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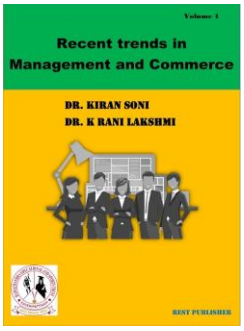

Evaluation of Quantitative Techniques for Managers using VIKOR Method

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Abstract: *Quantitative Techniques for Managers. Many different types of quantities, including numbers, symbols, and mathematical expressions, are used in quantitative management strategies. They support the decision-makers in choosing the best choice by serving as adjuncts. These are effective business methods that let managers maximize outcomes while working with constrained resources. Quantitative procedures are methods that give decision-makers organized, potent analytical tools based on quantitative data. Management uses this scientific approach to problem-solving and decision-making. The management can make decisions more effectively and objectively with the aid of quantitative methods. To arrive at a sound choice, such procedures rely on a scientific and statistical methodology. Quantitative procedures help the judgment and intuition of decision-makers by utilizing numerical symbols, mathematical expressions, and other quantities. These tools help businesses make better use of limited resources. One of the key benefits of quantitative data is that it is objective. There are fewer variables and more precise numbers used. This can help to eliminate study biases and increase the accuracy of the findings. Another benefit is that it is generally easier to obtain large sample sizes. The effective use of quantitative tools can assist the business in more accurately, affordably, and quickly resolving difficult issues. Managers can now use scientific management strategies to address complicated issues and boost productivity. To understand behavior and evaluate overall business performance, the financial modeling method known as quantitative analysis uses statistical modeling and data analysis. Quantitative analysts also referred to as quants, collect and evaluate information containing numerical values, such as salary and wage statistics. Quantitative techniques are a collection of programming and statistical methods that affect your decision-making, particularly in a field or line of work. It takes into account how symbols, mathematical phrases, and numbers are used. The VIKOR (VIšekriterijumsko Kompromisno Rangiranje) Optimal replacement Select method is used in Linear Programming, Network Models, Queuing Theory, Quality Control, Inventory Analysis, Production Scheduling Models, and Never, Hardly Ever, Sometimes, Frequently. Linear Programming, Network Models, Queuing Theory, Quality Control, Inventory Analysis, and Production Scheduling Models. Never, Hardly Ever, Sometimes, Frequently. Production Scheduling Models have the highest rank whereas Inventory Analysis has the lowest rank.*

Keywords: *Earned Value Management, Risk assessment, VIKOR Method.*

1. INTRODUCTION

The term "application of knowledge, skills, tools, and procedures to project activities to satisfy project requirements" refers to project management (PM). Since a project is "an endeavor performed temporarily to generate a product, service, or distinctive result," PM techniques are intended to be used in a variety of complicated situations. See the literature review for more on the background of PM. Project monitoring, which enables knowledge of the present development of the project and permits comparison to expected performances, is one of the functions offered by PM approaches. Combining EVM with risk management (RM) strategies, which take into account project activities' erratic behavior and the effects of unfavorable and unexpected events on work completed, expenses, and ultimately project performance can strengthen EVM. A project is typically divided into control points, or stages of work progress, which specify time points of control and are chosen to control the progress of a certain portion of the project over a predetermined period. By relying on the capability of comparing the projected values of the already completed WPS with the actual ones, the EVM and RM approach

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effectively assist project managers to determine project performances and manage them under certain and uncertain conditions. They are therefore frequently employed after each WPS when actual performance is available. Successful projects that are finished on time and under budget also adhere to the necessary technical and safety standards. Even though there are many techniques and approaches to assist project management efforts, keeping track of the costs and duration of a project is still challenging. Unless coupled with the other two, it can independently monitor any one category of little or no value. The author concurs with other scholars in the necessity for an applicable quantitative way to gauge task progress because doing so would get rid of the primary problem. We contend that the proper application of quantitative methodologies, often known as modeling, integrated with current management information and decision support systems, is one way to deal with this challenging scenario. The philosophy that "you can't manage what you can't model" is consistent with how this is done. A model in this context is a precise representation of a scenario that enables computer manipulation to judge the relative merits and impacts of various policies and implementations. The mathematical, symbolic, and graphic modeling disciplines provide means to examine and explain the structures, processes, and interactions that give rise to the circumstances we try to comprehend, manage, and improve. We contend that the proper application of quantitative methodologies, often known as modeling, integrated with current management information and decision support systems, is one way to deal with this challenging scenario. The philosophy that "you can't manage what you can't model" is consistent with how this is done. A model in this context is a precise representation of a scenario that enables computer manipulation to judge the relative merits and impacts of various policies and implementations. The mathematical, symbolic, and graphic modeling disciplines provide means to examine and explain the structures, processes, and interactions that give rise to the circumstances we try to comprehend, manage, and improve.

