COVID-19 Impact on the Construction Industry: Learned Lessons

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Abstract:

In January 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a global public health emergency of concern. By March, (WHO) officially declared COVID-19 a pandemic. The Egyptian government took preventive measures by issuing decrees nationwide as part of a comprehensive plan to address thepotential consequences of the Coronavirus. This research aims to examine the impact of the COVID-19 pandemic on construction project control processes in Egypt. The paper presents theoretical and practical findings and includes a questionnaire survey with 40 questions administered to 152 engineering and construction professionals. The findings are validated through case studies highlighting the crisis's impact on construction project control. The discussion of survey results highlights the most critical impacts on control processes and suggests strategies for overcoming these impacts.

Keywords: COVID-19 pandemic; construction projects; termination rights; crisis

1. Introduction

The global public health emergency of concern regarding the COVID-19 outbreak was declared by the World Health Organization (WHO) in January 2020. (WHO) formally classified COVID-19 as a pandemic by March. The Egyptian government took preventive measures by issuing decrees nationwide as part of a comprehensive plan to address thepotential consequences of the Coronavirus. Stakeholders in construction projects aim to complete their projects successfully, as they are essential for their interests or the country's economic and social development [1] [2]. Thus, the critical challenge in construction projects is to control the process to minimize the likelihood of negative consequences or project performance risks. Effective planning contributes to project success by meeting the time, cost, and quality goals within the project scope.

This becomes even more important when considering the potential risks posed by the COVID-19 pandemic on work conditions. The planning process is continuous and must be revised as changes occur during implementation [3]. In order to identify any deviations from the project plan and reference lines and implement corrective measures to meet the project's objectives and guarantee its success, the control process keeps track of the project's advancement [4] [5] [6] [7]. Figure 1 depicts the planning and control processes [7]. Since its initial report in Wuhan, China, in December 2019, the COVID-19 pandemic has had a severe impact on people's health and lives, resulting in over a million infections worldwide and thousands of deaths. [8]. In addition, the pandemic and government efforts to slow its spread, such as lockdowns, quarantines, travel restrictions, and heightened border controls, have had a significant impact on businesses, including worker shortages, disrupted supply chains, suspended and shutdown production, and decreased demand and supply of goods and services [9].

