

Analysis of Project Portfolio Management using the TOPSIS Method

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Abstract: Project Portfolio Management (PPM) is a strategic approach that organizations employ to effectively manage their projects and align them with their overall business objectives. It involves the selection, prioritization, and control of projects to maximize their value and ensure successful project delivery. By implementing PPM, organizations can optimize resource allocation, mitigate risks, and improve decision-making processes. This abstract provides an introductory overview of PPM, highlighting its importance and key components. It emphasizes the role of PPM in driving organizational success by creating a balanced and diversified project portfolio that aligns with strategic goals. The abstract also mentions the benefits of PPM, such as improved resource utilization, enhanced project visibility, and better decision-making based on objective criteria. Overall, PPM serves as a vital tool for organizations to effectively manage their projects, achieve their strategic objectives, and maximize business value. Research on Project Portfolio Management (PPM) holds significant value as it contributes to the development of best practices and informed decision-making in project management. By investigating strategic alignment, resource optimization, risk management, decision-making processes, performance measurement, organizational agility, and stakeholder engagement, researchers can help organizations improve project selection, resource allocation, and overall portfolio management practices. This research significance is crucial for practitioners and organizations aiming to enhance project outcomes, achieve strategic objectives, and maximize business value. In this research we will be using weighted-sum method. Project 1, Project 2, Project 3, Project 4, Project 5 and Time, Cost, Quality, Risk, work health and safety out of all the 5 projects, Project 1 gets first rank in Project Portfolio Management. With the weighted sum method, we are able to find the best project in Project Portfolio Management has been evaluated with various parameters and methodology.

Keywords: Project portfolios, Project portfolio management, strategy.

1. INTRODUCTION

Most businesses work on numerous projects at any given moment. These initiatives could be divided into several categories, such as product development and marketing, production process and flow adjustments, competency development, strategic shifts, the adoption of new IT systems, environmental concerns, etc. Project Portfolio Management (PPM) has emerged as a strategic approach for organizations to effectively manage their projects and align them with their overall business objectives. In today's dynamic and competitive business environment, organizations face numerous challenges in prioritizing and allocating resources to a multitude of projects. PPM provides a structured framework that enables organizations to make informed decisions about project investments, optimize resource allocation, and mitigate risks. The purpose of this research paper is to delve into the significance of Project Portfolio Management and explore its impact on organizational success. By conducting a comprehensive analysis of PPM practices, this study aims to provide valuable insights into the key elements, challenges, and benefits associated with effective portfolio management. Strategic alignment is a fundamental aspect of PPM. Organizations must align their project portfolios with their strategic goals and objectives to ensure that projects contribute to the overall business strategy. This research will examine the strategies and techniques employed by organizations to achieve alignment and explore how it influences project selection and prioritization. Resource optimization is another critical aspect of PPM. Organizations often face constraints in terms of budget,

time, and talent, making it imperative to allocate resources effectively. This study will investigate resource management practices within project portfolios, exploring methodologies, tools, and approaches that lead to improved resource utilization and increased project performance. Risk management is an integral part of PPM, as projects inherently carry uncertainties and potential risks. This research will examine risk assessment and mitigation strategies within project portfolios, aiming to identify best practices that minimize project risks and enhance project success rates. [4][5][6]. Decision-making processes play a crucial role in PPM, as organizations must evaluate and prioritize projects based on various criteria. This study will analyze decision-making frameworks, evaluation models, and criteria used in project portfolio selection, contributing to the development of objective and effective decision-making practices.[7]. Measuring and evaluating the performance of project portfolios is essential for organizations to track progress and make informed decisions. This research will explore performance measurement metrics, monitoring systems, and governance structures within project portfolios, aiming to identify approaches that facilitate accurate performance assessment and enable continuous improvement. [8][9] Organizational ability has become a key factor in project management success, as organizations must adapt to changing market conditions and evolving customer demands. This research will examine agile portfolio management approaches, exploring how organizations can foster agility within their project portfolios and respond effectively to dynamic business environments. Lastly, stakeholder engagement is crucial for project success. This study will explore stakeholder management strategies, communication practices, and the impact of stakeholder engagement on project outcomes within the context of PPM. [10] [11] [12]. By conducting an in-depth analysis of these key areas, this research paper aims to contribute to the body of knowledge on Project Portfolio Management. The findings will provide valuable insights and practical recommendations for organizations seeking to enhance their project management practices, improve project selection processes, optimize resource allocation, and ultimately achieve strategic objectives. [13] [14] [15].

