The Effect of COVID-19 on building construction project management. The case of Building construction in Addis Ababa

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Abstract

Corona virus disease (COVID-19) is a disease caused by the novel corona virus SARS-CoV-2. The COVID-19 pandemic has a tremendous negative impact on the health of a society as well as on the economy. The construction industry, which is the back bone of the global and local economy, is believed to have faced considerable challenges due to COVID-19 pandemic.

It is expected that delay of projects or quality compromise would have a casual sequence on the economy of a nation. The occurrence of the global pandemic of COVID-19 affected the construction industry, including building projects. Due to the nature of the unorganized nature of the construction industry, identifying the effect of COVID-19 and the challenges caused by the disease can give lessons to minimize its effects. Therefore to better understand the possible effects of the pandemic on building construction projects; this study has been conducted to explore the impact of COVID-19 on the building construction industry by taking the case of Addis Ababa, Ethiopia.

The current study used both quantitative and qualitative approaches through self-administered questionnaire and interview. Disruption in building material supply, losing jobs, project suspensions, cost and time over run and impact on quality of building construction projects are some of the challenges identified. Inflation related problems and scarcity of construction materials, shortages of labors, project delay and incurring additional cost are also the major impacts of COVID-19 on the building construction industry. As the stakeholders involved in the construction industry are experiencing the impacts of the pandemic, performing time-impact analysis, including examining the status of material procurement on projects, is critical to perform, in order to identify latent delays in schedule.

Keywords: COVID 19, building construction, pandemic, cost overrun, project delay

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1. Introduction

Corona virus (COVID-19) is a disease caused by the novel corona virus SARS-CoV-2. Most people infected with the virus will experience mild to moderate respiratory illness and recover without requiring special treatment. However, some will become seriously ill and require medical attention (W.H.O, 2021). In addition to the serious health emergency, the outbreak has resulted in a global economic decline (Bou Hatoum, M., et al. , 2021).

Ethiopia as the second-most populous country in Africa with more than 110 million people is among the developing countries where the pandemic has affected the economy significantly. The country's real GDP growth in 2019 was 9.0% and it was forecasted to be 6.2% in 2020 pre-COVID-19 and this forecast has later been revised downwards to 3.2% in 2020.

The pandemic interrupted economic activity in the country where over 40% of businesses closed due to COVID-19 related restrictions, and 32% of businesses reported no revenues in the first month of the pandemic (March - April, 2020) (Donna Harris, et al., 2021).

The construction industry is a fundamental economic sector that permeates most of the other sectors as it transforms various resources into constructed physical economic and social infrastructure necessary for socio-economic development (Demissew, A., 2020). The construction industry has important contributions to the Ethiopian economy, as demonstrated by its share in the GDP which contributes as much as 19.5% (Geda, A., 2021). It involves a wide range of human resource, financial sectors, consultants, contractors through various material supplies with 58-60% of the capital budget being spent on this industry (EEA, 2006).

The construction sector, like many other sectors, has been affected in a number of ways (Bou Hatoum, M., et al. , 2021). Since the pandemic began, there have been fewer employment opportunities, partially due to the work disruptions (Donna Harris, et al., 2021).

The disease outbreak is believed to impact the construction markets worldwide through supply chain disruptions, workforce restrictions, and legislative changes (Al-Mhdawi, M.K.S., et al., 2022). Nonetheless, developing countries seem to be more defenseless to the challenges related with the global pandemic. In particular, the pandemic has caused many project delays and challenges due to supply chain disruptions; changes in the laws; financing pressures; health and safety challenges; lack of human resources and workforce restrictions; challenges in accessing job sites, contractual implications and claims; suspension of construction projects; and unavailability of needed materials, tools, and equipment (Al-Mhdawi, M.K.S., et al., 2022).

This paper aims at assessing the impact of COVID-19 on construction projects and project management in Ethiopia by taking the case of building construction projects in Addis Ababa, Ethiopia. The specific objectives include identifying a comprehensive and validated list of construction themes and factors affected by the pandemic in Ethiopia; quantifying the impact of COVID-19 on building construction and related factors; and investigating the impact of the pandemic on private building constructions.

Understanding the impact COVID-19 has caused and identifying the measures to be taken to address those challenges in building

construction projects and overall project management becomes very important since it can lead to the interventions in designing preparedness and future mitigation when such catastrophic events occur.

