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Optimization of Recruitment of Prospective Financial Managers Through a Decision Support System with the Multi-Attribute Utility Theory Method

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Abstract

This research applies a decision support system based on Multi-Attribute Utility Theory (MAUT) in recruiting financial managers in technology companies "TechInnovate." The study aims to identify how MAUT can increase objectivity and effectiveness in candidate selection. The quantitative method collected data on 50 candidates and used nine criteria. Data is collected through each candidate's score and then aggregated by considering the relative weights of each criterion. Results show that applying MAUT significantly improves the objectivity of recruitment decision-making. This study proves that integrating a systematic approach in recruitment can strengthen a data-based and objective selection process. The implications of this study are relevant for companies operating in dynamic and technology-centric environments, suggesting the integration of MAUT-based decision support systems as an effective strategy in the recruitment process.

Keywords: *Decision Support System; Multi-Attribute Utility Theory; Manager Recruitment; Finance; Criterion.*

Abstrak

Penelitian ini menerapkan sistem pendukung keputusan berbasis Multi Attribute Utility Theory (MAUT) dalam rekrutmen manajer keuangan di perusahaan teknologi "TechInnovate". Penelitian bertujuan mengidentifikasi sejauh mana penggunaan MAUT dapat meningkatkan objektivitas dan efektivitas dalam seleksi kandidat. Metode kuantitatif digunakan dengan mengumpulkan data 50 kandidat dan terdapat sembilan kriteria yang digunakan. Data dikumpulkan melalui skor setiap kandidat, kemudian diagregasi dengan mempertimbangkan bobot relatif dari setiap kriteria. Hasil menunjukkan penerapan MAUT signifikan dalam meningkatkan objektivitas pengambilan keputusan rekrutmen. Studi ini membuktikan pengintegrasian pendekatan sistematis dalam rekrutmen dapat memperkuat proses seleksi yang berbasis data dan objektif. Implikasi dari penelitian ini relevan bagi perusahaan yang beroperasi dalam lingkungan yang dinamis dan teknologi-sentris, menyarankan integrasi sistem pendukung keputusan berbasis MAUT sebagai strategi efektif dalam proses rekrutmen.

***Kata-kata kunci**: Sistem Pendukung Keputusan; Multi Attribute Utility Theory; Rekrutmen Manajer; Keuangan; Kriteria*

1. Introduction

In today's dynamic business world, selecting competent financial managers is one of the critical factors for organizational success [1]. Economic managers have a strategic role in effective financial management, intelligent investment decision-making, and proactive risk control [2]. However, the recruitment process for these critical positions often faces challenges, especially in objectively assessing the various attributes of candidates that may affect future performance [3]. Therefore, developing decision support systems for this recruitment becomes relevant and urgent [4].

This study aims to optimize the recruitment process of financial managers using the Multi-Attribute Utility Theory (MAUT) Method. MAUT will be applied to integrate various factors and preferences in the selection process to produce more objective and accurate decisions [5]. By adopting this approach, the study not only assists companies in selecting the most suitable candidates but also contributes to the academic literature by presenting practical applications of decision theory in the context of recruitment. This research will reference other organizations facing similar difficulties in the managerial candidate selection process.

In developing this decision support system, the MAUT method was chosen for its ability to handle stakeholders' diverse and complex preferences in the recruitment process [6]. The system is designed to analyze and integrate quantitative and qualitative data from prospective candidates, which includes education, work experience, leadership skills, and interpersonal competencies. This systematic approach allows companies to conduct a more in-depth evaluation of each candidate [7].

Furthermore, implementing this decision support system also supports transparency and fairness in the recruitment process. By providing a clear framework and consistent assessment methodology, companies can minimize subjective bias and increase confidence in the selection process [8]. This is very important considering the strategic impact that a financial manager can have on the company's financial performance and stability.

The results of this study are expected to offer valuable guidance to companies in designing and implementing effective decision-support systems for managerial recruitment. Thus, this research contributes to improving the efficiency and effectiveness of the recruitment process and the development of human resource management theory and practice more broadly.