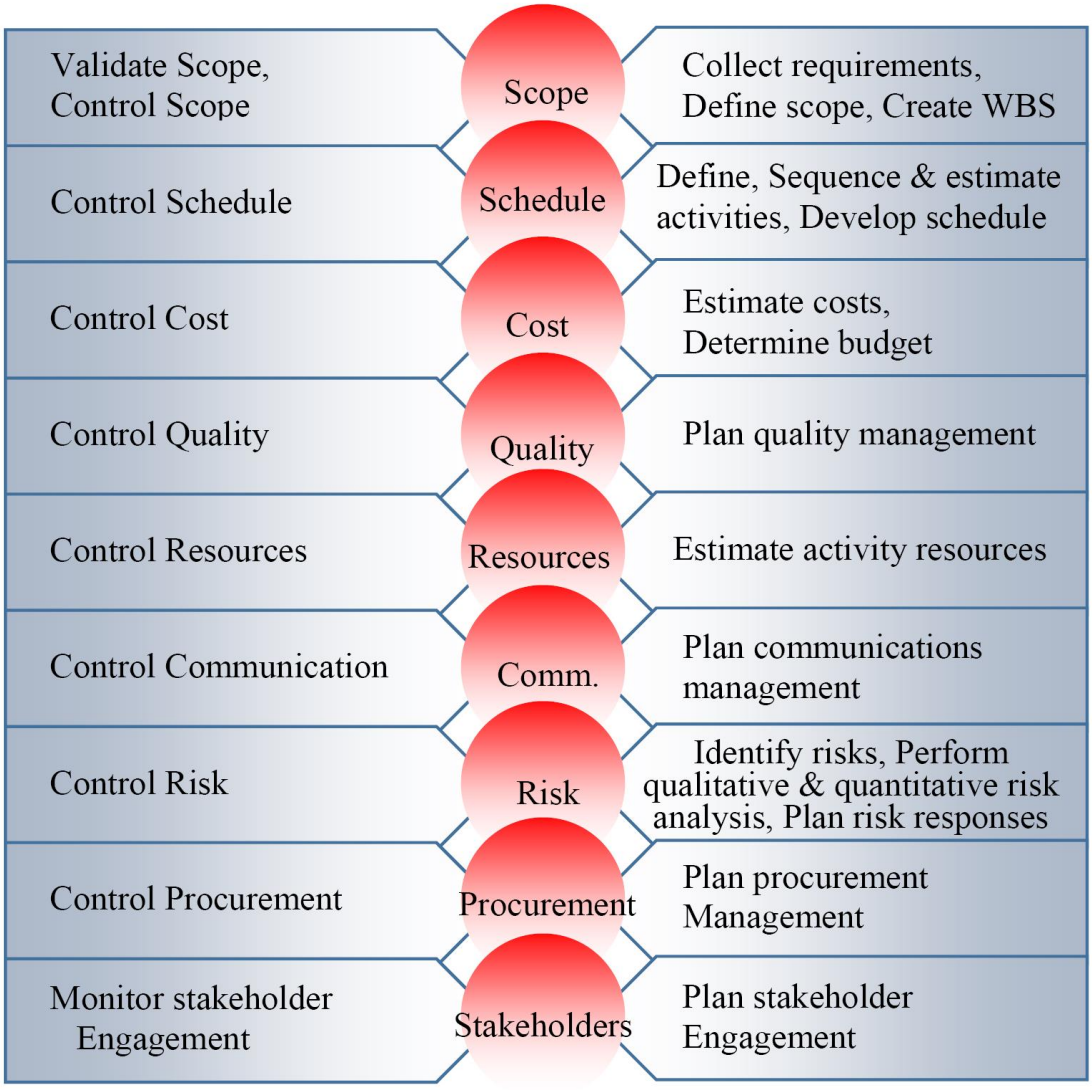

Figure 1. Planning & control processes group

2. Research Objectives

The current work environment has made the construction process more complex and constrained, making traditional project control systems less feasible and requiring a more innovative approach, especially in light of the rapid spread of the coronavirus. This raises the following query: How much does Egypt's coronavirus pandemic crisis affect controlling procedures on construction projects? The following hypotheses guided the study: H0: No statistically significant impact of the coronavirus pandemic on process control in construction projects. Ha: The COVID-19 pandemic statistically significantly impacts construction project process control. Therefore, the study aims to evaluate how the coronavirus pandemic has affected the control procedures of Egypt's construction projects. and explore non-traditional work tracking and alternative strategies during the pandemic.

3. Background

3.1 Scope

One important component that influences project performance and establishes the project's success is the project scope. Therefore, a well-defined scope meeting stakeholder requirements is necessary to maintain the project schedule and cost. The project scope is established through the WBS process and monitored and updated throughout its life cycle to ensure its completion and success. Effective control of the project scope helps control time and cost and prevents scope creep, a common issue in construction projects caused by additional instructions or changes in scope size.

3.2 Schedule

Effective scheduling is critical to successful project outcomes. Project schedule planning entails identifying activities, arranging them in sequence, assessing resource requirements, estimating their duration, and creating the project schedule and control plan [7]. Managing resource constraints during schedule can challenge project managers, but flexible resource management and contingency reserve analysis can minimize schedule risks [10] [11].

3.3 Cost

For all parties involved in a construction project, the accuracy of cost estimates is crucial.. Factors such as project complexity, construction method, project size and scope, site limitations, market conditions, and duration must be considered [12] [7]. In the planning phase, contingency reserves are estimated and incorporated into the project budget [13]. The budget should account for risk and keep the project within its budget [14]. Project delays and cost overruns may result from a shortage of contingency reserves. [15]. considering that construction costs are expected to account for 65–70% of the project budget, a contingency should be incorporated to allow for flexibility in decision-making during the design phase [16] [17] [18].

In a pandemic crisis, construction costs are greatly impacted by factors such as financing time, financing cost, interest rate changes, and financial market knowledge [18]. Cost control practices monitor project expenses to avoid incorrect costs and ensure the budget isn't exceeded [19]. Techniques for data analysis, including earned value analysis, variance, trend, and reserve analysis, were applied. [7]. But in a pandemic emergency, using earned value technology—which measures project performance by combining time, cost, and scope—becomes more difficult. [5] [20].

3.4 Quality

Meeting the customer's needs and completing the specifications and drawings outlined in the contract on time and within budget are all part of quality management. The most generally used approach to estimating the cost of quality considers assessment costs (such as testing, inspection, validation, and auditing) and the costs of preventing or minimizing errors from implementation problems (such as training, equipment, and time) [21] [22]. Processes are tracked, testing and performance concerns are handled, and manufacturers are overseen for final product control during the quality control procedure [23]. Regulations related to safety and health, the effectiveness of critical path activities, job completion metrics, resource efficiency, and discrepancies between planned and actual resource measurements are some factors that influence the cost of quality throughout the control phase [21]. This implies that the process becomes more complex in the pandemic-related constraints.

