

Analysis of Project Time Acceleration Using The Crashing Method in The Rehabilitation Project of SMPN 2 Pasongsongan, Sumenep District

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ABSTRACT

Delays in construction projects often result in increased costs and inefficiencies, which can negatively impact project management and resource allocation. To address these issues, this study analyzes project duration acceleration using the Crashing Method by incorporating overtime work hours and additional workforce into the rehabilitation project of SMPN 2 Pasongsongan, Sumenep Regency. This research aims to determine the extent of time reduction achievable when implementing a 3-hour overtime strategy and increasing the workforce simultaneously. Utilizing Microsoft Project 2016, the study compares the original 150-day schedule with an accelerated version using the Crashing Method. The results indicate that the project duration can be reduced to 140 days, saving 10 days. However, this acceleration incurs an additional cost of IDR 21,566,522, primarily due to labor expenses and extended work hours. The study further examines the trade-offs between time efficiency and cost implications, highlighting the importance of effective resource management in construction projects. Findings suggest that the Crashing Method is an effective strategy for project acceleration, provided that cost-benefit analysis, workforce efficiency, and resource availability are carefully considered. The study also emphasizes that proper coordination among project stakeholders, optimized scheduling, and proactive risk assessment are critical for ensuring that acceleration does not compromise work quality or safety standards. By offering insights into the practical application of the Crashing Method, this research serves as a valuable reference for project managers and construction planners seeking to improve time efficiency while maintaining budget control in infrastructure projects.

Keywords: *additional workforce; crashing method; overtime; project scheduling; time acceleration*

INTRODUCTION

Delays in construction projects are one of the major challenges that can lead to increased costs and inefficiencies in (Durdyev & Hosseini, 2020; Gurgun et al., 2024; Hosaini & Singla, 2019; Koirala & Joshi, 2017; Shillito & Schaffer, 2020; Svejvig et al., 2019) . According to Abas et al. (2022), one way to overcome these delays is to apply project acceleration methods such as the Crashing method. This method enables project acceleration by adding labor and overtime working hours, which contributes to faster project completion without sacrificing quality.

In a study conducted by Firdaus, Tjendani, and Witjaksana (2023), the Crashing method was shown to reduce project duration by increasing working hours and labor on activities that are on the critical path. This study highlights the effectiveness of this method in the construction project of SDN Kutisari 2, where there is an acceleration of the project with additional costs that can be controlled.

Good project management is key in optimizing the cost and time of project implementation. Fransiska Natalia Ralahall (2024) emphasized that careful planning and proper application of project management techniques are essential in avoiding delays that result

in cost overruns. In this case, the Crashing method is a relevant solution to overcome time constraints in construction projects.

In a road improvement project in Kupang Regency, Koten and Tjendani (2023) showed that the use of the Crashing method can accelerate the project by adding labor. The results of this study show that there is a relationship between project acceleration and a balanced cost increase, so that budget management remains under control.

Malifa, Dundu, and Malingkas (2019) in their research revealed that the construction project of flats in Manado can be completed faster with the Crashing method. By increasing the number of workers, the project can be completed in a shorter time than the initial plan, although there is an increase in costs that must be taken into account.

In addition, in the construction project of Hotel 57 Nganjuk, Muhammad Andi Maulana Putra and Budi Witjaksana (2023) applied the Critical Path Method (CPM) along with the Crashing method to identify activities that can be accelerated. The results showed that project acceleration can be done by increasing overtime working hours and labor, which ultimately shortens the project duration significantly.

In a commercial construction project, such as the construction of a McDonald's fast food restaurant in Pontianak, Muin (2023) used the Time Cost Trade Off (TCTO) method to evaluate the impact of project acceleration on cost. The results show that the addition of overtime working hours is one of the most effective strategies in accelerating project completion without sacrificing the quality of results.

Research by Olivia (2019) focusing on road improvement in Central Kalimantan also proved the effectiveness of the Crashing method in optimizing project duration. Project acceleration is done by increasing working hours and labor so that the project can be completed faster than the predetermined schedule.