1. Method

1.1 Stages of Research

This research for the development of decision support systems was carried out using several stages of research, which can be seen in **Figure 1.**

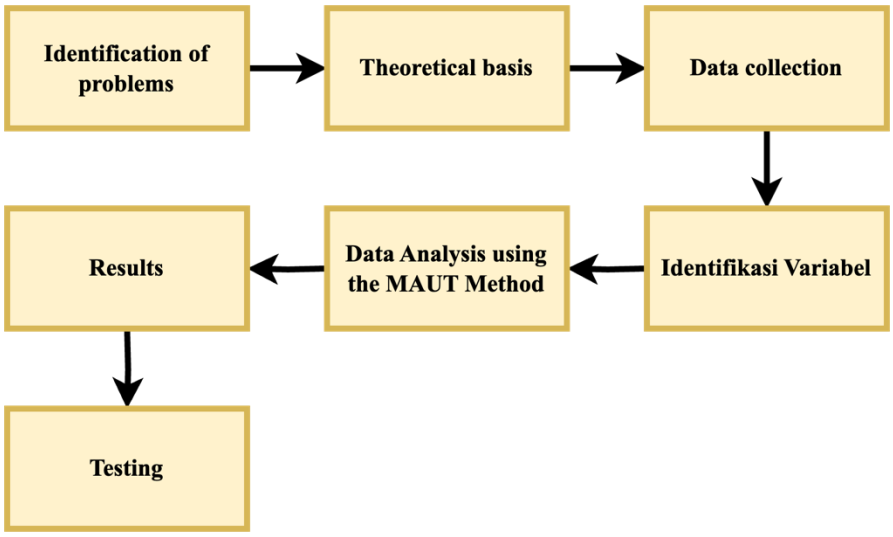

Figure 1. Stages of Research

Based on **Figure 1**. Several stages are carried out, namely "problem identification, theoretical foundation, variable identification, analysis, results, and testing. The explanation of the activities carried out is as follows:

1. Identify the problem

   Problem identification is the most critical process in conducting research apart from the background and formulation of existing problems. The problem is that several things must be considered, including Education and Qualifications, Work Experience, Analytical and Financial Skills, Communication Skills, Leadership and Team Management, Ethics and Integrity, Technology Capabilities, Adaptability and Innovation, Decision Making Ability. However, this needs to be considered when the recruitment process for this critical position often faces challenges, especially in objectively assessing various attributes of candidates that can affect future performance.

2. Theoretical foundation

   It is a research basis that needs to be upheld so that research has a solid basis and not just actions. The theoretical basis used is as follows:

a. Decision Support System

A decision support system is an interactive information system that can provide information and process data that can be modeled [9]. Decision Support System (DSS) is a computer-based system with three interacting components. The first component is the language system, which is a communication mechanism between users and other components of DSS. The second component is the knowledge system, which is a repository of problem domain knowledge in DSS, both in the form of data and procedures. The third component is the problem processing system, which is the relationship between the other two components, consisting of one or more common problem manipulation capabilities necessary for decision-making [10], [11].

b. MAUT Method

The Multi-Attribute Utility Theory (MAUT) method is used for decision-making. In this method, the final evaluation scheme, v(x), of an object is calculated by summing the weights defined as x with values relevant to the value dimension. [12]. This method is a method of decision-making [13]. MAUT is a method that finds the weighted sum of the same values in each utility of each attribute. This method can also process data from all attributes with different utilities [14]. Adapun rumus yang digunakan pada metode Maut sebagai berikut:

$$V_{(x)} = \sum_{i=1}^{n} w_j, X_{ij} \quad (1)$$

$$U_{(x)} = \frac{x - x_i^-}{x_i^+ - x_i^-} \quad (2)$$

The meaning of the formula is, $U_{(x)}$Is a normalization of alternate weights. X is an alternative. x_i^- The worst (minimum) weight of the x-th criterion, x_i^+ be = Best weight (maximum).