3.5 Resource

The resource plan is key to ensuring efficient resource use throughout the project and ensuring project success [24]. Environmental considerations, organizational assets, and activity resource requirements are the data needed to create the resource plan [7]. Resource control also requires the project management strategy, documentation, performance information, and organizational assets. Resource management is impacted by meetings, appropriate planning, a highly trained staff, safe working conditions, skilled worker sharing, the expertise of site managers, and decreased inequity [25]. Managing resource flow is challenging, especially during pandemics when human error can lead to increased costs and delays due to transportation and skilled worker shortages [26].

3.6 Communication

Improved stakeholder communication leads to better project outcomes, increased team trust, decision-making involvement, and learning and sharing of information [2] [27]. Communication style and method impact employee satisfaction and break down barriers between project team members, promoting collaboration and sharing of experiences [28]. The necessary input for communication planning includes a stakeholder register, management strategy of stakeholders, project-influencing environmental factors, and organizational and operational assets.

Analyzing communication needs, technologies, models, techniques, and revisions to the project management plan results in creating a communication management plan. [29]. Emails, brainstorming sessions, in-person meetings, and ICT (information and communication technology) education are all examples of efficient communication techniques [27]. ICT helps mitigate communication problems between remote consultants, contractors, and suppliers by reducing time, cost, and travel and facilitating information retrieval [30]. Technology dependency increases in pandemic times with the need for social distance. Project management plans, project documents, performance statistics, and organizational and operational assets are all examples of input used in communication monitoring. Maintaining effective communication and information exchange among the key project participants is essential since poor communication can result in rework, modification requests, disagreement, and delays [31].

3.7 Risk

Risk management aims to boost positive outcomes and decrease negative events [32]. All stakeholders must identify and evaluate risks and make well-informed decisions for risk management to be successful. A capable project manager is also necessary [33]. Throughout the project, the risk identification process should be carried out continuously. The risk log is divided into nine categories and is updated: Risks associated with building and economics, environment and natural disasters, finances, management, collaboration, law and regulation, politics, and technology [34] [35]. Qualitative risk analysis determines the priority of risks based on impact and probability [36] utilizing tools like impact charts, probability analysis, expert advice, Delphi, decision-making, and Monte Carlo simulation [37] [38] [39]. Risks can be reduced or eliminated by reducing causes, eliminating, or transferring them. Some risks, such as disasters and climate change, are outside the project manager's control; in these situations, the work can proceed or be accepted or addressed after the incident [35]. Throughout the life of the project, the risk control process keeps an eye on the project's performance, the risk environment, and how the risk management plan is being implemented [40] [41] using audits, data analysis, and meetings [42].

3.8 Procurement

Effective procurement planning establishes the needs and requirements of the project, the mode of purchase, and the vendor selection process, all of which contribute to effective outcomes and cost savings [43]. Contractor selection should be based on factors such as their reputation, ability to deliver on time, and technical expertise [44]. Control procurement monitors contract execution and ensures necessary changes for closure [43]. Project management plans are updated, procurement records and the organization's resources are maintained, and procurements are closed through procurement performance evaluations, checks, audits, and claims management [7]. The COVID-19 epidemic significantly influenced construction supply chain and procurement responsibilities.

3.9 Stakeholder

Several stakeholders are involved in the construction industry, and in order to maximize resources, foster support, and improve project success, all parties must be actively participating in the project. [45] [46] [2]. Project documentation, work performance data, and the project management strategy must all be consulted in order to track stakeholder participation. Project documentation, modification requests, work performance updates, and project management plan updates are generated using this information through IT and meetings [7].