Muhtar & Gunasti (2021) in her research on the University of Jember Training Center Building construction project showed that the combination of CPM and Crashing methods was able to produce significant project acceleration. This study indicates that this approach can be widely applied in other development projects.

Effective construction project management demands the application of acceleration techniques that are appropriate to the project conditions. Rani (2016) emphasized that the success of a project is highly dependent on the effectiveness of planning and resource management. In this case, the Crashing method becomes a reliable strategy in accelerating project completion without sacrificing quality.

Cost and time analysis using the Least Cost Analysis method conducted by Riza and Witjaksana (2022) on a classroom building construction project in Surabaya shows that a combination of careful planning and project acceleration techniques can produce optimal efficiency.

Samosir, Harahap, and Puspita (2022) in their research highlighted the importance of project acceleration strategies by adding work shifts as an alternative to the Crashing method. The results of this study show that the Crashing method is effective in accelerating projects, especially when combined with a good labor management strategy.

Rakasyiwi, Witjaksana, and Tjendani (2022) conducted a case study on a subsidized housing project and found that the critical path method (CPM) can be used in conjunction with the Crashing method to achieve more efficient project acceleration.

A data-driven approach was also used by Yeni Kustiyahningsih et al. (2023) in their analysis of salt policy in Indonesia, which showed that information-based decision optimization can help reduce uncertainty in project planning.

The novelty of this research lies in its application of the Crashing method to accelerate construction project completion, specifically targeting the impact of overtime and labor force increases on the duration and cost of a rehabilitation project for SMPN 2 Pasongsongan, Sumenep District. While previous studies have examined the Crashing method in various construction contexts, this research introduces a specific case study in Indonesia, contributing new insights into how this method can be applied to local projects, where labor management and cost efficiency are paramount. The unique focus on a 3-hour overtime strategy combined with additional workforce, along with a comprehensive cost-benefit analysis, provides a fresh perspective on managing project acceleration within a limited budget.

The urgency of this study is underscored by the increasing need for timely completion in construction projects, particularly in educational infrastructure. Delays not only result in higher costs but also affect the quality of educational services. By demonstrating how project time can be reduced with a manageable increase in costs, this research provides actionable recommendations for construction managers and stakeholders in Indonesia, where timely delivery of educational facilities remains a pressing challenge. This study emphasizes the importance of efficient resource management and proactive risk assessment in ensuring that project acceleration does not compromise the overall quality or safety standards of construction work.

Based on various studies above, the Crashing method has proven to be an effective strategy in accelerating the completion of construction projects by increasing overtime working hours and labor. However, its application must be done by considering the impact on the cost and quality of the project in order to stay within the predetermined budget limit.

In line with the background that has been explained, this research focuses on the main question: What is the project time if crashing is done with additional working hours (overtime) for 3 hours and additional labor?

In construction projects, the crashing method allows for accelerated project completion by adding the required resources. However, the implementation of this strategy requires an in-depth analysis of the cost efficiency and impact on project quality. This research aims to evaluate the extent to which project acceleration is possible using the Crashing method, as well as identify whether this strategy provides benefits that are worth the additional costs incurred. By answering this question, it is hoped that this research can provide useful recommendations for project managers in applying project acceleration methods optimally.

METHOD

This research design uses a quantitative approach with a case study method to analyze the effectiveness of the Crashing method in accelerating construction projects. The research was conducted by collecting primary and secondary data from construction projects that

experienced delays, then analyzed using project management software. The Crashing method was chosen because it is able to provide concrete results related to the efficiency of project time and cost without sacrificing the quality of work. The results of this study are expected to provide applicable recommendations for project managers in implementing an optimal acceleration strategy.

A case study approach was taken by analyzing a construction project that experienced delays and required acceleration using the Crashing method. The data collected includes the project schedule, labor costs, and external factors that affect the progress of the work. The analysis was conducted by comparing the project conditions before and after the application of the Crashing method to measure the effectiveness of acceleration. With this approach, the research can provide a comprehensive picture of the impact of the Crashing method on construction project efficiency.