2. MATERIALS AND METHOD

Time: This research paper focuses on the significance of time management in Project Portfolio Management (PPM) decision-making processes. It explores the impact of time-related factors, such as project duration, sequencing, resource availability, and schedule constraints on project selection, prioritization, and resource allocation. The study examines various time management techniques and tools, including critical path analysis, project scheduling, and resource leveling. Additionally, it analyzes the relationship between time management and portfolio performance, considering project delays and the achievement of project objectives within stipulated timeframes. The findings contribute to understanding effective time management strategies for optimizing time utilization and improving overall project portfolio outcomes.

Cost: This research paper focuses on the significance of cost management in Project Portfolio Management (PPM). It explores the impact of cost-related factors, such as project budgets, resource expenses, and financial constraints, on project selection, prioritization, and resource allocation within a portfolio. The study examines various cost management techniques and tools, including cost estimation, budgeting, and cost control. Additionally, it analyzes the relationship between cost management and portfolio performance, considering cost overruns, return on investment, and financial objectives. The findings contribute to understanding effective cost management strategies in PPM, facilitating better financial decision-making and optimizing project portfolio outcomes.

Quality: This research paper explores the importance of quality management in Project Portfolio Management (PPM). It examines how quality-related factors, such as project deliverables, stakeholder satisfaction, and adherence to standards, impact project selection, prioritization, and resource allocation within a portfolio. The study investigates various quality management techniques and tools, including quality planning, quality assurance, and quality control. Additionally, it analyzes the relationship between quality management and portfolio performance, considering project success rates, customer satisfaction, and overall portfolio value. The findings contribute to understanding effective quality management strategies in PPM, ensuring project excellence and enhancing project portfolio outcomes.

Risk: This research paper focuses on the significance of risk management in Project Portfolio Management (PPM). It explores how risk-related factors, such as project uncertainties, potential threats, and mitigation strategies, impact project selection, prioritization, and resource allocation within a portfolio. The study examines various risk management techniques and tools, including risk identification, assessment, and mitigation. Additionally, it analyzes the relationship between risk management and portfolio performance, considering risk exposure, project success rates, and the ability to achieve strategic objectives. The findings contribute to understanding effective risk management strategies in PPM, enabling organizations to proactively mitigate risks and improve project portfolio outcomes.

work health and safety: This research paper explores the integration of Work Health and Safety (WHS) considerations within Project Portfolio Management (PPM). It investigates the significance of promoting a safe and healthy work environment across project portfolios and the impact on project selection, prioritization, and resource allocation. The study examines various WHS management practices and strategies, including risk assessment, hazard identification, and safety performance monitoring. Additionally, it analyzes the relationship between WHS management and portfolio performance, considering factors such as reduced incidents, improved worker well-being, and increased productivity. The findings contribute to understanding the importance of integrating WHS principles into PPM processes, fostering a culture of safety, and enhancing project portfolio outcomes.

Method: TOPSIS method of ranking evaluated based on enhanced ambiguity comparison with weighted average. One of the typical approaches Multiple response in the process used in TOPSIS to improve problems, reduce uncertainty determining the weight of each response and manageable at the same time A global approach continuously [12]. The TOPSIS process is an advanced and simple ranking engine used. The state-of-the-art TOPSIS technique tries to simultaneously choose alternatives with very short of the best-correct solution far and far from the worst-case-scenario solution. A better superior response increases the benefit criteria and lowers the price criterion, while a worse superior response raises the price Criterion and Advantage Reduces criteria TOPSIS makes full use of the attribute records [13]. TOPSIS method, two fuzzy Member Respectively Activities and a census sheet. of this title Basic attributes of FMCDM Motivations for use, open challenges and constraints to its use, and recommendations for researchers to increase FMCDM acceptance and use [14]. Topsis is another mead because of its characteristics More effective than heuristics Fewer parameters, more stability multiple response values when the value changes contain The TOPSIS algorithm was developed [15]. TOPSIS rankings are given by five distance measurements, different Random problems of sizes are created are calculated in the numerical example. We conduct a comprehensive comparative study of preference ranking orders, including consistency ratio, odds ratio of best alternatives, and mean Spearman correlation coefficients. Finally, the Spearman Correlation The number of alternatives over the mean of the coefficients Number and distance of attributes The second is to realize the influence of measurements Row regression will be implemented. "Proximity to ideal" is developed by compromise programming system. It is the "majority" and the minimum Provides maximum "group utility" for the individual grievance to "opponent". TOPSIS method for ideal solution Short range and negativeoptimal Determines the solution with these distances Not considered significant [16]. The Topsis (of the optimal solution Order by unity technique for option) technique offered to indicate TOPSIS, a multi-criteria technique for identifying selected opportunity need to most from the grand perfect solution Shorter distances worse at best Stay away from the solution [17]. TOPSIS may also seem reasonable however it's far undoubtedly now not. One complaint is that the relative significance of the 2 separations is not considered, the hassle taken into consideration, and they amplify TOPSIS to solve the multi-goal selection-making (MODM) hassle. PIS Short distance from and NIS longest distance), then a "satisfiability condition" for each criteria is delivered, followed through max-min operator for those criteria Eliminate conflict between uses Ultimately "harmony is solution where the satisfaction [18]. TOPSIS (A Technique for Optimal Solution-like Regulatory Performance) is an effective. Perform analysis, comparisons and rating of options. Accordingly, appropriate Therefore, this take a look at will amplify TOPSIS to actual assignment-oriented group decision-making surroundings. A whole and efficient selection-making procedure is then supplied [19]. TOPSIS has been carried out. First, based on a big range of statistics and theoretical evaluation, the consequences of EW at the system of attribution in decision-making or assessment are analysed. Then from the perspective of specific and bilateral stage selection-making or assessment effects, the consequences of EW on TOPSIS are similarly analysed. E-TOPSIS is used to regulate the function of EW in selection-making or assessment [20].

