

IMPACT OF THE COVID-19 PANDEMIC ON PROJECT MANAGEMENT. RESPONSES, DETERMINANTS, ADAPTATION

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Purpose: The coronavirus pandemic had a significant impact on project management, including the implementation of construction projects. Therefore, a study was conducted to determine what the impact of this situation was on various aspects of project planning, organisation and implementation. It also aimed to identify the key success factors in project management after COVID-19.

Design/methodology/approach: 120 questionnaires were sent to managers directly involved in the project management industry, with particular emphasis on the construction sector. 100 were correctly completed and returned, corresponding to a response rate of 83.3%. Data analysis was carried out using SPSS software version 23.

Conclusion: The survey of project management professionals found that delays caused by COVID-19 constraints were correlated with the cost and timeliness of projects. At the same time, key success factors such as adaptability and flexibility gained importance.

Practical implications: The results obtained have an implementation significance due to the necessity of adapting traditional project management methods to the dynamically changing external environment, as revealed in the conclusions. The recommendations formulated can be a source of knowledge for construction companies and other entities operating in a dynamically changing business environment, as well as for other organisations.

Originality/value: In the face of increasing uncertainty and risks caused by various factors (e.g. epidemics, military aggression, economic crisis, etc.), a flexible approach to project management can be a key success factor not only in the implementation of projects and the building of competitive advantages for companies, but also in the optimisation of public administration.

Keywords: project management, coronavirus pandemic, COVID-19, key success factors, construction industry.

1. Introduction

The COVID-19 pandemic has introduced significant changes in many areas of life, and project management is no exception. The global health crisis has forced organisations to adapt quickly, which in many cases has required a revision of traditional management methods and the search for new solutions. This article attempts to analyse these changes, with a focus on Critical Success Factors (CSF CSF) and innovative project management techniques in the face of a pandemic.

The situation from March 2020 posed challenges of a scale and scope previously unheard of for economic, social and political organisations and public administrations. Managers had to ensure proper coordination between their institutions, which had to function smoothly during successive waves of the pandemic. The new challenges affected areas such as health, education, security, communications, the economy or public service offices. According to the legislation enacted, in order to minimise social contact and limit the increase in coronavirus infection among employees, most people were directed to work remotely (Mańka-Szulik, 2021, p. 20). The pandemic was a time of business uncertainty and economic instability, as reflected by the fact that phrases relating to business suspensions and employee redundancies reached their highest values since search data has been collected by Google Trends (since 2004). In some cases, the scale of the increase in search phrases was unprecedented, reaching 400% more than ever before" (Wolniak, 2020, p. 13). To confirm the research hypotheses, 120 surveys were sent to representatives of the construction sector. The research implemented issues known from the VUCA model into the area of construction affected by the pandemic. The limitation and weakness of the research was the survey questionnaire method. Subsequent studies will use expert interviews.

2. Project management – CSF

The key success factors in projects vary significantly depending on the characteristics of the project and its complexity. Research points to the identification of specific elements that play a key role in successful project management, regardless of the scope or nature of the project (Chawana, Knapp van Bogaert, 2011, p. 369).

Project manager competence: one of the most important success factors is the competence of the project manager. The project manager's skills and experience are key to effectively managing the process and ensuring transparency. The project manager should have the ability to manage a team, make decisions and solve problems, which is essential to deliver the project according to the objectives and schedule (Garrett, Park, Redlener, 2009, p. 142).

Quality of subcontractor services: In the construction industry, the quality of subcontractor services is extremely important. The timeliness and quality of subcontractors have a direct impact on the success of a construction project (Carr et al., 2011, p. 47). Research confirms that working with reliable and highly qualified subcontractors is crucial to achieving the intended results.

Support from top management: Support from the top management of the organisation is also a fundamental factor for success. Top management should provide the necessary resources and be involved in solving project problems, which is particularly important in the face of project difficulties and challenges.

Influence of external factors: Key success factors are also influenced by external project factors. The current pandemic situation is an example of the influence of external factors on the project management process (Wyk, Dahmer, Custy, 2004, p. 259).

