Building of Informatics, Technology and Science (BITS)
Volume 3, No 4, Maret 2022 Page: 604−609
ISSN 2684-8910 (media cetak)
ISSN 2685-3310 (media online)
DOI 10.47065/bits.v3i4.1370

Decision Support System Using Simple Multi-Attribute Rating Technique Method in Determining Eligibility of Assistance

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Submitted: **02/03/2022**; Accepted: **21/03/2022**; Published: **31/03/2022**

Abstract−Determining the viability of establishing business support for small and medium companies (UKM) is one of the activities that must be assessed carefully and selectively based on the existing evaluation at the Medan City Cooperatives and UKM Office. It is hoped that as a result of this, adequate outcomes for business development help for small and medium companies (UKM) to get assistance funding in business development can be obtained. The solution to the aforementioned issues is to construct a decision support system to aid in determining the feasibility of UKM development assistance. Smart (Simple Multi-Attribute Rating Technique) was chosen to facilitate the aforementioned problem solution by assigning weight to each choice. This decision support system demonstrates how improvements in science and technology may help the Medan City Cooperatives and UKM Office determine the feasibility of village development assistance for the right choice of SMEs based on the proper factors and calculations.

Keywords: Decision Support System; Feasibility; SMART; UKM; Cooperative Service

1. INTRODUCTION

In response to the requirement for more information development, information systems and computer technology are quickly evolving. Because computers provide comfort for people to carry out tasks, the rapid development of computer technology cannot be separated from the rapid development of information technology[1]-[2]. Changes and dynamics in society that are rapidly increasing following the periods and technology necessitate accurate, up-to-date, and sufficient information. One example of a fast-increasing technology product that can assist the public in processing and presenting information is information technology. To supply this information, a tool or media that can process varied information and present it as relevant information in an appealing package while taking information quality requirements into account is required [3]–[5].

Computers play a vital part in acquiring accurate and up-to-date information in today's technology age. Computers can also assist enterprises in determining the best line of action to take. A decision support system is a component of a computerized information system used to help an organization or agency make decisions[6]–[8]. Decision support systems are intended to assist people in making decisions. The system can evaluate by taking into account previously entered criteria.

One of the activities necessitates careful examination and selection based on previous evaluations in determining the feasibility of business support to small and medium-sized firms (SMEs). This is projected to yield sufficient findings to aid the development of small and medium-sized firms (SMEs) seeking business development loans. As a result, the Medan City Cooperatives and SMEs Office require a decision support system based on the Simple Multiple Attribute Rating Technique (SMART) [9]–[11]. So that aid is not provided incorrectly based on preconceived criteria, such as whether it is comfortable to get assistance or not, and that adequate, precise, effective, and efficient results are reached.

A decision support system (DSS) is a component of a computerized information system that comprises a knowledge-based system or knowledge management and is used to aid decision-making in an organization or enterprise. It is also known as a computer system that converts information into information to make decisions regarding semi-structured situations.

Decision Support Systems (DSS) are interactive information systems that present, model, and manipulate data. With the above understanding, it is possible to explain that DSS is not a decision-making tool, but rather a system that assists decision-makers in filling in the information needed by decision-makers, which comes from information that has been processed in relevant ways, and in making decisions about a problem with information. A DSS information system is an interactive computer system that assists decision-makers in solving unstructured problems by utilizing various information models [8], [12], [13].

An effective information management system is also required when developing an information system so that the acquired information can be correctly processed and investigated to perform optimally. For information systems to perform well, highly efficient information technology is required. The cornerstone for system development is information technology that assures the seamless flow of information and information and the accuracy of the outcomes of information processing.

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2. RESEARCH METHODOLOGY

Regarding the findings of this study, researchers employed R&D (Research and Development) approach, so the stages of the research process are as follows:

1. Data Collection Methodologies (Data Collecting)
   Several strategies are utilized to acquire data from the research, including:
   a. Observation
      Observation is a data-gathering method involving direct visits to the Medan City Cooperatives and SMEs Office, where the research will be conducted.
   b. Interview
      This interview strategy is used to gather extra information from people in positions of authority and interact directly with the system created as a data source.
2. Review of Literature (Library Research)
   A literature review is one of the supporting aspects as a theoretical basis for researchers to investigate the topics presented. In this situation, the researcher consults various library sources, including books, national and international journals, and other publications.