These findings are also believed to help policy makers improve the currently available plan of strategy by developing new policy and practice that will be helpful in coping with such circumstances in the future among the building construction sector.

2. Literature Review

COVID-19, a health crisis that changed into an economic and jobs crisis, had potentially become a social and economic crisis both worldwide and in Ethiopia (Commission,J.C, 2020). This has been revealed in several study findings (Commission, J.C, 2020 and Timilsina, S., 2021).

A study conducted on impact of COVID-19 in the construction industry has shown that the COVID-19 global pandemic has caused delays in construction projects (Zamani, S.H., et al.,2021 and Koushki, P., et al, 2004). The problem is not limited to delay in project works but also many other challenges like project suspension due to constraint in movements and supply shortage, shortage of workforce due to cessation of projects and the spreading of the virus in gatherings, time overrun which is associated with the movement and measure control period (Demissew, A., 2020 and Koushki, P., et al, 2004), and cost overrun and financial impact following the economic deterioration and ongoing overhead costs to keep companies running (Bou Hatoum, M., et al. , 2021 and Demissew, A., 2020).

Other impacts including material price fluctuations, legal issues and interruptions in contractual terms, impact on existing accomplished activities and uncertainty of survival have also been reported (Zamani, S.H., et al., 2021).

Generally, some of the possible areas of adverse impacts of COVID-19 on construction industry include labor shortages due to difficulties in mobilization and its role in causing 61% of job loss in the construction industry (EEA, 2006). In this case, temporary/daily laborers (that constitute up to 90% of the jobs in this industry) are expected to lose their jobs relatively quickly, and different levels of skilled works will be affected (Commission,J.C., 2020).

Disruptions are observed on the supply chain of construction resources due to difficulties in mobilizing especially importing materials like cement, steel, aluminum, and their products. This is due to the major countries (China, Turkey, Japan, UAE, UK, USA, Italy, South Africa, India,) that Ethiopia imports for the construction industry has been on lockdown due to the Noble Corona Virus pandemic(EEA, 2006). Additional cost due to new Safety and Health requirements, foreign currency shortages, in general, because of delivery delays (Geda, A., 2021) include the impacts.
Further delay or additional cost have emanated from changes of the law restricting the activities. Reduction in productivity is because of the social distancing of laborers and restrictions by the government (Geda, A., 2021, EEA, 2006 and Commission, J.C, 2020).
Management becomes intensive because of unfamiliar roles & responsibilities introduced by regulatory bodies and claim administration. Increased expenses due to additional cost for PPEs; and idleness of resources like equipment, machinery, and

tools, resources (human and materials); imported plant or equipment coming from China (or other affected countries) (Al-Mhdawi, M.K.S., et al., 2022) and delayed supply have resulted in price escalations of a resource (Donna Harris, et al., 2021).

Reduction of new investments in the construction industry causing thousands of new cases and fatalities as well as wide scale disruption and fear, both socially and economically (Al-Mhdawi, M.K.S., et al., 2022) have been found to be the impacts of the pandemic. Owners and contractors need to carefully analyze whether they should terminate or suspend projects or portions of projects. Some opt to press forward while some opt to terminate or suspend.

Similarly a study done in Ethiopia to evaluate the impact of COVID-19 on construction industry has identified the possible areas of adverse impacts of COVID-19 on construction industry (Demissew, A., 2020). Shortages of labor or human resource because of the troubles in movement from one place to another causing majority of job loss and human resource turnover from the construction industry are among the biggest obstacles for the sector (DEGYE, G., et al, 2020). Disruptions of the supply chain of construction resources due to difficulties in mobilizing especially importing materials like cement, steel, aluminum, and their products were also affecting the market significantly (Demissew, A., 2020). In addition, the dynamic cost inflation due to new safety and health requirements, shortage in foreign currency , delay or additional cost originated from changes of the law restricting the activities, decrement in productivity because of the social distancing of laborers and movement restrictions from one place to another by the government (Koushki, P., et al, 2004), the intensive management due to unfamiliar roles & responsibilities introduced by regulatory bodies and claim administration, an increase in expenses and incidentals due to additional cost for personal protective equipment, and the cost for resources like equipment, machinery, and tools, human resources during idle working days were some of the deteriorating challenges the sector have faced due to the pandemic (Demissew, A., 2020, Zamani, S.H., et al., 2021 and DEGYE, G., et al, 2020).