2. MATERIALS AND METHOD

Earned Value Management

Project Management (PM) is a vital activity that determines the success or failure of a project. As a result, numerous methods have been developed over time to streamline efforts involved in such activity and improve its efficacy. As stated earlier, the first attempt to support project managers in the planning phase was made in 1950 with the introduction of CPM, a method that is deterministic and determines the longest path (i.e., the "critical path") in a network, which is taken as the earliest time for project completion. A few years later, PERT was established, introducing an activity duration uncertainty hypothesis. Last but not least, Monte Carlo Simulation (MCS), which was first suggested for project planning in the early 1960s, swiftly rose to become one of the strategies employed for projects impacted by operational uncertainty. With the adoption of EVM, a serious effort to organize the Prime Minister's procedure was made. EVM, which incorporates metrics from PM's Iron Triangle, was first mentioned in the PMBOK Guide in 2000 and is widely used in the PM industry to monitor project performance. When project costs and schedules are established, "EVM generates variance and performance indices for project costs and schedules, therefore providing early indications of projected project performance results. Using specific performance indicators, such as Planned Value (PV), Earned Value (EV), and Budgeted and Actual Costs, EVM monitors project progress and calculates schedule and cost deviations from expected values (BC and AC). Implementation of schedule variation (SV), cost variance (CV), schedule performance index (SPI), and cost performance index (CPI). The Earned Schedule (ES) concept expands on SV and SBI's shortcomings. Based on these, recent research has been spurred by the potential to increase the potential of EVs by enhancing traditional indicators with more sophisticated ones and using statistical and fuzzy techniques for EV indicators. We were able to find the most pertinent publications that address the issue of project control and monitoring thanks to the examination of the literature.

Risk assessment

A project risk is an unforeseen event or scenario that, if it occurs, will affect one or more project objectives, such as scope, time, cost, or quality. The most well-known RM methods are PERT, Probability-Impact Risk Matrix, Pareto Charts, MCS, Decision Trees, Failure Models and Effects Analysis (FMEA), System Dynamics Models, Sensitivity Analysis, and many other effective procedures. PERT, for instance, enables the assessment of the risk of going over the expected completion time as a result of activity-related uncertainty factors. The risk of exceeding the completion time is false unless activities on the critical path are also risky, according to a common criticism of this technique. This is because activities not on the critical path have a higher probability of switching than those on the critical path will have an impact on the completion time. This suggests that PERT is not a reliable method for calculating the risk involved in a project. Additionally, it prevents us from understanding how the risk profile of the overall project varies and the effects of early/delayed WPSs on WPS that have not yet been implemented. Recent literature is awash with instances of novel approaches designed to aid project managers in making decisions in the face of uncertainty in the field of risk assessment and management. Here, key pieces of evidence from the literature are presented, and contrasts with the author's suggested method are highlighted. a tool that will aid the project manager in making the optimum risk management decision. To

estimate the effects of prospective risks in conjunction with preventative and/or corrective action, the created technique, known as Pro Risk, uses the concepts of risk scenario, treatment scenario, and project scenario.