3. Data Collection

Data collection is the second stage after preliminary research is carried out, which contains sequences from the beginning to the end of the study. In conducting research, a data collection stage is needed to obtain information about the object of research. The data collected includes:

a. Criteria Data, which serves as a reference for assessing prospective financial managers to be used, the criteria used are Education and Qualifications, Work

Experience, Analytical and Financial Skills, Communication Skills, Leadership and Team Management, Ethics and Integrity, Technology Capabilities, Adaptability and Innovation, Decision Making Ability.

b. Alternative Data is data from the sample to be assessed where the sample consists of 50 prospective candidate data.

c. Design

4. Variable identification

After the data is obtained, an identification process will be carried out on the data, which will include research instruments, designs, and samples.

5. Analyzes

After the data is successfully identified, an analysis process will be carried out that includes the calculation process with the MAUT method on the data that has been identified, analyzing the system to be built.

6. Result

At this stage, the results of the decision support system will be obtained, both in the form of manual calculation results and from the results of the system calculations built.

7. Testing

After the results are obtained, it will be tested against the results of manual calculations with the results of the system that has been built.

2.2 MAUT Method Process

In the MAUT method, several processes will be passed to get the results in the decision support system; these stages can be seen in **Figure 2.**

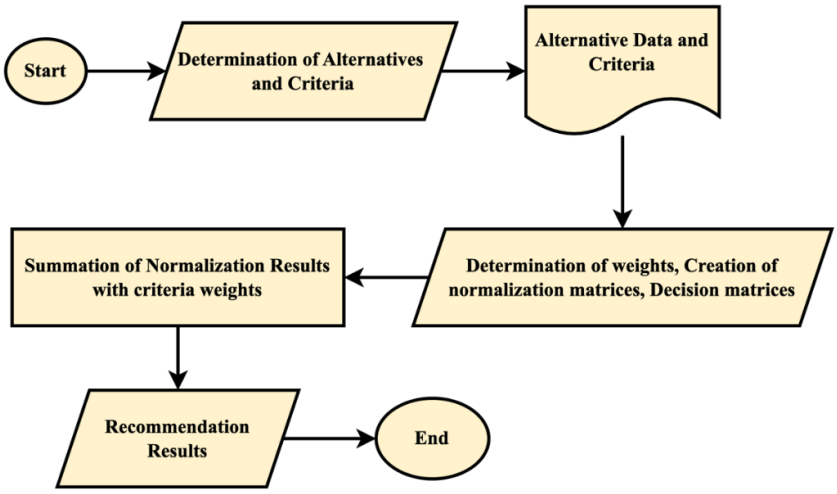

Figure 2. Stages of the MAUT Method

In this study, the MAUT method stage process has seven processes, namely the starting stage, which is continued by determining alternatives and criteria. Alternatives include education and qualification data, work experience, analytical and financial skills, communication skills, leadership and team management, ethics and integrity, technology skills, adaptability and innovation, and decision-making ability. Once the alternatives and criteria are determined, the next step is to display the data and alternative input through the previous stage. Furthermore, determining the weight on each criterion is by Education and Qualifications: 15%, Work Experience: 20%, Analytical and Financial Ability: 15%, Communication Skills: 10%, Leadership and Team Management: 15%, Ethics and Integrity: 10%, Technology Ability: 5%, Adaptability and Innovation: 5% and Decision-Making Ability: 5%. Once the weights of each criterion are determined, they create a normalization matrix to process the values on each criterion, and the decision matrix will contain the final values of each alternative—next, the summation of the normalization results with the weight of the requirements. After obtaining a decision value, the system will display the results of recommendations or decisions from each existing alternative.