Furthermore delay in material supply and the escalation of price was also believed to cause newly emerging investments in the industry to significantly decrease causing wide scale disruption and fear both socially and economically (Jawa, A. G.,et al 2022).

Studies by many researchers concurred that the COVID-19 pandemic has impacted the construction industry worldwide (Araya F., 2021). Regarding its effect on the building construction sector, numerous studies emphasize that COVID-19 has disrupted the normal operations of construction projects, placing a high level of attention on the safety and health of construction workers on the field (Koushki, P., et al, 2004).

Based on the report of the International Labor Organization, approximately 2.7 billion workers, equivalent to 81% of the workforce around the world, was estimated to be affected by COVID-19, and certainly these percentages include workers in the construction sector (Ihsan, A. H., et al, 2021).

Construction has a huge proportion of temporary and unskilled workers that it has been estimated in the market that at least 60% of the projects in construction will cease due to lack of financial liquidity, with all

temporary workers in these projects (daily laborers) to be laid-off (Commission,J.C, 2020).

Shortages of labor or human resource because of the movement restrictions causing 61% of job loss only by the sector of construction is one of the major obstacles (DEGYE, G., et al, 2020). In addition, a necessary share of jobs was estimated to be impacted relatively quickly with a medium-estimate of 741 thousand jobs threatened in 3 months, representing 34% of total employment in construction (Commission,J.C , 2020).

In this case, contract or temporary employees such as daily laborers that constitute more than 90% of the work load in construction industry were the ones at first line to lose their job (Commission,J.C , 2020). Furthermore, preliminary statistics showed that the construction sector in Iraq has experienced 52% of employment reduction and 68% production reduction due to COVID-19 (Al-Mhdawi, M.K.S., et al., 2022).

According to Nový, M. and J. Nováková, (2022), the pandemic has led to lower number of employees (86%), extension of the implementation period (65%), suspension of the implementation (53%), lack of building materials(18%), introduction of anti-pandemic measures in the company (94%), introduction of a home office of technical and economic employees (96%), provision of protective equipment (82%) and changes in shift rate (22%).

The building construction markets in developing countries are perceived to be more vulnerable to the challenges associated with the pandemic (Al-Mhdawi, M.K.S., et al., 2022). As such, the main goal of this study is to clearly understand the impact of COVID-19 on construction projects in Ethiopia by considering the case building construction projects in Addis Ababa, Ethiopia.

3. Methodology

The research study involves data collection and analysis by adopting a cross sectional study design using quantitative and qualitative research approach with the study participants being workers of building construction projects. The qualitative method (interviews) is used to obtain a general understanding of the quantitative analysis.

Building construction companies were selected based on reviewing several criteria, such as the organization size, engagement in building construction projects and availability of information from past projects mainly during the time of COVID-19.

The study participants include individuals working in building construction industry, employees, administrative staffs, contractors, sub-contractors, consultants and company owners engaged in building construction projects in Addis Ababa, Ethiopia.

The data collection has been done by developing a semi-structured questionnaire and conducting an interview among employees, contractors, sub-contractors, administrative staffs, consultants and company owners in selected organizations in Addis Ababa. This approach is used to identify factors that have relationship with effect of covid-19 in the building construction management sector. Some of the basic questions include:

- What problems the construction industry has faced due to COVID-19?

- If appropriate notices in a suitable format regarding the changes in time or quality to the client were given or not?
- Were any mechanisms to minimize the effect of COVID-19 on building construction projects and the overall project management considered or not?

The open-ended interview is used to encourage respondents to give their perceptions on the problem faced by their company due to COVID-19. Before directly stepping in to data collection, pilot testing were done for the tool and the process of piloting the questionnaire on a sample of respondents have allowed the researcher to ensure more response options, add more questions related to sample characteristics, remove redundancies, and make sure the understanding of all respondents who would fill the survey. The data collected during pilot testing were excluded from the final sample to ensure consistent data collection and analysis.

Quantitative data were obtained through a Google questionnaire survey distributed to the target respondents. The questionnaires were sent to those with ability to read and understand English language considering their academic level. Face to face interview has also been done for respondents who might have no access to internet service.