3. VIKOR METHOD

The VIKOR approach is added as an adaptive approach implemented inside the MCDM problem and is evolved Inapplicable (exclusive units) and A unique choice of contradictions many to solve the problem of doing as an attribute selection technique standard. Help selection makers arrive at a final answer. A Multi-criterion for compromise ranking Metric lb-for metric is used. aggregation feature within the compromise programming method. The VIKOR method turned into advanced for multivariate Preliminary (Given) Preference of compromise solution obtained with weights Determines the load stability periods for equilibrium. In the presence of this approach, contradiction Evaluation is from a fixed set of alternatives and focuses on selection standards. The VIKOR technique changed multiple criteria in complex structures Built to improve and great reputation, Contrasted and exceptional unit ranking with grades and alternatives it specializes in selection. VIKOR in approach, it's close to a first-rate alternative Compromise by assessing charter Rankings is being completed, too a compromise is an agreement. way of mutual options. VIKOR is used to assess medical institution service exceptional due to the fact this technique represents a compromise selection in an indistinct, ambiguous, and uncertain environment. For this purpose, the principal cause and contribution of this look are to advocate a collection fuzzy-based compromise VIKOR method with parameters by way of fantastic triangular numbers (TFNs) on the way to be considered later, and the set principle and VIKOR approach Might be added within the next segment. The VIKOR Index is well-matched. Taguchi's SN rate is simultaneously an excellent characteristic, considering recommendation and variation and VIKOR Index simultaneous use and regret Measures to improve multi-response methods. The VIKOR technique is brought as an identical technique applied within the MCDM hassle and developed as a multi-standards selection-making technique. The VIKOR method makes decisions to provide methods by researchers to finish hard issues with extra correct solutions. This involves using the simplest VIKOR, the nation of the artwork of VIKOR specialty in this paper, and as we shall see Uniquely mathematics. You are Different from VIKOR. It can be found in the documentation The proposal can be evaluated. The VIKOR technique is based on integrative fuzzy qualification Qi, which for a first-class solution represents the alternate distance. Functions and routines in developing a set of VIKOR rule Rank numbers are used A numerical example illustrates using the VIKOR technique in water resources planning, which targets numerical justification. VIKOR with incomplete statistics for analysis of land use techniques to reduce economic and social expenses with the capability of natural dangers. The bad defines the solution with the furthest distance from the appropriate answer and the answer with the short of a suitable solution Far, but it no longer takes into account these distances' Relative importance. The VIKOR technique includes defining positive and negative perfect points within the answer area. It makes a specialty Possible in the presence of contradiction Limited options Ranking from the set and choosing and incompatible (attributes with specific units) standards. While the VIKOR method solves demonstration examples. It also attempted to pick out the fine-appearing VIKOR approach to the usage of Spearman's rank correlation coefficient values.

4. ANALYSIS AND DISCUSSION

TABLE 1. Quantitative Techniques for Managers

	Never	Hardly Ever	Sometimes	Frequently
Linear Programming	0.34	0.85	0.75	0.13
Network Models	0.22	0.71	0.67	0.21
Queuing Theory	0.39	0.89	0.93	0.37
Quality Control	0.15	0.93	0.72	0.14
Inventory Analysis	0.27	0.86	0.86	0.26
Production Scheduling Models	0.36	0.72	0.81	0.36
Best	**0.15**	**0.93**	**0.93**	**0.13**
worst	**0.39**	**0.71**	**0.67**	**0.37**

Table 1 shows the data set for the VIKOR method. Linear Programming, Network Models, Queuing Theory, Quality Control, Inventory Analysis, and Production Scheduling Models Alternatives Never, Hardly Ever, Sometimes, Frequently is the Best and Worst Value.