The pandemic has affected the time-consuming nature of project management and how delays are dealt with. In an environment where many activities can be halted or delayed depending on government action, understanding and adapting to these external challenges has become crucial to effective project management.

Project management, defined as a comprehensive effort to manage a project effectively, is based on a variety of techniques. These methods support project managers in effectively implementing projects on schedule and on budget (Klum, 2006, p. 902). Project management techniques focus on optimising available resources and on dealing with potential delays and challenges that may arise during project implementation.

One commonly used concept is the Agile method, which introduces flexibility into project management. This methodology, based on an iterative approach, enables projects to adapt to changing conditions and requirements. Research indicates that Agile brings value to organisations by improving supply chain efficiency and integrating feedback into project communication (Atherton, 2007, p. 59). Delivering projects in short iterations (sprints) allows projects to respond to change on an ongoing basis and better adapt to the needs of the organisation. In contrast to the agile approach, classic techniques such as the cascade method (Waterfall) also remain useful. This technique allows project managers to gain a clear overview of project execution, identifying sequences of activities and dependencies that contribute to project success (Balakrishnan et al., 2014, p. 727). Despite its long-term usefulness, the cascade method has its limitations, with the result that project management often requires the use of different techniques within the same project.

Another technique is Critical Path Method management, which identifies key elements of a project and focuses on them to minimise delays. The literature indicates that project managers often use a combination of different techniques, adapting them to the specific needs of the project. This approach increases the visibility and understanding of the project, enabling decisions to be made at each stage of implementation.

3. Project implementation under pandemic conditions. Methodological assumptions of empirical research

As part of the survey, 120 questionnaires were sent to people directly involved in the project management industry, with a particular focus on the construction sector. Of the questionnaires sent out, 100 were correctly completed and returned, corresponding to a response rate of 83.3%. The final number of respondents of 100 was sufficient for a reliable statistical analysis of the impact of the pandemic on project implementation in Poland. SPSS version 23 software, which is widely recognised as one of the most important tools for statistical analysis, will be used to analyse the data in this study. SPSS is highly regarded for its functionality and versatility.

The conduct of the described study was justified by the disruptive impact of the COVID-19 pandemic on project management both in Poland and around the world. The pandemic caused major disruptions to infrastructure projects, leading to delays and, in some cases, even a complete halt to work. This situation undermined the ability to implement many key initiatives that were essential for economic transformation.

The crisis triggered by the COVID-19 pandemic posed an unprecedented challenge for many stakeholders, being an event of global scope with a huge impact on various aspects of socio-economic life. Despite the official end of the pandemic, its effects are still visible, especially in the area of project implementation. Reactions of panic and uncertainty among stakeholders have contributed to numerous delays in the implementation of planned projects, and these delays are having a long-term impact on economies, especially in the construction sector, which plays a key role in many countries.

The cancellation or stoppage of construction projects has had a negative impact on production and employment, forcing managers to identify the causes of delays and develop strategies to manage in unpredictable conditions. The rising cost of delays is forcing project teams to make difficult decisions, such as reducing resources or lowering material quality to fit within budgets and deadlines.

Initial predictions in 2020 were that the situation should improve in 2021 following the introduction of a universal vaccination programme. However, the reality turned out to be more complex due to the volatile pandemic conditions and the fact that a significant part of the population approached vaccination with mistrust, which delayed the achievement of collective immunity. As a result, despite the availability of vaccines, project constraints and disruptions persisted longer than originally anticipated.

Study objectives and research questions

The main objective of the study is to develop a strategy framework on key success factors for project management in the post-pandemic period. In order to achieve this objective, the following specific objectives have been identified:

- A. Identification of project delivery methods in a post COVID-19 environment.
- B. Identify key determinants of project management success in the new post-pandemic reality.
- C. Explore the relevance and impact of key success indicators in project management post COVID-19.

These objectives form the basis for specific research tasks that aim to answer the following research questions:

- Research Question 1 - What project management methods are used in the post-pandemic period?
- Research Question 2 - What are the key factors contributing to success in project management after COVID-19?
- Research Question 3 - To what extent does the post COVID-19 period affect key success indicators in project management?

The aim of the study was to provide precise answers to these questions, contributing to the development of strategies for effective project management in a changed environment after the COVID-19 pandemic.