In addition, a qualitative approach has been used to get a detailed explanation on the subject matter when it is relevant and to clearly analyze the collected data qualitatively. Participants or respondents were selected randomly to avoid selection bias. However the fact that those respondents were involved in various building construction projects were confirmed before proceeding to the interview.

The potential respondents have been informed about the purpose of the study and their willingness to participate in the interview was confirmed with their oral consent. Before proceeding to data collection, pre testing of the questionnaire was also made. On the spot checking and review of completed questionnaires to ensure completeness and consistency of the information was done and immediate action were taken. To keep accuracy of data, data entry was done. Non respondents were communicated twice and those participants with missing information were asked again to complete.

There were 102 respondents who participated on the questionnaire survey. Data were coded, entered and cleaned using Epi data version 3.1. All statistical tests were performed using STATA version 14. Data were cleaned for outliers and corrected by transforming in to categorical variable if they were numeric or by omitting extreme values (highest and lowest value). Missing data was omitted before analysis is done.

Participants comprised both genders with different backgrounds, age groups, levels of education, working positions, and experience in the construction industry. The data and information from the findings were gathered to determine the effects of COVID19 pandemic on the building construction industry as well as project sites. The demography of respondents is presented using descriptive analysis.

To see the effect of each independent variable on the outcome variable, cross tabulation is used and the strength of the associations was assessed by computing chi square test.

4. Results and Discussion

Respondent's Demographic Description

Exhibiting clear and understandable evidence on the impact of COVID-19 is believed to help all stakeholders engaged in the building construction to prepare more effective response plans, considering global and local aspects.

Among the 102 respondents participating in this research, 64.71% were males and 35.29% were females. Majority of the study participants range within the age of 30-40 having percentage of 34%. On the other hand 45 (51.14%) of them hold a bachelor degree and 34.09% of them hold master's degree. With regards to marital status, 61% were married and the rest single.

With regards to work experience, 26.47% have more than 5 years and 22.55% have 5-10 years and 21.57% have 10-15 years of experience. The remaining 15.69%, 7.84% and 5.88 % have15-20 years, 20-25 years and more than 25 years respectively.

Regarding their current employment of involvement in project status there were 101 participants who gave answer for this question among which 18 (17.82%) of them are building construction company owners and majority of the respondents 34(33.66%) are permanent employees.

The fact that the study participants are diversified from different stakeholders and work experience range is believed to give a logical picture of the concept from different perspective.

Besides, majority of the respondents were from senior positions, such as site engineers, consultants or project managers representing 20%, 18.89% and 14.44% consecutively. In this assessment 14(15.56%) of them were contractors and 14.44% were other stakeholders involved in the building construction management within the organization. Table 1 below summarizes the detailed descriptive data for respondents in terms of their current employment or involvement status.

Table 1. Employment or involvement in the company status of study participants

Current involvement	Frequency	%	Cumulative
Company owners	18	17.8	17.82
Consultants	13	12.9	30.69
Contract employers	15	14.9	45.54
Daily laborers	16	15.8	61.39
Permanent employers	34	33.7	95.05
Others	5	4.9	100.00
Total	101	100	

COVID-19 infection and protection mechanisms among building construction workers

Regarding the COVID-19 infection status, a total of 96 study participants responded, among which 40.63% confirmed that they have been infected with the disease. On the other hand 19.79% believe that they might have been infected with COVID-19 and the rest 39.58% were not diagnosed.

More than half (52.50%) of respondents who have been infected by COVID-19 have been absent from work place for 16-30 working days. Among those participants who have

been infected, 26 of them have lost their position. This shows how much the pandemic could affect the industry negatively.

From a total of 100 respondents 72.04% were not vaccinated, which shows the possibility of the spreading effect of the pandemic among the workers. Nearly 50% of the study participants have mentioned that lock down is among the COVID-19 protection method which was not preferable for them that they have never implemented it. They also indicated that personal protective materials like face mask, hand and material sanitizers were found the most unsuitable personal protective equipment for them.

Challenges faced by contractor and company owners

Table 2 shows some of the most commonly challenges faced by contractors and company owners. Delay in monthly salary, adjusting to the new work schedule and losing job were among the most common challenges faced.

Table 2. Challenges faced by contractors during the COVID-19 pandemic

Contractor challenges	Frequency	%	Cumulative
Adjusting to new work schedule	14	19.4	19.44
Lack of safe working environment	9	12.5	31.94
Uncertainty of survival	7	9.72	41.67
losing jobs	13	18.1	59.72
managing a heavier work load	10	13.9	73.61
monthly salary delay	15	20.8	94.44
other	4	5.56	100.00
Total	72	100.	

