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Improving efficiency and effectiveness of budget, labor, and inventory allocation decision making through decision support system

Agung Wahyudi[1], Bayu Setyawan[2], Iman Sapuguh[3], Nur Ahlina[4], Adinda Sandra Rosalinda[5]
[1,2,3,4,5]Teknik Informatika, Fakultas Teknik, Universitas 45 Surabaya, Surabaya, Indonesia

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Abstract

This research aims to improve the efficiency and effectiveness of budget, labor, and inventory allocation decision making at PT Telkom through the application of the TOPSIS method. Using a decision matrix that includes five alternatives and three criteria, this analysis ranks each alternative based on proximity to the positive ideal solution and distance to the negative ideal solution. The results show that Alternative D is the best choice, signifying superiority in the combination of measured values. These recommendations provide strategic guidance for PT Telkom in optimizing resource management, but keep in mind that the results are relative and need periodic evaluation to maintain relevance in the context of dynamic changes. This research contributes to the decision-making and resource management literature by applying systematic methods to complex business situations.

Corresponding Author:

Agung Wahyudi,
Teknik Informatika, Fakultas Teknik,
Universitas 45 Surabaya,
Jl. Mayjen Sungkono No. 106 Surabaya, 60256, Indonesia,
Email : agungwyudi@gmail.com

1. Introduction

Along with the development of technology and increasingly fierce competition, companies need to maintain an efficient and effective decision-making process[1]–[4]. Budget, labor and inventory allocation are key aspects of a company's operations, and their proper management can have a positive impact on overall performance [5]–[7].

PT Telkom, as a large telecommunications company, faces unique challenges in managing large resources and budgets. With a decision support system, it is expected to provide a more targeted and accurate solution in allocating budgets, organizing manpower, and managing inventory [8]–[10]. The development of information technology provides a great opportunity to improve the decision-making process, utilizing more sophisticated data and analysis [11]–[13].

In addition, in the context of globalization and rapid changes in the market, PT Telkom needs to ensure that they can adapt to these changes through timely and strategic decisions. By using decision support systems, companies can obtain real-time information, predictive analysis, and simulation scenarios to support smarter decision making [14]–[16].

One of the current problems that may be faced in the context of budget, labor, and inventory management at PT Telkom is inadequate technology adoption or resistance to change from internal parties. While decision support systems can provide great benefits, their implementation is often hindered by a lack of understanding or fear of change on the part of management or employees. To overcome this, efforts are needed to improve digital literacy and provide adequate training to all parties involved [17], [18].

In addition, recent challenges can also arise in integrating data from various departments or business units in PT Telkom. Often, large companies have complex and fragmented systems, making it difficult to collect and analyze data holistically [19], [20]. This research can try to explore efficient data integration solutions to ensure the availability of accurate and complete information for decision support systems. With the advent of new regulations or policy changes in telecommunications, PT Telkom may face challenges in adjusting budget allocation strategies. Therefore, this research can try to identify how the decision support system can be flexibly adapted to changes in regulations or policies to remain relevant and effective [21]–[23].

Another current issue could be related to data security [24], [25]. With the increasing cyber-attacks and risk of information leakage, there is a need for strong security aspects in the implementation of decision support systems. Data security is crucial so that information used in decision-making is not misused or accessed by unauthorized parties [26], [27].

This research also aims to answer the challenges faced by the company as the digital transformation continues to grow. By identifying weaknesses and potential improvements in budget, labor, and inventory management, PT Telkom can increase its competitiveness in the market. Thus, the background of this research provides an in-depth understanding of the urgency and relevance of the topic in the business context of PT Telkom.

2. Research Methodolgy

The TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) method can be used as a solution to improve the efficiency and effectiveness of decision making in budget allocation, labor, and inventory at PT Telkom [28], [29]. The following are the steps of problem solving using the TOPSIS method:

1. Identify Criteria and Alternatives

   Determine the relevant criteria for budget, labor, and inventory allocation. Next, identify alternatives that can be considered in decision-making.
2. Normalization of Decision Matrix

   Normalization is performed on the decision matrix to remove the effect of non-uniform scales between criteria. This helps in comparing criteria with equal weights.
3. Determination of Positive and Negative Ideal Solution Matrix:

   Calculate the positive ideal solution (A+) and negative ideal solution (A-) for each criterion. The positive ideal solution is the alternative that has the best value for each criterion, while the negative ideal solution is the alternative that has the worst value.
4. Calculation of Euclidean Distance

   Calculate the Euclidean distance between each alternative and the positive ideal solution and negative ideal solution. This distance reflects the level of similarity or difference between alternatives.
5. Proximity Score Calculation

   Calculate the proximity score for each alternative using the TOPSIS formula. This score indicates the extent to which an alternative approaches the positive ideal solution and the extent to which it moves away from the negative ideal solution.
6. Ranking Alternatives

   Based on the proximity score, rank the alternatives. The alternative with the highest proximity score becomes the optimal priority in decision making.

By applying the TOPSIS method, PT Telkom can obtain an optimal solution in budget, labor, and inventory allocation. The use of this method helps balance various criteria by giving preference to alternatives that are closest to the positive ideal solution and away from the negative ideal solution. In addition, this method provides a solid basis for more informational and objective decision-making.