The data used in this study consisted of primary data and secondary data relevant to the construction project under study. Primary data was obtained through direct observation at the project site, interviews with project managers, and questionnaires to labor and related parties. Observations were conducted to determine the actual conditions in the field, while interviews and questionnaires were used to identify factors affecting project delays. With this combination of techniques, the research can obtain more accurate and in-depth data.

Meanwhile, secondary data was collected from project documents such as work progress reports, planning schedules, and project cost budgets. These documents are analyzed to understand how delays occur as well as how the Crashing method can be applied in project acceleration. In addition, the research also referred to previous literature that discussed the implementation of the Crashing method in different types of construction projects. With this approach, the research can ensure that the data used has high validity and is relevant to the research objectives.

The data that has been collected is analyzed using quantitative methods to measure the effectiveness of the application of the Crashing method in construction projects. The analysis was conducted using project management software to simulate the acceleration of project duration based on the scenario of adding overtime working hours and labor. The simulation results are compared with the project schedule before acceleration to determine the effect on project duration and cost. With this method, the research can provide objective results regarding the effectiveness of Crashing in project time management.

In addition to simulation using the software, this study also applied descriptive statistical analysis to display trends in project delays and factors contributing to delays. Data from interviews and questionnaires were analyzed using thematic coding techniques to identify emerging patterns related to the constraints and advantages of applying the crashing method. By combining quantitative and qualitative approaches, this research can provide more in-depth and applicable analysis results for construction project managers.

The main variables in this study consist of independent variables and dependent variables that are interrelated in terms of accelerating construction projects. The independent variable in this study is the Crashing method which includes the addition of overtime working hours and an increase in the number of workers. This research measures how the application of this method can affect the duration and cost of the project, so as to determine the effectiveness of

the acceleration strategy. By clearly defining the variables, this research can accurately measure the resulting impact.

On the other hand, the dependent variables in this study are the project duration and project costs that change due to the application of the Crashing method. The measurement is done by comparing the duration and cost before and after the application of the Crashing method. With this analysis, the research can identify the extent to which project acceleration can be done without causing a significant increase in cost. This variable-based approach ensures that the research can produce findings that can be applied in terms of construction project management.

RESULT AND DISCUSSION

Acceleration Time Analysis Results

The project acceleration time analysis was carried out by comparing the project duration before and after the application of the Crashing method. The results showed that before the application of the Crashing method, the project was planned to last for 150 working days. With the application of additional overtime working hours for 3 hours and an increase in the number of workers, the project duration has accelerated significantly. Simulations conducted using project management software showed that the project duration could be reduced to 140 working days.

The main factors contributing to the acceleration of the project were the increase in labor productivity due to overtime and the increase in the number of workers on the critical path. Based on the results of interviews with project managers, the increase in labor allowed the implementation of some activities that were previously carried out sequentially to be parallel. Thus, the project can achieve higher time efficiency. However, the challenge faced is managing working hours so as not to cause excessive fatigue in the workforce.

The results of the analysis also showed that the time acceleration had a positive impact on the project workflow. Activities that were previously on the critical path can be completed earlier, thus reducing the risk of delays. In addition, the crashing method allows for a more optimal redistribution of resources. With better manpower allocation, work on the critical path can be prioritized to ensure project time efficiency.

Calculations in the project management software showed that accelerating the project from 150 days to 140 days was possible at a measurable additional cost

Table 1. Recapitulation of additional costs for worker acceleration.