One critical finding in this study includes the challenge contractors and building construction company owners has faced. Delay in monthly salary, adjusting to the new work schedule and losing job were among the most common challenges faced by contractors.

On the other hand cost overrun and financial impact, material price fluctuation and shortage of material supply with increasing expense for the idleness of resources like equipment of machinery are some of the challenges mentioned by company owners, the result of which is summarized in Table 3.

Table 3. Challenges faced by company owners during the COVID-19 pandemic

Challenges faced by company owners	Freq.	%	Cum.
cost overrun and financial impact	7	25.93	25.93
Impact on existing accomplished activities	1	3.70	29.63
Increase expense for idleness of resources like equipment & machinery	3	11.11	40.74
Legal issues and interruptions in contractual terms	1	3.70	44.44
material price fluctuations	6	22.22	66.67
Other	2	7.41	74.07
project suspension	2	7.41	81.48
shortage of material supply	3	11.11	92.59
time overrun	2	7.41	100.00
Total	**27**	**100.0**	

Effects of the COVID-19 Pandemic on building construction projects

A total of 101 participants have given their response regarding their representation during project works. Majority of them (57.43%) represent the contractor, 18% the consultant, 15% the client, 8% the sub-contractor and only 1.98% represent construction material supplier.

In general, 96.51% of the survey respondents have clearly responded that the global pandemic COVID-19 has significantly affected their building construction project, which really shows its impacts.

Besides the effect on building construction project timeliness, overall project cost and project quality has been evaluated. The STATA analysis shows that the disease has significantly affected the project time and cost than the building quality. 85.88% of the respondents have indicated that it affected their project time, 77.91 % indicated a negative effect on cost and 58.02 % responded that covid-19 has affected the quality of their project. Table 4 presents the combined set of data regarding the effect of the disease on project time, cost and quality.

Table 4 Effect of COVID-19 on specific types of building construction projects

Effect of COVID-19 on building construction project	**Frequency**	**Percentage (%)**	**Cumulative**
Cost	22	28.21	28.21
Quality	8	10.26	38.46
Time	31	39.74	78.21
Time, Cost	10	12.82	91.03
Time, Cost, Quality	7	8.97	100.0
Total	78	100.0	

The respondents have also addressed its level of effect on time, cost and quality of those mentioned projects. It was found out that, 33 (50%) of the study participants have confirmed the pandemic to have delayed their project in 6-12 months. 30.30% have also stated that their project work has been delayed by 12-18 months, which is very much significant for project work activity and progress. Table 5 shows the level of significance on how COVID-19 has affected projects of building construction management. It shows that the pandemic has significant effects that could alter the cost, time and quality of project activities.

Similar finding have been observed showing that COVID-19 has caused operational and financial issues, while financial aids and complete information is needed to overcome those impacts.

This has been further seen on a study done in Ethiopia implying scarcity and increasing cost of construction materials, hard currency shortages, reduction productivity, shortages of labors, delay of projects (extension of time), and incurring additional cost being the major challenges in Ethiopian construction industry (Demissew, A., 2020).

Table 5: Significance test to show the effect of COVID-19 on building project management

Did COVI-19 Affect your construction project?	Specific effect on					Total
	Cost	Quality	Time	Cost and time	Cost, time and quality	
No	0	0	0	0	1	1
Yes	22	8	31	10	6	77
Total	22	8	31	10	7	78

Pearson chi^2 (4) = 10.2746 Pr = 0.036

Similar findings were obtained from other studies identifying long term and short term impact of the pandemic on the industry (Demissew, A., 2020, Al-Mhdawi, M.K.S., et al., 2022, and Zamani, S.H., et al., 2021). Studies show that the disruption in the labor flow in addition to the supply shortage as in the current study has directly led the economic activity to resume making contractors to face the challenge of financing increased costs (Rokooei, S., et al., 2022) and the uncertainty of whether those are covered by contract clauses and can be recovered (Koushki, P.A. and N. Kartam, 2004).