	Quality	Quality work health and Ti			Risk		
		safety					
Project 1	0.299	0.191	0.285	0.337	0.236		
Project 2	0.199	0.228	0.159	0.252	0.275		
Project 3	0.245	0.191	0.194	0.185	0.179		
Project 4	0.13	0.225	0.168	0.114	0.119		
Project 5	0.127	0.166	0.194	0.112	0.191		

3. **RESULT AND DISCUSSION**

TABLE 1 Project Portfolio Management

Table 1 Shows the Project Portfolio Management for Analysis using the TOPSIS Method. quality, work health and safety, Time, Cost, Risk and with evaluation preference: Project 1, Project 2, Project 3, Project 4, Project 5.





FIGURE 1. Project Portfolio Management

Figure 1 shows the Project Portfolio Management for Analysis using the TOPSIS Method. quality, work health and safety, Time, Cost, Risk and with evaluation preference: Project 1, Project 2, Project 3, Project 4, Project 5.

IABLE 2. Normalized data							
0.0365	0.0894	0.0557	0.1136	0.0812			
0.0520	0.0396	0.0756	0.0635	0.0253			
0.0365	0.0600	0.0320	0.0342	0.0376			
0.0506	0.0169	0.0142	0.0130	0.0282			
0.0276	0.0161	0.0365	0.0125	0.0376			

 TABLE 2. Normalized data

Table 2 showing the Normalized data Project Portfolio Management using the analysis method in TOPSIS alternative preference: quality, work health and safety, Time, Cost, Risk and with evaluation preference: Project 1, Project 2, Project 3, Project 4, Project 5.



Figure 2 showing the Normalized data Project Portfolio Management using the analysis method in TOPSIS alternative preference: quality, work health and safety, Time, Cost, Risk and with evaluation preference: Project 1, Project 2, Project 3, Project 4, Project 5.

TABLE 3. Weightages									
Weightages									
0.20	0.20	0.20	0.20	0.20					
0.20	0.20	0.20	0.20	0.20					
0.20	0.20	0.20	0.20	0.20					
0.20	0.20	0.20	0.20	0.20					
0.20	0.20	0.20	0.20	0.20					

Table 3 showing the Weightages Project Portfolio Management using the analysis of Topsis method in all same value.

$$\boldsymbol{X_{wnormal1}} = \boldsymbol{X_{n1}} \times \boldsymbol{w_1} \tag{2}.$$

TABLE 4. Weighted normalized decision matrix

Project 1	0.0848	0.1327	0.1047	0.1495	0.1265
Project 2	0.1012	0.0883	0.1220	0.1118	0.0706
Project 3	0.0848	0.1087	0.0794	0.0821	0.0861
Project 4	0.0998	0.0577	0.0528	0.0506	0.0746
Project 5	0.0737	0.0564	0.0848	0.0497	0.0861

Table 4 show the Weighted normalized decision matrix Project Portfolio Management using the analysis method in Topsis alternative preference: quality, work health and safety, Time, Cost, Risk and with evaluation preference: Project 1, Project 2, Project 3, Project 4, Project 5 Weighted normalized decision matrix value.



FIGURE 3. Weighted normalized decision matrix

Figure 3 show the Weighted normalized decision matrix Project Portfolio Management using the analysis method in Topsis alternative preference: quality, work health and safety, Time, Cost, Risk and with evaluation preference: Project 1, Project 2, Project 3, Project 4, Project 5 Weighted normalized decision matrix value.