2. Results and Discussion

In the results and discussion, a data analysis process will be carried out, where the data is in the form of criteria used to assess the best rubber quality. The method used in analyzing this data is to apply the MAUT method to produce information by ranking the criteria of the data managed earlier, as well as the steps needed for the desired design to the expected analysis. The criteria used to assess the best rubber sap quality can be seen in **Table 1.**

Table 1. Criteria Data

No	Code	Criteria/ weights
1	KM1	Education and Qualifications: 15%
2	KM2	Work Experience: 20%
3	KM3	Analytical and Financial Skills: 15%
4	KM4	Communication Skills: 10%
5	KM5	Leadership and Team Management: 15%
6	KM6	Ethics and Integrity: 10%
7	KM7	Technology Capabilities: 5%
8	KM8	Adaptability and Innovation: 5%
9	KM9	Decision Making Ability: 5%

Next, determine the sub-criteria of the criteria in Table 1, where the sub-criteria are displayed in **Table 2.**

Table 2. Criterion Value

No	Criterion	Value Code	Sub Criteria
1	KM1	A	Don't have a related degree or certification (0 poin)
		B	Bachelor's degree in a related field (3 poin)
		C	Bachelor's degree with practicum experience or relevant projects (6 poin)
		D	Master's degree or professional certification (10 poin)
2	KM2	A	Less than 3 years experience in finance (0 poin)
		B	3-5 years of experience in financial position (3 poin)
		C	3-5 years experience with managerial role (6 point)
		D	More than five years of experience with strategic roles (10 point)
3	KM3	A	Basic skills in financial analysis (0 point)
		B	Expertise in financial analysis for routine tasks (3 point)
		C	Expertise in financial analysis for complex projects (6 poin)
		D	Advanced expertise in financial analysis and decision making (10 poin)
4	KM4	A	Difficulty in conveying financial information (0 poin)
		B	Effective communication at the operational level (3 poin)
		C	Effective communication at the managerial level (6 poin)
		D	Highly effective communication at all levels of the organization (10 poin)
5	KM5	A	Limited experience in leadership (0 poin)
		B	Effective leadership without significant team initiative (3 poin)
		C	Effective leadership with multiple successful team initiatives (6 poin)
		D	Outstanding leadership with a track record of building and developing successful finance teams (10 poin)
6	KM6	A	Questions about integrity in the past (0 poin)
		B	Good reputation without negative notes (3 poin)
		C	Solid reputation for ethics and professionalism (6 poin)
		D	Renowned for extremely high ethical standards with proactive integrity initiatives (10 poin)
7	KM7	A	Basic capabilities in financial software (0 poin)
		B	Proficiency in using standard financial software (3 poin)
		C	Expertise in financial software and general information systems (6 poin)
		D	Expertise in advanced financial software and information systems (10 poin)
8	KM8	A	Difficulty in adapting to change or innovation (0 poin)
		B	Adequate adaptation to change (3 poin)
		C	Good adaptability and some innovative approaches (6 poin)
		D	Highly adaptive with impactful innovative solutions (10 poin)
9	KM9	A	Often making decisions that are less effective or appropriate (0 poin)
		B	Sometimes making effective decisions (3 poin)
		C	Generally make effective and appropriate decisions (6 poin)
		D	Consistently make highly effective and informed decisions based on robust analysis (10 poin)

The following is an alternative assessment data from the Decision Support System to determine the quality of rubber sap (Hevea brasiliensis) using the MAUT method is presented in **Table 3.**

Table 3. Alternative Data

No	Alternative Code	KM1	KM2	KM3	KM4	KM5	KM6	KM7	KM8	KM9
1	Cand_1	D	C	B	D	D	C	B	D	B
2	Cand_2	D	B	D	B	B	D	B	B	D
3	Cand_3	B	C	C	C	C	D	D	C	B
4	Cand_4	C	D	D	C	B	B	C	B	D
5	Cand_5	D	D	D	B	D	C	D	C	B
6	Cand_6	C	D	D	B	B	C	D	B	D
7	Cand_7	C	C	D	C	D	C	C	D	C
8	Cand_8	B	C	B	D	D	B	D	C	B
9	Cand_9	D	D	B	D	D	D	D	B	B
10	Cand_10	B	C	C	D	D	D	C	C	B
…	…	…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…	…	…
48	Cand_48	B	C	B	D	C	D	D	B	C
49	Cand_49	B	B	D	B	D	D	C	D	D
50	Cand_50	D	C	D	C	B	C	B	C	D