3.10 COVID-19 Outbreak

The new coronavirus is a highly contagious virus that spreads quickly among people and was thought to cause several health problems and negative social and economic effects on all aspects of the environment [47]. SARS-CoV-2 is a novel viral strain that is unknown to humans. It was discovered in Wuhan City, China, towards the end of 2019 and is spreading quickly among individuals by spray. Death can result from flu-like symptoms accompanied by pneumonia and respiratory difficulties [48]. With an average incubation period of 4 to 6 days, the virus is spread indirectly and from person to person online. According to a different study, the incubation period varies depending on the immune system and age of the human and typically lasts between two and five days before the symptoms of the illness manifest. [9]. Many nations, like Italy and Malaysia, as well as other large cities, like Matila, Daegu, and Wuhan, have been forced to close due to the coronavirus pandemic [9]. To find out how COVID-19 affected project performance, a survey was carried out in the United Arab Emirates. [49]. According to their findings, the construction industry faced several difficulties that made it difficult to complete projects on time, including delays in schedule, disruptions in cash flows, delays in permits, approvals, and inspections; travel restrictions; serious health and safety concerns; and shortages of equipment and materials. Contractors anticipate that Covid-19 will continue to affect their projects across Europe, the Middle East, and Africa (EMEA) through at least 2023. In Africa, where vaccine adoption is proceeding more slowly, the pandemic might have a longer-lasting effect on initiatives that provide several COVID-19 problems [50]. They were located and categorized into five groups. Their main conclusions and findings showed that anxiety, despair, and even suicide are frequently influenced by a variety of factors, including a hostile work environment, excessive workloads, domestic circumstances, and worries about job stability. They offered solutions to these problems and showed how project productivity could be increased while worker safety was maintained by redefining worksite safety and putting signs up, keeping a safe distance between workers, setting up sanitizers and washing stations in the fields, and using efficient technologies.

3.11 COVID-19 Safety and Health Challenges

The COVID-19 epidemic first impacted the construction industry, increasing the danger of infection for employees. Projects have experienced halts, delays, and modifications as businesses adopted new working practices. In addition to causing physical health problems, the virus also makes people anxious and harms their mental health.

The health of employees and their communities may be negatively impacted by employment-related factors such as lower pay, changed work patterns, and elevated stress levels. The smart buildings that were proposed may be a prevention mechanism against the virus [51]. Strategies such as improving worksite safety through signage, social distancing, providing sanitizers, and incorporating technology can enhance productivity while keeping workers safe.

3.12 COVID-19 Impact on construction projects in Egypt

The Egyptian prime minister announced a state of emergency in response to the coronavirus outbreak, and governmental institutions took safety measures to safeguard the populace. These included remote work, rotating schedules, movement restrictions, curfews, and suspension of international air travel. The precautions have impacted construction, tourism, shipping, mining, and gas [52]. Construction and other labor-intensive industries are prone to the spread of infections [9]. This increased risk makes accessing healthcare difficult for construction workers [53]. Workers traveling around a lot at work and having trouble getting healthcare are likelier to get sick [54]. The pandemic has also affected project budgets, schedules, completion, human resources, and contractual obligations [55] [17]. Due to the difficulty in getting to work sites, the coronavirus epidemic affected the construction industry's supply chains, availability of building materials, and employee attendance [56]. The pandemic also resulted in parties to construction contracts potentially requesting adjustments to prices or project duration due to clauses in the contracts that allow for delays or price adjustments in the event of certain conditions [57]. Thus, the pandemic caused delays, suspensions, contract termination and bankruptcy in the construction industry [58] [59]. "Force majeure" is a term frequently seen in construction contracts, which grants contractors the right not to fulfill certain contractual obligations in the event of circumstances beyond their control, such as government procedures or epidemics that result in unexpected shortages of goods or manpower [60]. Force majeure can lead to project time extensions, suspensions, or complete project termination [61] [62]. Work on the site is halted until the force majeure event ends if it affects one of the parties' ability to perform under the contract terms. Following the occurrence, either work is resumed, or the contract is terminated if conditions do not permit it [63]. When a force majeure event leads to the project's termination, all parties involved will bear the consequences, with the contractor being compensated for work completed thus far [64]. Not all force majeure provisions include an epidemic clause, which can create conflicts if the force clause is invoked [60]. Thus, care must be taken in crafting future contracts, including force majeure conditions and dispute resolution provisions, and seeking expert advice in drafting these clauses [57]. Managing the possible effects of the novel coronavirus while continuing to operate and provide services on time presents a significant problem for businesses, particularly for multinational corporations implementing risk-reduction measures like remote work [65]. Remote work facilitated by modern communication tools like video chats and online meetings allows teams to manage projects from home [56]. Alternatives include diversifying suppliers, transportation, workers, and clients [57]. The internet, e-commerce, and smart and virtual apps can reduce the demand for physical space and on-site work [54].