	Positive Matrix				Negative matrix					
Project 1	0.1012	0.1012	0.1012	0.1012	0.1012	0.0737	0.0737	0.0737	0.0737	0.0737
Project 2	0.1012	0.1012	0.1012	0.1012	0.1012	0.0737	0.0737	0.0737	0.0737	0.0737
Project 3	0.1012	0.1012	0.1012	0.1012	0.1012	0.0737	0.0737	0.0737	0.0737	0.0737
Project 4	0.1012	0.1012	0.1012	0.1012	0.1012	0.0737	0.0737	0.0737	0.0737	0.0737
Project 5	0.1012	0.1012	0.1012	0.1012	0.1012	0.0737	0.0737	0.0737	0.0737	0.0737

TABLE 5. Positive and Negative Matrix

Table 5 shows Positive and Negative Matrix for Project 1, Project 2, Project 3, Project 4, Project 5 In various Positive Matrix in Maximum of all common 0.1012 is taken and for Negative matrix the Minimum value 0. 0.0737 is taken.

	SI Plus	Si Negative	Ci	Rank
Project 1	0.0438	0.0858	0.6622	1
Project 2	0.0392	0.0576	0.5950	2
Project 3	0.0320	0.0392	0.5505	3
Project 4	0.0703	0.0371	0.3455	4
Project 5	0.0571	0.0240	0.2960	5

TABLE 6. Final Result of Project Portfolio Management

Table 6 shows the final result of TOPSIS for Project Portfolio Management. Figure 5 shows the TOPSIS Analysis Result of Project Portfolio Management. In Table 6, Si positive is calculated using the formula (3). From figure 6, In Si positive, Project 4 is having is Higher Value and Project 3 is having Lower value. Si Negative is calculated using the formula (4). In Si Negative, Project 1 is having is Higher Value Project 5 is having Lower value. Ci is calculated using the formula (5). In Ci, Project 1 is having is Higher Value and Project 5 is having Lower value.

$$X_{si+1} = \sqrt{\left(\left(X_{wn1} - X_{p1}\right)^{2} + \left(Y_{wn1} - Y_{p1}\right)^{2} + \left(Z_{wn1} - Z_{p1}\right)^{2}\right)}$$
(3)
$$X_{si-1} = \sqrt{\left(\left(X_{wn1} - X_{n1}\right)^{2} + \left(Y_{wn1} - Y_{n1}\right)^{2} + \left(Z_{wn1} - Z_{n1}\right)^{2}\right)}$$
(4)
$$X_{ci1} = \frac{X_{si-1}}{\left(X_{si+1}\right) + \left(X_{s(i-1)}\right)}$$
(5)



FIGURE 4. Result of Project Portfolio Management



FIGURE 5. Rank

Figure 5 Shows the Ranking of Project Portfolio Management. Project 1 is got the first rank whereas is the Project 5 is having the Lowest rank.

4. CONCLUSION

In conclusion, Project Portfolio Management (PPM) is a critical discipline that enables organizations to effectively manage their portfolio of projects and align them with strategic objectives. This research paper has explored various aspects of PPM, including its definition, benefits, methodologies, and challenges. The findings highlight the importance of PPM in enhancing project success rates, optimizing resource allocation, and improving overall organizational performance. Through a comprehensive review of existing literature and analysis of real-world case studies, this research has provided valuable insights into the key components of PPM. The research has emphasized the significance of project selection and prioritization, resource allocation, risk management, and performance monitoring in the context of PPM. It has also identified the need for effective communication, stakeholder engagement, and governance structures to support successful PPM implementation. The results demonstrate the importance of each of these components in PPM decision-making processes and their influence on project selection, prioritization, resource allocation, and overall portfolio performance. The timely completion of projects, effective use of resources, and alignment with organizational objectives are all ensured by effective time management. Effective planning, control, and resource optimization are made possible by cost management. Stakeholder satisfaction and the delivery of high-quality project results are prioritized by quality management. The main goals of risk management are to find, evaluate, and eliminate potential risks to project success. Project teams benefit from a safe and healthy work environment that promotes productivity and well-being thanks to work health and safety measures. Furthermore, the research has identified several challenges and barriers that organizations face in implementing PPM, such as resistance to change, inadequate project evaluation criteria, and insufficient integration with strategic planning. By understanding these challenges, organizations can develop strategies to overcome them and improve their PPM processes. Overall, this research paper contributes to the existing body of knowledge on PPM by providing a comprehensive overview of its key principles and practices. The insights gained from this research can serve as a valuable resource for organizations seeking to enhance their project management capabilities and achieve better outcomes through effective PPM implementation. As PPM continues to evolve and adapt to the dynamic business environment, further research is warranted to explore emerging trends, best practices, and innovative approaches in the field. By staying abreast of these developments and continuously refining their PPM processes, organizations can stay competitive, deliver successful projects, and achieve their strategic objectives.

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