After the data is entered into the system, the conversion process is carried out to the values in each criterion owned by each alternative, as shown in **Table 4.**

Table 4. Value Conversion

No	Alternative Code	KM1	KM2	KM3	KM4	KM5	KM6	KM7	KM8	KM9
1	Cand_1	10	6	3	10	10	6	3	10	3
2	Cand_2	10	3	10	3	3	10	3	3	10
3	Cand_3	3	6	6	6	6	10	10	6	3
4	Cand_4	6	10	10	6	3	3	6	3	10
5	Cand_5	10	10	10	3	10	6	10	6	3
6	Cand_6	6	10	10	3	3	6	10	3	10
7	Cand_7	6	6	10	6	10	6	6	10	6
8	Cand_8	3	6	3	10	10	3	10	6	3
9	Cand_9	10	10	3	10	10	10	10	3	3
10	Cand_10	3	6	6	10	10	10	6	6	3
…	…	…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…	…	…
48	Cand_48	3	6	3	10	6	10	10	3	6
49	Cand_49	3	3	10	3	10	10	6	10	10
50	Cand_50	10	6	10	6	3	6	3	6	10

The next step is to normalize the matrix whose value is taken from the conversion result in the value of each criterion contained in the alternative using formula (2). The normalization process displayed is data 1 and 50; for other data, the same process is also used.

Cand_1

$$A11 \quad \frac{10-3}{10-3} = 1.000$$

$$A12 \quad \frac{6-3}{10-3} = 0.429$$

$$A13 \quad \frac{3-3}{10-3} = 0.000$$

$$A14 \quad \frac{10-3}{10-3} = 1.000$$

$$A15 \quad \frac{10-3}{10-3} = 1.000$$

$$A16 \quad \frac{6-3}{10-3} = 0.429$$

$$A17 \quad \frac{3-3}{10-3} = 0.000$$

$$A18 \quad \frac{10-3}{10-3} = 1.000$$

$$A19 \quad \frac{3-3}{10-3} = 0.000$$

Cand_50

$$A501 \quad \frac{10-3}{10-3} = 1.000$$

$$A502 \quad \frac{6-3}{10-3} = 0.429$$

$$A503 \quad \frac{10-3}{10-3} = 1.000$$

$$A504 \quad \frac{6-3}{10-3} = 0.429$$

$$A505 \quad \frac{3-3}{10-3} = 0.000$$

$$A506 \quad \frac{6-3}{10-3} = 0.429$$

$$A507 \quad \frac{3-3}{10-3} = 0.000$$

$$A508 \quad \frac{6-3}{10-3} = 0.429$$

$$A509 \quad \frac{10-3}{10-3} = 1.000$$

The results of the process from data 1 to data 50 are displayed on the normalisation matrix.

1.000	0.429	0.000	1.000	1.000	0.429	0.000	1.000	0.000
1.000	0.000	1.000	0.000	0.000	1.000	0.000	0.000	1.000
0.000	0.429	0.429	0.429	0.429	1.000	1.000	0.429	0.000
0.429	1.000	1.000	0.429	0.000	0.000	0.429	0.000	1.000
1.000	1.000	1.000	0.000	1.000	0.429	1.000	0.429	0.000
0.429	1.000	1.000	0.000	0.000	0.429	1.000	0.000	1.000
0.429	0.429	1.000	0.429	1.000	0.429	0.429	1.000	0.429
0.000	0.429	0.000	1.000	1.000	0.000	1.000	0.429	0.000
1.000	1.000	0.000	1.000	1.000	1.000	1.000	0.000	0.000
0.000	0.429	0.429	1.000	1.000	1.000	0.429	0.429	0.000
…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…
0.000	0.429	0.000	1.000	0.429	1.000	1.000	0.000	0.429
0.000	0.000	1.000	0.000	1.000	1.000	0.429	1.000	1.000
1.000	0.429	1.000	0.429	0.000	0.429	0.000	0.429	1.000

