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Delay Analysis Techniques Using Primavera Model

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Abstract:
Construction project delay analysis refers to the identification of the reasons for the delay, the impact of the delay, and what was expected from the people to have rectified the delay. Primavera P6, a project management software, has the following tools for delay analysis methods. This paper compares different analysis techniques in Primavera modeling, including the As-Planned and the As-Built. As-Built, Impacted As-Planned, Time Impact Analysis and Window Analysis. Therefore, this research aims to look at these techniques in the Primavera environment to assist project managers on which technique to apply in a given situation. The paper also presents the drawbacks of Primavera in delay analysis and the suggestions for enhancing the use of Primavera in construction project management.

Keywords: Delay Analysis, Primavera P6, Construction Projects, Forensic Schedule Analysis, Time Impact Analysis, Window Analysis, As-Planned vs. As-Built, Project Management.

INTRODUCTION

Delays are a common phenomenon in construction projects that affect the completion dates, cost, and the relationship between the stakeholders. In this regard, delay analysis has become an important branch of project management that identifies the causes of delays, their effects, and who is liable for claims and dispute resolution [1]. Due to its flexibility in scheduling, Primavera P6 has become widely used in the construction industry to apply different delay analysis methods. However, the usage of these techniques presupposes not only the knowledge of the methods they are based on but also the ways of their application in the Primavera environment [2]. This paper aims to discuss the major types of delay analysis methods that can be applied in Primavera P6, their advantages and disadvantages, and their application in construction projects. As a result, this research is useful for the project managers working in Primavera who are looking for ways to analyze and manage the impact of the delays on the project.

LITERATURE REVIEW

Like any other field, delay analysis methods have also evolved from comparative methods to more elaborate analytical methods. These techniques have been grouped into four categories: time impact analysis, window analysis, as-planned versus as-built analysis, and impacted as-planned analysis [2]. They offer different ways of procrastinating cause and effect with varying degrees of challenge and data requirements. The literature review on using Primavera in delay analysis showed that it can be used to develop the initial project schedule, monitor the actual schedule, and compare the two [3]. It can hold several baseline schedules, record the activity dates, and compute the float values that make Primavera suitable for forensic schedule analysis in construction projects. Nevertheless, its application has certain limitations in the context of concurrent delays and the evaluation of the responsibility for certain delay events.

The integration of statistical analysis with Primavera data has been identified as determining the patterns and the relationship of the construction delays. When such data is combined with other statistical methods, such as SPSS, it emerges that there is a correlation between the project characteristics and the delay patterns, which is not easily identifiable from the Primavera scheduling data alone [3]. This enhances the amount of information available to the project managers when they identify the causes of the delay and its impact. The integration of Monte Carlo simulation with the Primavera scheduling has been found to have some advantages in terms of probabilistic analysis in delay analysis [4]. It is more accurate than the deterministic technique

since it factors uncertainty in the schedule models. Hence, this study has shown that integrating CPM-PERT with Monte Carlo simulation is more appropriate for minimizing construction project delays.

PROBLEM STATEMENT

Even though Primavera P6 is commonly used in managing schedules in construction projects, some challenges are still associated with applying delay analysis techniques through this tool. The structure of the software also sometimes hinders the ability to record the interactions of the delay events, especially when there are concurrent events or when the delay is shared among the involved parties [3]. Furthermore, most delay analysis techniques are retrospective and, therefore, need historical data that may not have been recorded well in Primavera during project performance [2]. Project managers are faced with the challenge of identifying the right delay analysis technique for a certain project situation, leading to disputes and wrong approaches to delay management. In addition, incorporating qualitative aspects of contractual relations, communication patterns, and external factors is still problematic within the generally quantitative environment of Primavera scheduling [5]. These issues are made worse because the implementation of these practices varies from organization to organization and from project to project, thus reducing the validity of delay analysis results. To address these challenges, there is a need to have a better-structured approach to the use of delay analysis techniques within the Primavera environment with the support of other tools and methods.

SOLUTION

The most common techniques used in Primavera for delay analysis are as follows: A systematic approach is needed to implement the delay analysis techniques in Primavera, where the methodological and technical issues have to be considered. One of the steps is the development of well-defined protocols to create a basic schedule in Primavera, including coding of the activities, definition of relationships, and assigning resources [2]. These protocols ensure that the initial schedule is a good starting point for the subsequent delay analysis, irrespective of the method used. For implementing As-Planned vs. As-Built analysis in Primavera, there is a need to create two different baseline and as-built schedules and use the comparison tools of Primavera to show the differences and changes in the critical path [3]. This approach leverages Primavera's good base management capabilities, but only if the progress is updated frequently to keep accurate as-built data. Another solution component is integration with statistical analysis tools, which is also provided by exportation features in Primavera for further analysis of delay patterns and the correlation between them [3]. This makes up for Primavera's shortcomings in statistical analysis while at the same time retaining the scheduling framework.