Visualize projects through building information modeling and 3D designs in virtual meetings [56]. In public-private partnerships, mitigating common risks by incentivizing profits and promoting trust and cooperation between parties is crucial [66]. Improving confidence in contractors and the workforce is essential to ensuring project completion, as agreed [56]. Teleworking and social separation can reduce traffic and stop the virus's transmission [67]. The aftermath of the pandemic highlights the significance of anticipating advancements in construction techniques that quicken emergency architecture development. The COVID-19 outbreak challenges global healthcare systems and often burdens medical facilities and personnel. To mitigate losses, construction companies should take a proactive approach by using SWOT analysis and establishing an early warning system [1]. If work at the site is necessary, preventive measures such as temperature checks, rotating work teams, and isolation for symptomatic individuals should be implemented [48]. It is suggested that in order to assure compliance, face masks, gloves, and appropriate safety distances from an official be worn [68]. Decrease the personnel on the site and supply hand sanitizers in offices and other areas [56]. Organizations should work with building contractors and employers to encourage health education by providing free diagnosis and treatment and materials in the local languages [69]. To educate staff, use visual aids like pictures, posters, and signage in offices and work areas [53]. Contract terms and obligations, as well as risks affecting contract performance, should be evaluated by companies to assess their rights and obligations during unforeseen circumstances [70] [57].

4. Methodology

This study aims to investigate how the coronavirus pandemic has affected building process control using a scientific technique. In order to accomplish this purpose, a survey of pertinent national and international sources—such as books, journals, and research papers—was carried out, and online articles and reports were included. Additionally, the study collected primary data via both closed- and open-ended questionnaires. A panel of three specialists examined the 36-question questionnaire to ensure it was usable. The answers to the questionnaire will be useful in updating project management techniques and evaluating work alternative tactics during the pandemic crisis. One research consultant, two project management professors, and 190 experts in the construction business participated in the study. The poll, which assessed work choice tactics in response to the pandemic and graded the significant consequences of COVID-19 on construction projects, was completed by 147 out of 190 respondents. At the conclusion, respondents were allowed to add more impacts and tactics. The Mean Item Score (MIS) was computed to identify the dominating statement in the survey, which employed a Likert scale from 1 to 5. The impact of COVID-19 on controlling processes in Egyptian building projects was examined using a case study methodology. A 5-point Likert scale, with options ranging from "Strongly disagree" (1) to "Strongly agree" (5), was employed in the study to determine the respondents' level of agreement or disagreement with certain assertions.

The Likert scale was selected for this study because it is a commonly used format in educational research and enables respondents to express their thoughts properly. A method was used to generate the "Mean Item Score" (MIS), which was then ranked in descending order with the highest-ranking statement being regarded as the most dominant [71].

$$MIS = \frac{1\times\text{no. of ones}+2\times\text{no. of twos}+3\times\text{no. of threes}+4\times\text{no. of fours}+5\times\text{no. of fives}}{\text{Total no. of responses}} \quad (1)$$

4.1 Sampling

In order to represent the study community appropriately, the researcher used a scientifically systematic random sample to choose various work sites relating to the research issue. This was done to include all parties in the work team (consultant, contractor, and employer) in the research sample. The state sector (Ministry of Housing, Utilities, and Urban Communities) and the commercial sector (major project contractors and engineering consultants) were the survey's focus, which was carried out in Egypt. The Egyptian Federation for Construction & Building Contractors said in 2013 that 465 contractors had construction projects valued at 2.5 million LE or more. As a result, 50 organizations connected to the Ministry of Housing, Utilities, and Urban Communities as well as 25 consulting firms received the survey. 540 contractors, consultants, and organizations connected to the Ministry of Housing, Utilities, and Urban Communities were eligible to participate in the survey.

4.2 Cases studies

To verify the questionnaire results and comprehend the effects of the coronavirus pandemic on these projects, the researcher chose two projects from their worksite (New Port Said City - Salam) with varying budgets and specifications. In order to clarify the questionnaire questions and validate the findings, the consultants and contractors for these projects were interviewed as part of the study methodology for these case studies. The case studies are briefly summarized in Figure 2.

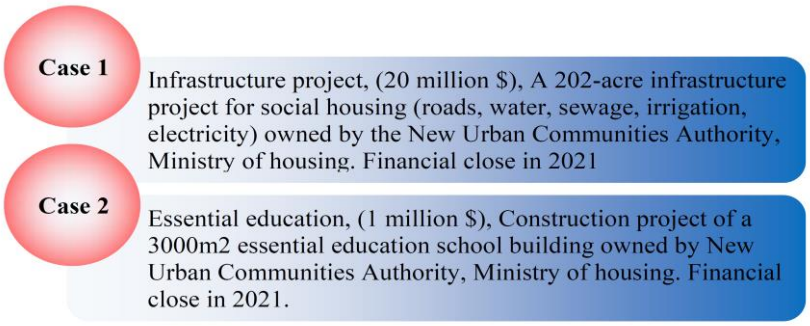

Figure 2. Cases overview

5. Results

5.1. Survey Participants

The survey began by asking participants to provide details on their job titles, industry, experience, etc. Figure 3 shows that 25.2% were owners, 32% were consultants, 38.1% were contractors, 3.4% were subcontractors, and 1.4% were suppliers. In-depth interviews with a group of construction experts were conducted as part of the survey to obtain information on how the COVID-19 epidemic has affected construction project control procedures. The respondents ranked the 12 survey questions, were prioritized based on statistical weight considerations, and evaluated potential pandemic mitigation techniques.