The next step will be normalized matrix multiplication with preference weights using the formula (1):

Alt_1 = (1,000 * 0,15) + (0,429 * 0,20) + (0,000 * 0,15) + (1,000 * 0,10) + (1,000 * 0,15) + (0,429 * 0,10) + (0,000 * 0,05) + (1,000 * 0,05) + (0,000 * 0,05) = 0,578
Alt_2 = (1,000 * 0,15) + (0,000 * 0,20) + (1,000 * 0,15) + (0,000 * 0,10) + (0,000 * 0,15) + (1,000* 0,10) + (0,000 * 0,05) + (0,000 * 0,05) + (0,000 * 0,05) = 0,450
Alt_3 = (0,000 * 0,15) + (0,429 * 0,20) + (0,429 * 0,15) + (0,429 * 0,10) + (0,429 * 0,15) + (1,000 * 0,10) + (1,000 * 0,05) + (0,429 * 0,05) + (0,000 * 0,05) = 0,428
Alt_4 = (0,429 * 0,15) + (1,000 * 0,20) + (1,000 * 0,15) + (0,429 * 0,10) + (0,000 * 0,15) + (0,000 * 0,10) + (0,429 * 0,05) + (0,000 * 0,05) + (1,000 * 0,05) = 0,528
Alt_5 = (1,000 * 0,15) + (1,000 * 0,20) + (1,000 * 0,15) + (0,000 * 0,10) + (1,000 * 0,15) + (0,429 * 0,10) + (1,000 * 0,05) + (0,429 * 0,05) + (0,000 * 0,05) = 0,764
Alt_6 = (0,429 * 0,15) + (1,000 * 0,20) + (1,000 * 0,15) + (0,000 * 0,10) + (0,000 * 0,15) + (0,429 * 0,10) + (1,000 * 0,05) + (0,000 * 0,05) + (1,000 * 0,05) = 0,557
Alt_7 = (0,429 * 0,15) + (0,429 * 0,20) + (1,000 * 0,15) + (0,429 * 0,10) + (1,000 * 0,15) + (0,429 * 0,10) + (0,429 * 0,05) + (1,000 * 0,05) + (0,429 * 0,05) = 0,628
Alt_8 = (0,000 * 0,15) + (0,429 * 0,20) + (0,000 * 0,15) + (1,000 * 0,10) + (1,000 * 0,15) + (0,000 * 0,10) + (1,000 * 0,05) + (0,429 * 0,05) + (0,000 * 0,05) = 0,407
Alt_9 = (1,000 * 0,15) + (1,000 * 0,20) + (0,000 * 0,15) + (1,000 * 0,10) + (1,000 * 0,15) + (1,000 * 0,10) + (1,000 * 0,05) + (0,000 * 0,05) + (0,000 * 0,05) = 0,750
Alt_10 = (0,000 * 0,15) + (0,429 * 0,20) + (0,429 * 0,15) + (1,000 * 0,10) + (1,000 * 0,15) + (1,000 * 0,10) + (0,429 * 0,05) + (0,429 * 0,05) + (0,000 * 0,05) = 0,542
Alt_11 = (0,429 * 0,15) + (0,000 * 0,20) + (0,429 * 0,15) + (0,000 * 0,10) + (1,000 * 0,15) + (0,429 * 0,10) + (0,000 * 0,05) + (1,000 * 0,05) + (1,000 * 0,05) = 0,421
Alt_47= (1,000 * 0,15) + (1,000 * 0,20) + (0,000 * 0,15) + (0,429 * 0,10) + (0,429 * 0,15) + (0,429 * 0,10) + (1,000 * 0,05) + (0,429 * 0,05) + (0,429 * 0,05) = 0,5929
Alt_48= (0,000 * 0,15) + (0,429 * 0,20) + (0,000 * 0,15) + (1,000 * 0,10) + (0,429 * 0,15) + (1,000 * 0,10) + (1,000 * 0,05) + (0,000 * 0,05) + (0,429 * 0,05) = 0,421
Alt_49= (0,000 * 0,15) + (0,000 * 0,20) + (1,000 * 0,15) + (0,000 * 0,10) + (1,000 * 0,15) + (1,000 * 0,10) + (0,429 * 0,05) + (1,000 * 0,05) + (1,000 * 0,05) = 0,521
Alt_50= (1,000 * 0,15) + (0,429 * 0,20) + (1,000 * 0,15) + (0,429 * 0,10) + (0,000 * 0,15) + (0,429 * 0,10) + (0,000 * 0,05) + (0,429 * 0,05) + (1,000 * 0,05) = 0,542