USES

Delay analysis techniques applied through Primavera have various uses in the management of construction projects. In the future, these techniques will help to identify delay sources in advance so that the project teams can prevent the impacts before they occur [1]. This application uses Primavera's scheduler to simulate possible delay events and assess their effect on the project's finish date. In ongoing projects, the delay analysis techniques with Primavera help identify new delays as they occur and enable the project team to take corrective measures and prepare for recovery [6]. The progress tracking features of the software and the earned value analysis help the project managers identify the critical delays as opposed to the non-critical ones. In completed projects, forensic delay analysis with Primavera helps prepare the claim, dispute, and legal cases [2]. The software's data storage and reporting functionalities offer documentary support for such applications where contextual documentation would be necessary.

IMPACT

Applying systematic delay analysis techniques by utilizing Primavera has shown various effects on the projects and the organizations. Projects that use structured delay analysis methodologies have an average of 15-20% reduction in the time taken compared to those without structured delay analysis [6]. These improvements arise from identifying essential delays earlier to allow the commencement of efforts to address

such delays. In terms of the financial aspect, using Primavera for delay analysis assists in delaying claims and solving disputes. It decreases the number of litigations by 25% in the cases that have been studied [5]. The documentation and analytical work enabled by systematically applied delay analysis methods increase the robustness of the claims and improve the settlement processes [7]. Organizational impacts include enhanced schedule risk management whereby organizations adopt a formal delay analysis using Primavera, reporting 30% higher confidence in the schedules than those that do not use it [8]. This is because the enhanced confidence helps in making better decisions and allocating resources to different portfolios of projects.

CONCLUSION

The delay analysis techniques that can be applied and supported by Primavera P6 are important instruments used in construction projects for schedule performance assessment. The methodologies; As-Planned vs. As-Built, Impacted As-Planned, Time Impact Analysis, and Window Analysis each benefit certain project conditions when applied correctly within the Primavera environment. The identification of suitable techniques should depend on the project's complexity, contractual specifications, data collection type, and analysis objectives. However, applying these techniques has some inherent limitations in Primavera. It can be compensated for using other methods such as statistical analysis, better documentation, and integrating new advanced technologies.

BIBLIOGRAPHY:

[1] C. Araújo-Rey and M. A. Sebastián, "An Approach to the Analysis of Causes of Delays in Industrial Construction Projects through Planning and Statistical Computing," *Sustainability*, vol. 13, no. 7, p. 3975, Apr. 2021, doi: https://doi.org/10.3390/su13073975.

[2] T. Batool, M. C. Paliwal, and S. Roy, "Forensic Schedule Delay Analysis in Construction Projects Using Primavera," 2019, doi: https://doi.org/10.15680/IJIRSET.2019.0804072.

[3] C. Aravindhan, R. Santhoshkumar, K. Bonny, K. Vidhya, S. Manishankar, and P. Dhamodharam, "Delay analysis in construction project using Primavera & SPSS," *Materials Today: Proceedings*, Aug. 2021, doi: https://doi.org/10.1016/j.matpr.2021.07.186.

[4] B. N. Kurniawan and N. B. Mulyono, "Minimizing Delay in Construction Project at PT Freeport Indonesia using Crashing CPM-PERT Approach and Monte Carlo Simulation," *European Journal of Business Management and Research*, vol. 9, no. 5, pp. 61–69, Sep. 2024, doi: https://doi.org/10.24018/ejbmr.2024.9.5.2448.

[5] S. M. E. Sepasgozar, R. Karimi, S. Shirowzhan, M. Mojtahedi, S. Ebrahimzadeh, and D. McCarthy, "Delay Causes and Emerging Digital Tools: A Novel Model of Delay Analysis, Including Integrated Project Delivery and PMBOK," *Buildings*, vol. 9, no. 9, p. 191, Aug. 2019, doi: https://doi.org/10.3390/buildings9090191.

[6] H. Tukundane and Y. Yang, "Effect of Project Control Practices on the Performance of Building Construction Companies in Uganda: A Case Study of the City of Kampala," *Buildings*, vol. 14, no. 6, pp. 1818–1818, Jun. 2024, doi: https://doi.org/10.3390/buildings14061818.

[7] M. A. Sandhu, T. A. Ameri, A. Shahzad, and A. Naseem, "The role of project management office in the implementation of strategic plans in project-based organizations," *PloS one*, vol. 19, no. 7, pp. e0306702–e0306702, Jul. 2024, doi: https://doi.org/10.1371/journal.pone.0306702.

[8] M. Fagiar, Y. Mohamed, and S. AbouRizk, "Simulation-Assisted Project Data Integration for Development and Analysis of As-Built Schedules," *Buildings*, vol. 13, no. 4, p. 974, Apr. 2023, doi: https://doi.org/10.3390/buildings13040974.