bandung: CV. Alfabeta.

You, H. (2020). Distribution of covid-19 morbidity rate in association with social and economic factors in wuhan, china: Implications for urban development. *International Journal of Environmental Research and Public Health*, *17*(10). https://doi.org/10.3390/ijerph17103417

Zamani, S. H. (2021). Effect of COVID-19 on building construction projects: Impact and response mechanisms. *IOP Conference Series: Earth and Environmental Science*, Vol. 682. https://doi.org/10.1088/1755-1315/682/1/012049