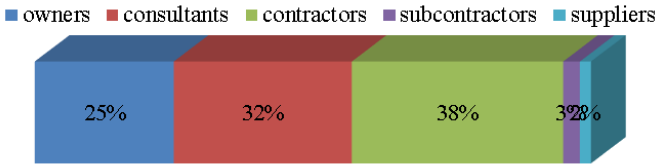

Figure 3. Organization's categories of respondents

5.2. Ranking of COVID-19 impact on controlling construction projects

This section examines the effects of the coronavirus pandemic on Egypt's building project control procedures, which are prioritized based on survey responses. The most significant impact, as ranked by the survey respondents, was on the project's cash flow, with the highest "Mean Item Score" (MIS) of 4.02 and rank 1, due to the widespread economic recession, see Figure 4. The project schedule came second with MIS of 3.97 and rank 2, followed by work completion at 3.89 with rank 3. With a MIS of 3.88 and a ranking of 4, the contractual condition performance came in fourth, and the project cost came in fifth with a ranking of 3.85 and a ranking of 5. With a MIS of 3.74, the start and end dates of the activities were placed sixth out of six. The worker shift system was ranked seventh with MIS of 3.69 and rank 7, followed by deliverables status at 3.66 with a rank of 8. Stakeholder engagement was ninth with MIS of 3.6 and ranked 9, while working hours and construction material supply ranked tenth with MIS of 3.57 and 10. Finally, project team management was ranked eleventh with an MIS of 3.41 and ranked 11.

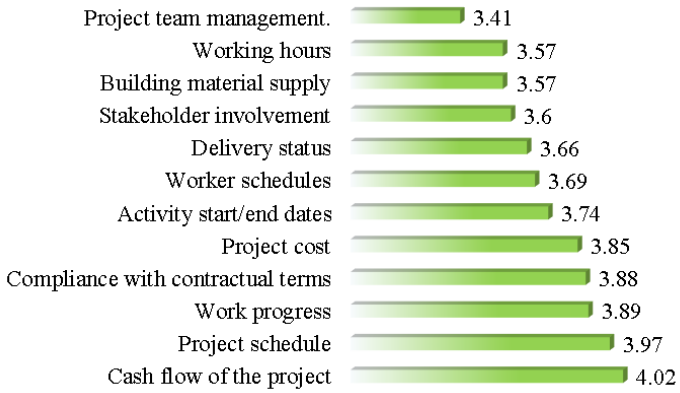

Figure 4. Ranking of COVID-19 impact on controlling in construction projects

5.3. Ranking the impact of COVID-19 on the contract conditions

With a Mean Item Score of 3.45, the participants gave the possible impact on contract terms the highest ranking—1. With a MIS of 3.42, the contractor's compensation was rated second. The claim for alternative prices was ranked third with an MIS of 3.35 and ranked 3, and the termination of some contracts was ranked last with an MIS of 3.03 and ranked 4, see Figure 5.