4. Record of results obtained

The following are the overall statistical results, which were compiled from the survey responses. Each section of the survey corresponds to different issues related to project implementation during the COVID-19 pandemic. The average scores assigned to each of these issues provide insight into how respondents perceived each aspect of the pandemic's impact on projects. These indicators allow an assessment of the importance of each element and its potential impact on project management.

Table 1.
Impact of delays (ID)

Impact of delays	Average
The current pandemic situation has caused delays in ongoing projects.	3.404
The financial impact is an important dimension of delay.	3.768
My company makes its supply chains more flexible because of delays.	3.566
Delays will continue to increase the cost of existing projects.	3.444
Too many delays lead to the cancellation of existing projects.	3.505
Average.	3.537

Table 2.*Key success factors (KSF)*

Key success factors	Average
Flexibility in this environment is a key factor for success.	3.556
Using new and existing IT systems improves business processes.	3.545
Subcontractors are key to project delivery.	3.354
Qualified project managers are becoming increasingly important.	3.292
Companies need to use new techniques to remain effective in the execution and delivery of projects.	3.253
Average.	3.400

Table 3.*Upgrading skills (HR)*

Improving HR skills	Average
There have been significant changes in skills due to the pandemic.	3.636
Companies are focusing on imparting new skills to employees during this time.	3.434
Higher productivity is the goal of upskilling, which is being realised.	3.515
My company does not undertake such investments.	3.474
Upgrading staff skills is only part of the solution, requiring a combination of factors.	3.374
Average.	3.487

Table 4.*Methods used (MU)*

Methods used	Average
Companies are increasingly relying on delayed payments to cope with the situation.	3.404
There is no change to the current project delivery methodology.	3.576
The greater strain on cash flow is causing companies to focus more on cost-cutting.	3.616
Agile project management methods are becoming more common in implementation.	3.556
Technology is being used to reduce the cost of project delivery across the board.	3.475
Average.	3.525

Table 5.*Impact on project implementation (EP)*

Impact on project implementation	Average
Project implementation changed forever after the coronavirus pandemic.	3.515
In the new normal, life without the implementation of information technology will not be possible.	3.455
Lightweight project management methodologies will become standard.	3.566
Key success factors affect project implementation both during and after a coronavirus pandemic.	3.455
Average.	3.497

4.1. Analysis of the data revealed as a result of the implementation of the research programme

Objective 1: Identify effective project delivery methods. Based on the results of the study, it is recommended that companies invest in human resource development and adapt their methods to flexible approaches. Incorporating external factors in a quantitative way into project schedules also proved important.

Objective 2: To identify key success factors in project management post COVID-19. The results of the analysis indicate that the key factors have a significant correlation and play a significant role in project success. The level of correlation confirms the importance of these factors in the context of the changed post-pandemic environment.

Objective 3: To test the significant impact of success indicators on project management after COVID-19. Regression analysis showed that the model is statistically significant, confirming the quantitative relationship and measuring the impact on project implementation. Key success factors such as methods used, impact of delays and human resource development contribute to explain the impact on project implementation during the pandemic.

The impact of delays was one of the key independent variables analysed in the study. It was defined as the effect of project delays occurring, especially in the context of the coronavirus pandemic situation. Faced with the pandemic, most projects, regardless of their size, experienced significant delays. This was due to limitations in the number of available workers on construction sites and bans on construction activities imposed by the governments of many countries, which considered these sites to be high risk areas for the spread of the virus.

Key success factors are those elements that must be met for a project to be successful. While these factors may vary depending on the type of project, research indicates that for construction projects there are several universal key success factors. In particular, adaptability and flexibility in project delivery are often considered essential as they have a significant impact on the overall success of a project. In reality, the impact of these factors is variable and depends on the type of project and the specific business environment in which it is implemented.

The independent variable, which is the impact of the methods used, aims to understand how the techniques used in project implementation have evolved in response to the coronavirus pandemic situation. Traditionally, project implementation has relied on methods such as cascade, which are well suited to stable and predictable business conditions. However, research shows that changing external factors can force significant modifications to these methods.