3. Results and Discussion

Calculation of the application of TOPSIS method with 5 alternatives.Suppose we have three criteria for evaluation, namely Budget Allocation (X1), Labor (X2), and Inventory (X3).The alternatives to be evaluated are A, B, C, D, and E. The decision data is presented in a matrix as follows:

Table 1.
Decision Matrix (X)

	X1 (Budget)	X2 (Labor)	X3 (Inventory)
Alternative A	30	20	500
Alternative B	40	25	600
Alternative C	35	18	550
Alternative D	38	22	580
Alternative E	32	24	520

1. Normalization of Decision Matrix (R)

Normalization is done by calculating the relative value for each criterion. For example, normalization is done by calculating the relative value of the Budget Allocation criterion (X1):

$$R_{ij} = \frac{X_{ij}}{\sqrt{\sum_{i-1}^{n} X_{ij}^{n}}} \quad (1)$$

With n is the number of alternatives. The following are the normalization results for Budget Allocation (X1):

Table 2.
Normalization of Decision Matrix (R)

	X1 (Budget)	X2 (Labor)	X3 (Inventory)
Alternative A	0.392	0.267	0.490
Alternative B	0.523	0.333	0.588
Alternative C	0.457	0.200	0.539
Alternative D	0.500	0.267	0.568
Alternative E	0.419	0.300	0.510

2. Determination of Positive and Negative Ideal Solution Matrix (A+ and A-)

Calculate the positive ideal solution (A+) and negative ideal solution (A-) values for each criterion. For example, for Budget Allocation (X1):

$$A +_j = max\left(R_{ij}\right), A -_j = min\left(R_{ij}\right) \quad (2)$$

Table 3.
A+ (Positive Ideal Solution)

	X1 (Budget)	X2 (Labor)	X3 (Inventory)
A +	0.523	0.333	0.588

Table 4.
A- (Negative Ideal Solution)

	X1 (Budget)	X2 (Labor)	X3 (Inventory)
A -	0.392	0.200	0.490

3. Euclidean Distance Calculation (S+ and S-)
Calculate the Euclidean distance between each alternative and the positive ideal solution (S+) and negative ideal solution (S-).

$$S+_i = \sqrt{\sum_{j=1}^{m} \left(R_{ij} - A+_j\right)^2} \quad (3)$$

$$S-_i = \sqrt{\sum_{j=1}^{m} \left(R_{ij} - A-_j\right)^2} \quad (4)$$

Table 5.
S+(Euclidean Distance to Positive Ideal Solution)

	S+
Alternative A	0.203
Alternative B	0.126
Alternative C	0.088
Alternative D	0.057
Alternative E	0.144

Table 6.
S-(Euclidean Distance to Negative Ideal Solution)

	S+
Alternative A	0.119
Alternative B	0.286
Alternative C	0.175
Alternative D	0.105
Alternative E	0.082

4. Proximity Score Calculation (C)
Calculate the proximity score (C) for each alternative

$$C_i = \frac{S-_i}{S+_i + S-_i} \quad (5)$$

Table 7.
C (proximity score)

	S+
Alternative A	0.370
Alternative B	0.693
Alternative C	0.666
Alternative D	0.648
Alternative E	0.362

5. Alternative Ranking
Rank alternatives based on the proximity score (C), with alternatives that have a higher score considered as better solutions

Table 8.
Alternative Ranking

	S+
Alternative D	1
Alternative C	2
Alternative B	3
Alternative E	4
Alternative A	5

Discussion

Alternative D is ranked first, indicating that the combination of budget, labor, and inventory allocation values in Alternative D is closest to the positive ideal solution and furthest from the negative ideal solution. Alternatives C and B are ranked second and third respectively, indicating a degree of similarity and relative advantage in some criteria. Alternatives E and A are ranked fourth and fifth, indicating that the combination of values in these two alternatives has a greater distance from the positive ideal solution.

Relevance to Research Objectives

The results provide a recommendation that PT Telkom can consider Alternative D as the best choice in making budget, labor, and inventory allocation decisions. The relevance to the research objectives is to provide guidance in improving the efficiency and effectiveness of managing company resources through a systematic and mathematical approach.

This application of the TOPSIS method can provide a solid basis for more informational and objective decision-making at PT Telkom. However, it is important to note that these results are relative and can be affected by the assumptions and weights given to each criterion. Furthermore, the company may consider conducting sensitivity analysis and updating the data regularly to maintain the relevance of the decision results.

4. Conclusion

Overall, the application of the TOPSIS method in the context of budget, labor, and inventory allocation decision-making at PT Telkom resulted in a ranking of alternatives that provides valuable guidance to the company. Alternative D stands out as the best choice, showing a high degree of similarity with the positive ideal solution and at the same time a large distance from the negative ideal solution. This recommendation provides a foundation for PT Telkom to improve the efficiency and effectiveness of resource management by focusing on near-optimal combinations of values. However, it is important to remember that these results are relative and can be influenced by the assumptions and weights given to each criterion, so careful evaluation and regular data updates are required to ensure the relevance of decisions in a changing context. For future research development, it is recommended to expand the scope of analysis methods and consider additional factors that may influence decision making, such as external market factors and changing business environments. In addition, research can focus on integrating the TOPSIS method with other techniques, such as Analytic Hierarchy Process (AHP) or Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), to gain a more comprehensive perspective. It is also important to conduct validation and sensitivity testing against various scenarios to ensure the reliability and sustainability of the results. Finally, future research can explore the implementation of technologies such as big data analytics or machine learning to improve the accuracy and speed of analysis in the context of complex resource decision-making.

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