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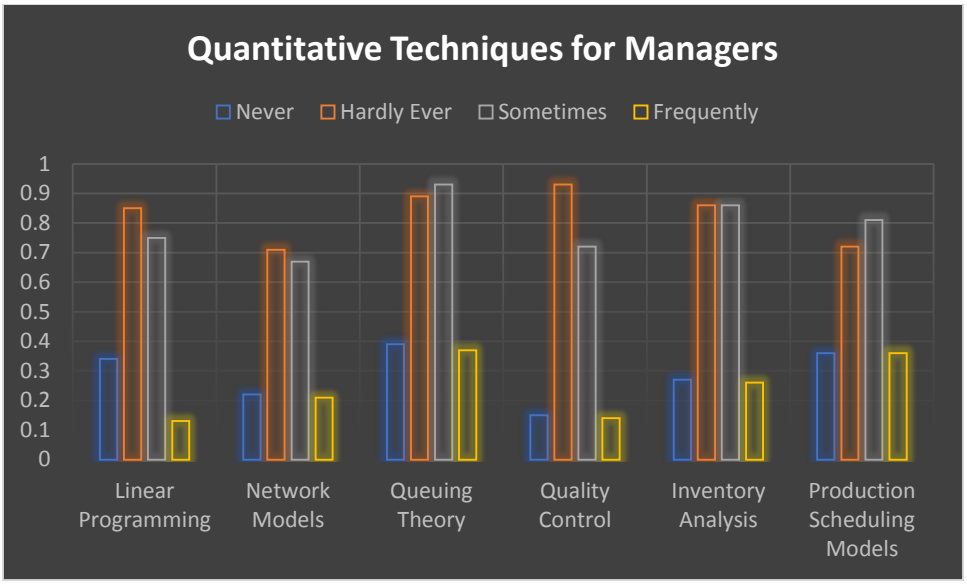

FIGURE 1. Quantitative Techniques for Managers

Figure 1 shows the data set for the VIKOR method. Linear Programming, Network Models, Queuing Theory, Quality Control, Inventory Analysis, and Production Scheduling Models Alternatives Never, Hardly Ever, Sometimes, Frequently is the Best and Worst Value.

TABLE 2. Calculation Sj and Rj

Never	Hardly Ever	Sometimes	Frequently	Sj	Rj
0.197917	0.090909	0.173077	0	0.461903	0.197917
0.072917	0.25	0.25	0.083333	0.65625	0.25
0.25	0.045455	0	0.25	0.545455	0.25
0	0	0.201923	0.010417	0.21234	0.201923
0.125	0.079545	0.067308	0.135417	0.40727	0.135417
0.21875	0.238636	0.115385	0.239583	0.812354	0.239583

Table 2 shows the calculation Sj and Rj is the sum of Normalization of tabulation 1 which is calculated from the determination of best and worst values.

TABLE 3. Final Result of Calculation Qj

	Calculation Qj			
	Sj	**Rj**	**Qj**	**Rank**
Linear Programming	0.461903	0.197917	0.480691	4
Network Models	0.65625	0.25	0.869916	2
Queuing Theory	0.545455	0.25	0.777589	3
Quality Control	0.21234	0.201923	0.29021	5
Inventory Analysis	0.40727	0.135417	0.162438	6
Production Scheduling Models	0.812354	0.239583	0.954545	1

Table 3 shows the Final Result of the Calculation Qj calculated from the sum of the calculation from the Sj and Rj from the Qj value, the rank is taken.

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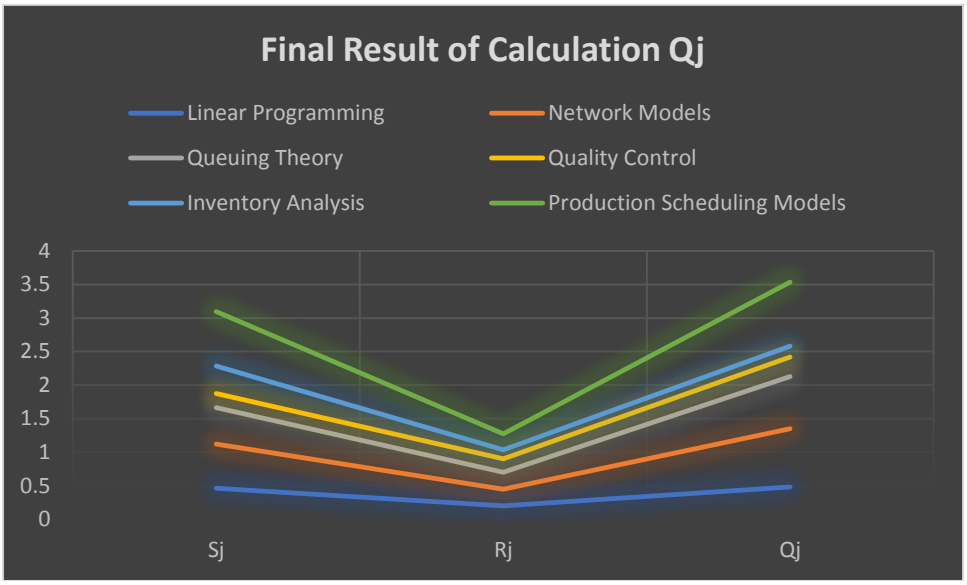