The study found that it was important for project implementation to understand how developing employees' skills could improve performance and productivity. This was particularly important in the context of changes in the labour market, where the decreasing number of jobs available required employees to be more versatile and adaptable to different roles.

4.2. Application significance of the results of the study

The first suggestion arising from the study concerns the need for project managers to be more flexible in project implementation. Managers should not rely solely on static management methods or base their decisions solely on internal project information. In order to succeed in a dynamically changing business environment, they should actively integrate external information and adapt their approach to changing conditions.

Another application refers to the need to change the project delivery methods normally used. In the current environment, which demands greater flexibility, companies need to adapt their approach to supply chain and project cycle management to achieve more with limited resources. This points to the growing role of information technology, which can bridge the productivity gap and improve decision-making, enabling companies to adapt more effectively to new challenges.

The pandemic had a significant impact on the implementation of construction projects. In particular, project delays caused by pandemic-related constraints were strongly correlated with the cost and timeliness of project delivery. At the same time, key success factors such as adaptability and flexibility have gained in importance, indicating the need to adapt traditional project management methods to the dynamically changing external environment.

The study also found that the project delivery methods used had changed, placing greater emphasis on flexibility and risk management. In the context of human resources, the development of staff skills, especially in terms of flexibility and multitasking, proved crucial to maintaining productivity and efficiency in project implementation in the face of a pandemic.

Based on the results of the research, recommendations were made to project managers and construction companies, focusing on the need to implement flexible project management methods, greater integration of external factors influencing project delivery and investment in staff skills development.

The study obviously encountered some limitations, such as the peculiarities of the construction market in Poland and the variability of the business environment during the pandemic, which may affect the possibility of generalising the results. At the same time, these limitations are an inspiration for further studies on the impact of the pandemic on different economic sectors and on project management in the context of global crises.

5. Conclusion

This article contributes to a better understanding of the impact of the coronavirus pandemic on construction projects in Poland. The results of the research and the recommendations formulated can be a source of knowledge for construction companies and other entities

operating in a dynamically changing business environment, as well as for other organisations. In the face of increasing uncertainty and risk, a flexible approach to project management can be a key success factor not only in implementing projects and building competitive advantage for companies, but also in optimising the functioning of public administration. The VUCA model plays an important role - it is primarily a world of variability, complexity, uncertainty and ambiguity.

Interestingly, globally, the level of organisational development did not affect incidence. For example: the dynamics of COVID-19 cases in smart cities had a low correlation with the level of smart technology adoption, as it was more susceptible to the spread of waves and strains of the virus depending on geographical location (Kuzior et al., 2022, p. 21). This is because in cities, it was the speed of response and relevance to the threat that mattered.

Using the example of the study carried out in Zabrze, it can be seen that a task team set up in the City Hall together with the Department of Crisis Management and Civil Defence coordinated the securing of infrastructure for the isolation of infected persons, the supply of disinfectants, protective and preventive procedures. Together with social assistance, care was organised for those in need. Support was provided to schools that introduced distance learning. Assistance packages were developed and implemented for residents and entrepreneurs doing business in the city, including exemptions, tax breaks and preferential tax rates. Activities were undertaken to activate and integrate residents. All these activities were properly communicated to ensure access to reliable, up-to-date and relevant information distributed through easily accessible mass and social media (Mańka-Szulik, Krawczyk, 2020, p. 414).

Similarly, economic organisations have had to respond adequately to the requirements of production or project implementation processes. Some of the management models developed at that time have been permanently implemented in social and economic reality, such as the execution of tasks via platforms in cyberspace. The use of remote forms of dealing with customers is, moreover, a welcome development. It not only ensures efficiency, high quality and transparency of service, but is also user-friendly. Paradoxically, the Covid-19 pandemic has also translated into an increase in the use of e-government tools by citizens using public services (Kuzior, Mańka-Szulik, Krawczyk, 2021, pp. 269-270). Traditional decision-making processes have been transferred to digital space, which has ensured the continuity of local government, but has generated new challenges. These undeniably relate to ensuring an adequate level of security for the IT tools and systems that support decision-making and other processes carried out by public authorities. This challenge will be with us for years to come, regardless of the impact of the pandemic (Mroczka, 2021, p. 92).

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