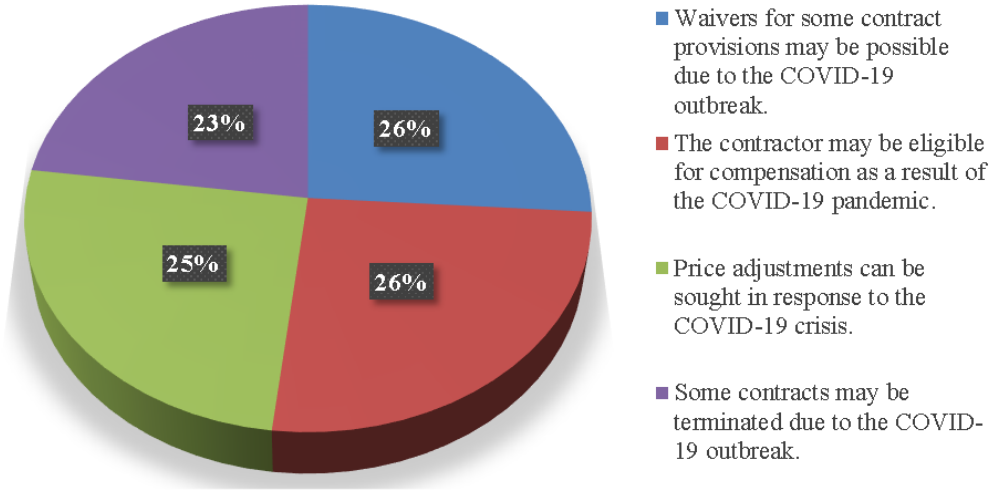

Figure 5. Ranking impact of COVID-19 on contract conditions

5.4. Work option strategies ranking

The following is a ranking of work different strategies used by respondents to mitigate the impact of the coronavirus pandemic: Contract clauses concerning rights of delay or termination ranked highest (MIS=4.27, R=1), then putting preventive measures into practice (MIS=4.26, R=2), modifying the duration of activities (MIS=4.25, R=3), settling claims and disputes through negotiation (MIS=4.23, R=4), diversifying supply sources (MIS=4.14, R=5), reevaluating contingency reserves to maintain project schedules (MIS=4.08, R=6), reevaluating contingency reserves to maintain project budgets (MIS=4.03, R=7), utilizing BIM and 3D design models for remote work (MIS=3.93, R=9), and carrying out project activities in parallel (MIS=3.88, R=10), monitoring with contemporary technology (MIS=3.86, R=11), utilizing virtual teams and remote work (MIS=3.83, R=12), and increasing owner confidence in the contractor (MIS=3.41, R=13), as illustrated in Figure 6.