No.	Job Description	Crash cost	Normal cost	Cost slope
1.	Fit. Calcium Silicate Ceiling Board	IDR 10,818,120	IDR 1,858,200	IDR 4,479,960
2.	Electrical Panel	IDR 10,818,120	IDR 4,037,730	IDR 3,390,195
3.	Install 1 m NYY 4 x 6 mm ² + BC 6mm Feeder Cable	IDR 10,818,120	IDR 2,887,710	IDR 3,965,205
4.	Down Light Panel 25WATT, LED	IDR 10,818,120	IDR 440,000	IDR 5,189,060

5.	Inst. Lighting, NYM 2x1.5 mm (o) PVC HI dia. 20mm	IDR 4,327,248	Rp3,438,600	IDR 888,648
6.	Inst. socket, NYM 2x2.5 mm (o) PVC HI dia. 20mm	IDR 4,327,248	IDR 673,794	IDR 3,653,454
Total <i>slope</i> plus 3 hours of overtime and labor				IDR 21,566,522

Source: Researcher Data (2024)

The data in the table shows that accelerating the project through the Crashing method resulted in an increase in project costs of Rp. 21,566,522.00. This is a consideration factor in determining the project acceleration strategy to stay within the predetermined budget limit.

Although there are additional costs due to project acceleration, this study shows that the benefits outweigh the potential losses due to project delays. With faster completion, the project can reduce indirect costs incurred due to the extended completion time. Therefore, the crashing method can be an effective strategy in ensuring the project is completed on time without compromising the quality of work.

The results show that the application of the Crashing method in accelerating construction projects can result in significant time efficiency. With the addition of overtime working hours for 3 hours and an increase in the number of workers, the project that was originally planned to be completed in 150 days can be accelerated to 140 days. This shows that the acceleration strategy through Crashing can be effectively applied in projects that experience delays.

The study also found that the main factor supporting the success of the Crashing method is good resource management. By optimizing the workforce on the critical path, the project can run more efficiently and avoid obstacles that can cause delays. In addition, good coordination between the project manager and the field team is key in implementing this method.

In terms of costs, the study showed that despite the increase in costs due to additional labor and overtime, the economic impact was still favorable. The additional cost of Rp. 21,566,522.00 incurred due to project acceleration is still lower than the potential loss due to project delays. In other words, the acceleration strategy implemented has succeeded in providing benefits that outweigh the risks.

In addition, the results of this study show that the use of the Crashing method is more effective than other acceleration methods such as excessive overtime without increasing labor. By balancing the amount of labor and additional working hours, the project can achieve higher efficiency. Therefore, this strategy can be a reference for other projects facing delay constraints.

However, in the application of the Crashing method, this study also identified several challenges. One of the main challenges is managing the workforce to remain productive despite working additional hours. If not managed properly, the workforce can experience fatigue which can lead to a decrease in productivity. Therefore, there is a need for a labor rotation strategy and stricter supervision in the implementation of this method.

In general, this research provides evidence that the Crashing method can be an effective solution in accelerating construction projects without sacrificing quality. With good resource management, the project can achieve optimal acceleration at a cost that is still within reasonable

limits. Therefore, this method is recommended to be applied in projects that face the risk of delay in order to complete the work according to the predetermined schedule.

CONCLUSION

The research concludes that applying the Crashing method through 3 hours of overtime and an increase in workers significantly accelerates construction project completion. Originally planned for 150 days, the project was completed in 140 days, saving 10 days. This time reduction was achieved by optimizing manpower on the critical path and extending working hours. However, this acceleration led to an additional cost of Rp. 21,566,522. Despite this, the reduction in duration helped minimize indirect costs from delays. Thus, the Crashing method proves effective in project acceleration without uncontrollable cost increases. The combination of overtime and additional labor is more efficient than using only one method. Successful implementation requires good labor management to prevent productivity loss due to fatigue. Proper planning is essential to identify critical path activities for significant impact. Labor rotation and appropriate overtime incentives are necessary to maintain performance and prevent burnout. Budget management must be adjusted to account for additional acceleration costs, with reserve funds to avoid budget overruns. Lastly, using project management technologies like Microsoft Project or Primavera is recommended to simulate acceleration scenarios and accurately identify critical paths. These tools help project managers make informed decisions, ensuring efficient and optimal project acceleration.

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