FIGURE 2. Final Result of Calculation Qj

Figure 2 Shows the Calculation Sj, Rj, and Qj data set using the VIKOR method. Qj for Production Scheduling Models is showing the highest value and Quality Control is showing the lowest value.

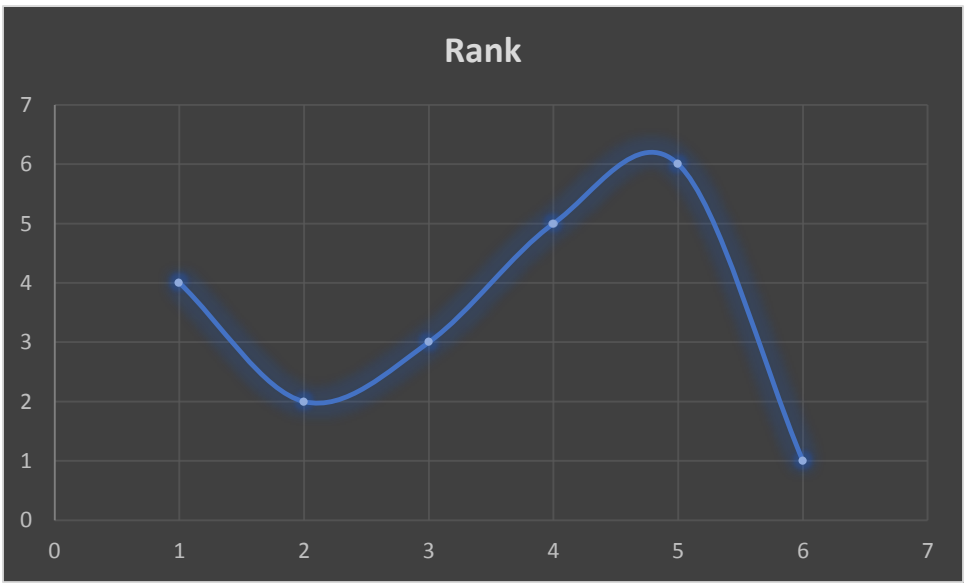

FIGURE 3. Shown the Rank

Figure 3 shows the Rank of the data set for using the analysis of the VIKOR Method. Production Scheduling Models got the first rank whereas Inventory Analysis is having the lowest rank.

5. CONCLUSIONS

The study addressed the subject of risk assessment and management, providing a novel method for risk prevention and balance that can assist management in the decision-making process by putting risk response strategies into place to avoid, minimize, or accept project hazards. The suggested model has the drawback of dealing with deterministic project plans, therefore it does not account for activity-related uncertainty, but it is still helpful when a project needs to be planned with specific parameters. One of the issues that led to the development of its management technique was the requirement to determine costs, time, and project needs. Grants are, of course, calculated proportionally to these factors, just like in the case of development plans for regular projects or project proposals for European work projects. In these situations, potential

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departures from the planned values are documented in the progress phase when the actual values are determined and compared to the planned values. Based on these factors, future developments of the suggested method might rely on the application of stochastic project planning techniques (PERT method), which can account for the uncertainty surrounding activity duration. This paper presents a viable method for quantitatively assessing task progress. Earned value and WBS are used in the process. Some advantages of the suggested technology over the commonly used WPC method are highlighted in a comparison with WPC. This technique was successfully utilized during the redesign of a big petrochemical project modernizing three refinery units. There are provided examples of created reports. By using this method, owners and contractors can avoid expensive contractual and legal disputes over the state of their projects and the compensation of the contractors involved. Through this procedure, senior management can take a backseat to fewer senior staff members in time-consuming mundane activities.

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