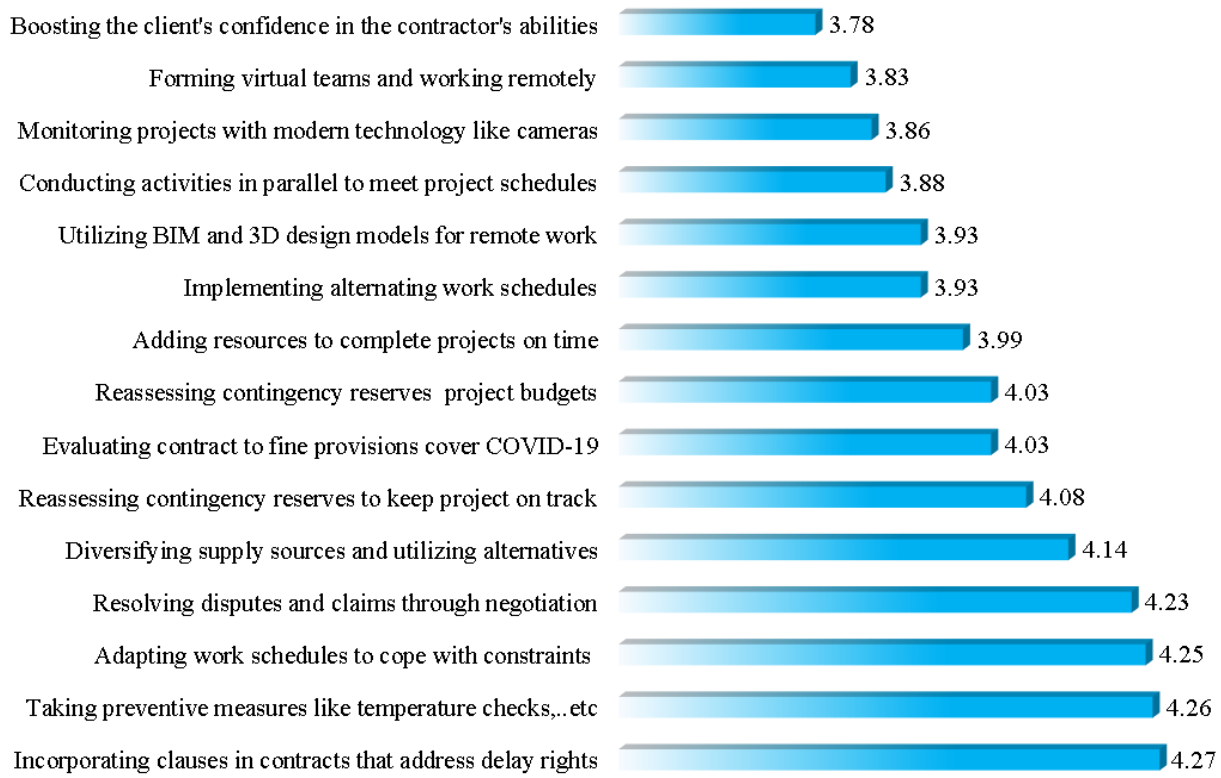

Figure 6. Ranking of work option strategies

6. Discussions

Measuring COVID-19's impact on controlling the construction projects

The findings of the survey and case studies indicate that the coronavirus pandemic has a statistically significant influence on process control in building projects. The area most affected by the global economic downturn is the project's financial flow. Recurrent worker illnesses and a 50% reduction in staff led to delays in the project timeline. The state-mandated preventive measures caused a delay in the project's completion and affected certain contractual requirements, namely the project's duration. Precautions like masks, continual sterilization, and temperature measurement equipment increased the project's cost and impacted worker wages. The activity begins, and employee absences and the shift system impact completion dates. The shift system and workforce decrease hampered stakeholder participation, and poor communication impeded deliverables. Import challenges negatively impacted project resources, and governmental mandates resulted in a reduction in working hours. The project team was difficult to manage because of inadequate communication.

Work option strategies assessment under COVID-19

Clauses on rights to terminate or postpone payments, terms for price adjustments, and hardship provisions impacting contract length are also included in the contract. Effective precautions, including temperature checks, mask use, social separation, and health guidelines, are helpful when working on-site. Activity duration should be adjusted due to COVID-19 constraints. Claims and disputes can be resolved through negotiation. Diversifying supply sources and exploring alternative options is advisable. Contingency reserves should be re-evaluated to secure project schedules and budgets. The contract terms should be reviewed to assess provisions related to COVID-19. Remote work and virtual teams are options for tasks not requiring direct supervision. For example, 3D modeling and BIM technology can help with remote work. Parallel project activities might be carried out to keep the project timeline on track. It is advised to monitor utilizing contemporary technologies, such as webcams. Consequently, there can be increased trust about the contractor's capacity to finish the job on schedule and within budget. Reducing the effects of COVID-19 is of the highest priority to all parties involved in building projects. A strategy prioritizing COVID-19-related health and safety measures at construction sites should be developed in cooperation with stakeholders, including clients, consultants, contractors, subcontractors, suppliers, and all other pertinent parties in the construction sector. Furthermore, international organizations such as the European Agency for Safety and Health at Work (EU), the Department of Occupational Health in China, and the Ministry of Health in Mexico have released guidelines for the construction sector to guarantee secure and healthful working environments during the pandemic [70]. As a result of COVID-19, the construction sector has had to adjust to considerable difficulties and create unique solutions for specific construction projects in order to minimize delays and other effects while upholding business interests. In addition to highlighting the effects of COVID-19 on the construction sector, this conversation offers clients and other stakeholders recommended strategies for addressing these issues. Their research showed how drones could plan appropriate activities and remotely monitor COVID-19 hotspots. Nonetheless, they pointed out that for implementation to be successful, data processing, security, and privacy issues must be addressed. AI-powered drones can transform unprocessed data from IoT networks into insightful knowledge. Disclosing or continuously taking pictures of the work in progress can be used to monitor the construction process. In addition to taking pictures, drones can help with thermal imaging and social distancing. The monitoring procedure can require fewer people when a project controller compares these snapshots to plans automatically through BIM or manually.

7. Conclusions and recommendations

This study aims to investigate how Egypt's construction project control procedures have been affected by the COVID-19 outbreak. The study contains a questionnaire survey with 40 questions given to 152 engineering and construction experts in addition to theoretical and practical findings. Case examples illustrating the crisis's effect on building project control serve to corroborate the conclusions.

The survey results are discussed, highlighting the most significant effects on control procedures and offering solutions. This study examined how the coronavirus pandemic affected Egypt's project control procedures. The results showed that the significant impacts were cash flow, schedule non-compliance, non-compliance with project contract conditions, additional costs, reduced working hours, and difficulties engaging stakeholders. The strategies for managing work during the epidemic include preventive measures, adjusting activity duration, diversifying supply sources, re-analyzing contingency reserves, using modern monitoring technology and virtual teams, and remote work. The key finding was the need for automation and reduced dependency on human involvement in construction control, using techniques such as network cameras and drones to transmit data and visually monitor the process through an automated system.

The study highlights the need for contracts to include delay and termination rights clauses, price adjustment terms, and hardship provisions. This helps allocate risks to specific events, including pandemics, and develop response plans. Having a documented project risk register and learning lessons from previous crises can also help in future pandemics. Training in modern technology for monitoring and awareness to reduce panic during outbreaks is crucial to adapting to remote work.

8. Acknowledgments

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