After obtaining the sum with the weight of the criteria, the next step is to rank and provide decision recommendations, as seen in **Table 5.**

Table 5. Decision Results

No	Rangking	Alternative Code	Final score	Decision
1	Rangking 1	Cand_44	0.8286	Recommended
2	Rangking 2	Cand_26	0.7857	Backup 1
3	Rangking 3	Cand_5	0.7643	Backup 2
4	Rangking 4	Cand_9	0.7500	Did not qualify
5	Rangking 5	Cand_25	0.7357	Did not qualify
6	Rangking 6	Cand_12	0.7071	Did not qualify
7	Rangking 7	Cand_22	0.7000	Did not qualify
8	Rangking 8	Cand_36	0.6429	Did not qualify
9	Rangking 9	Cand_7	0.6286	Did not qualify
10	Rangking 10	Cand_47	0.5929	Did not qualify
…	…	…	…	…
…	…	…	…	…
…	…	…	…	…
48	Rangking 48	Cand_18	0.2143	Did not qualify
49	Rangking 49	Cand_42	0.2000	Did not qualify
50	Rangking 50	Cand_40	0.1786	Did not qualify

Furthermore, the same data will be tested through the decision support system shown in **Figure 3**.

Figure 3. System Testing

In the financial manager selection process, the MAUT-based decision support system successfully identified and ranked 50 candidates based on an overall score calculated from various predetermined criteria. The shortlisted candidates and their rankings are as follows:

1. Cand_44, with the highest score of 0.8286, placed at Rank 1 and received a "Recommended" recommendation for the position. This score indicates that this candidate best fits the desired criteria for the role of financial manager.
2. Cand_26 and Cand_5 ranked 2nd and 3rd with scores of 0.7857 and 0.7643, respectively. They are in the "Reserve" category, which means they have potential but with lower preference than the leading candidate.
3. Candidates with ranks 4 to 10 had scores varying from 0.7500 to 0.5929 and were all given a "Did Not Qualify" decision, indicating that they did not meet the threshold set for this position.

The candidate with the lowest rank, Cand_40 at position 50 with a score of 0.1786, clearly indicates that they are far from meeting the necessary criteria for the position of financial manager, indicated by the status "Not Qualified".

3. Conclusion

This research has successfully applied a decision support system based on Multi Attribute Utility Theory (MAUT) to the recruitment process of financial managers in a technology company. Using MAUT, we can quantify and integrate the critical attributes expected of a financial manager into an objective and measurable decision index. The results of this study show that MAUT-based systems not only increase objectivity in the selection process, but also provide more informative and transparent decisions.

Out of the 50 candidates evaluated, the system successfully identified the candidate that best suited the company's needs, which was indicated by giving a "Recommended" recommendation to the candidate

with the highest score. Next, candidates with second and third scores are selected as reserves, providing additional options for companies in making final recruitment decisions. Candidates with lower scores were systematically grouped as "Not Qualified," indicating that they did not meet the minimum criteria that had been set. These findings confirm that the implementation of MAUT can help organizations overcome subjective bias and improve the efficiency of the recruitment process by providing a data-driven decision framework. Recommendations for further implementation include adjustment of attribute weights based on the company's strategic priorities and integration of this system with other decision tools to improve the accuracy of candidates' predictions of success in financial management roles.

The research provides a basis for technology companies and other industries to implement similar decision support systems, offering a more effective and objective way of selecting the most qualified candidates for critical organizational positions.

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