While addressing the qualitative questions to further address detailed issues on the effect of the pandemic, participants have raised several points. Some of those points regarding the mitigation mechanisms to overcome the challenge of time over run and shortage of material supply during the pandemic include working very late more than the usual working hour with a lesser quality material and the use of lesser quality building material were the major ones.

The respondents have also addressed that the significant shortage in material supply has been diverting their focus more on its availability that the quality of supply which in return compromised the quality of the project work. Similar results were found in a qualitative study conducted in Malaysia showing material delay problems due to country to country procedures and scarcity of supplies due to the supplier company's operations put on hold leading to high demand for supplies (Zamani, S.H., et al., 2021).

Measures taken to minimize the effect of COVID-19 on building construction management

The study has also addressed the presence of records which are prepared to confirm project delays and measurements that were taken to minimize the effect of COVID-19 on building construction projects. It was thus found out that only 50% respondents have tried to take action to address the effect of the global pandemic. On the other hand 62 (73.81%) of them have documented temporary records of confirmation that reveals the impact of the pandemic on project time delays.

The study also shows that there is poor effort regarding the measure taken in Ethiopia. In contrast to this, a study conducted in Wuhan, china to identify strategies to address COVID-19 in the construction industry identified that adhering to a product, organization, and process (POP) modeling approach combined with building information modeling allowed for the ultra-rapid creation, management, and communication of project-related information,

resulting in the successful achievement (Luo, H., et al., 2020).

This shows the need for government support in preparing guidelines that could help in mitigating such catastrophic challenges in the future supply (Zamani, S.H., et al., 2021). In addition to the current countermeasures, the government could provide other mechanisms to reduce the impact of COVID-19 in the building construction industry. This includes developing standard operating procedures that could be used in such emerging challenges.

5. Conclusions

The emergence of COVID-19 abruptly changed the work routine in many industries (Al-Mhdawi, M.K.S., et al., 2022 and EEA, 2006). Its effect hasn't been confined to health areas, although the immediate cure of people who contracted the disease was the most urgent concern (Donna Harris, et al., 2021).

This study was able to identify the effect of COVID-19 on building construction projects in Ethiopia by considering the case of building construction projects in Addis Ababa has faced unprecedented challenge, similar to many other countries. The response to the COVID-19 crisis was intended to ensure public health and safety, with minimal impact on necessary industries. However the building construction industry is among the most highly affected sector by the COVID-19 global pandemic. This study could be additional supporting document to the existing ones to show that the pandemic has caused a significant effect on the building construction industry.

There is a deteriorating financial situation and cost inflation of construction materials and supplies compromising time and cost of projects. Moreover, contractors faced the problem of late payment and cost over runs of the projects. Likewise, the operational level impact is related to delay in project completion, supply chain problems, difficulty in workforce management, and maintaining health and safety of the workforce.

Undertaking a construction project requires a significant amount of planning: starting from the conceptual phase to the detailed design phase, It is necessary to make thorough preparations about labor; the provision of costs and resources; and the purchase of construction materials and machineries.

The study has identified the problems caused by pandemic COVID-19 on the building construction industry, and the need for considerable measures to minimize its devastating negative impact. This is because the damage will proceed by impacting the building construction industry by causing operational and financial issues. The operation is effected as project timelines due to shortening the time of construction activities and late approvals by related authorities.

Besides, the shortage of skilled workers and supplies, and logistic issues has directly and indirectly affected the building construction project operation.

The findings of this research can help construction managers and policymakers to adopt a national approach when there is a relative consensus.

6. Recommendation

In addition to the current countermeasures, the government could provide other mechanisms to reduce the impact of COVID-

19 in the building construction industry. This includes developing standard operating procedures that could be used in such emerging challenges.

As subcontractors, and suppliers experienced COVID-19 impacts, it is critical to perform a schedule assessment or time-impact analysis, including examining the status of material procurement on projects, to identify latent delays in the schedule. It is critical to perform a schedule assessment or time-impact analysis, including examining the status of material procurement on projects, to identify latent delays in the schedule.

In addition, identifying causative and attributable factors could help when projects face challenges in delay that could lead to suspension. Furthermore, revising resource planning across project stakeholders (owners, project managers, architects, engineers, contractors, a subcontractors) and identifying current key resources as well as those required for the duration of the project could provide an updated data on the progress of the project. Finally stakeholders engaged in the building construction projects should continuously conduct risk analysis by considering the various situations that could suddenly emerge and affect the project.

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