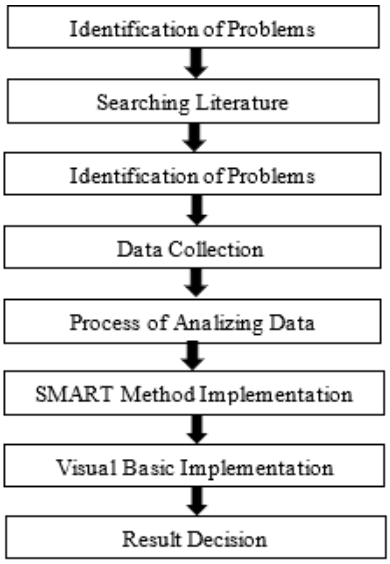

Figure 1. Research Design

2.1 SMART Method

SMART is a multi-attribute decision-making procedure. This multi-attribute decision-making technique assists decision-makers in selecting among multiple possibilities. Every decision-maker must have an option that is consistent with the goals that have been established.[14], [15]

Each alternative comprises numerous properties, each of which has a value. This value is averaged across a range of values. Each attribute has a weight that reflects how important a particular scale is. Each characteristic has a weight that indicates how essential it is compared to other attributes. This weighting and rating are used to arrange each alternative to find the optimal option.

To predict the value of each alternative, SMART employs an adaptive linear model. SMART is more extensively utilized because of its ease of reacting to decision-makers' needs and assessing responses. The finest analysis is transparent so that decision-makers can accept it and grasp the situation thoroughly. SMART weighing employs a 0 to 1 scale, making it simple to calculate and compare values for each choice.

$$Maximaze \sum_{j}^{k} = 1 \; W_j \; . \; U_{ij} \; . \; Vi = 1 \; to \; n \qquad (1)$$

SMART approaches or steps include, among others:

1. Determine which users are in good physical condition to make decisions.
2. Identify existing problems by paying attention to the cause of the problem and existing constraints so that it does not divert from the goals to be reached later on.
3. Identify existing alternatives to achieving the goals of the system-to-be-created.
4. Determination of factors and criteria to aid decision making
5. For each criterion, enter a value or weight. The user determines this rating or weight, and the system assigns a standard scale weight based on the entered rating.
6. For each possibility, assign a score to each criterion. The user also does this so that each criterion for each possibility can be evaluated qualitatively or quantitatively.

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7. Increase the utility of specific qualities representing how effectively each criterion sees each alternative. At this point, each alternative's criteria are graded on a scale of 0 to 1.
8. calculating the evaluation of each alternative.

The functional hierarchy is the model's principal tool, and human perception is its primary input. The only important difference between the SMART model and other models is the type of input; the outcomes of the problem analysis directly decide the proportion of each weighting. The SMART weighting approach is the most basic method for decision support. Several parameters that influence the decision may be seen in this procedure.

One of the activities that require rigorous assessment and selection based on existing assessments in determining the viability of providing business support for Small and Medium Enterprises (UKM). It is hoped that this will yield suitable outcomes in acquiring business development help for Small and Medium Enterprises (UKM) to receive loan funding for company development.

This study discusses how to use the Simple Multi-Attribute Rating Technique (SMART) method to determine the feasibility of developing business assistance for small and medium businesses. By selecting the feasibility of developing business assistance, business assistance should be obtained on how to get assistance for business development. The SMART method calculation in determining the feasibility of developing business assistance for small and medium enterprises in a decision support system is designed to have an algorithm discussed in the calculation according to the Medan City Cooperatives and Small and Medium Enterprises (UKM) agency's criteria.

3. RESULT AND DISCUSSION

3.1 The SMART Method of Calculation

1. Establishing Criteria

The SMART technique will calculate numerous criteria, which are listed in the table below:

Table 1. Data Criteria

Code	Rating Factor	Percentage	Criterion Weight
K1	Marketing Aspect	30%	0,3
K2	Financial Aspect	30%	0,3
K3	Production Aspect	25%	0,25
K4	Administrative Aspect	15%	0,15
Total		100%	1 (Σ=1)

Source: Medan City UKM

There are eight firms, for example, that have been presented to the Medan City Cooperatives and UKM. The assessment criteria are market and marketing considerations, financial issues, and production aspects. The following information is provided for each firm in the table below:

Table 1. Initial Data of Each Business

Alternative UKM	Marketing Aspect	Financial Aspect	Production Aspect	Administrative Aspect
Business 1	5	4	4	4
Business 2	4	4	3	4
Business 3	4	3	3	5
Business 4	3	4	5	5
Business 5	4	5	5	4
Business 6	5	4	5	4
Business 7	4	4	4	3
Business 8	3	5	3	3

Source: Medan City UKM

Description of the value of the criteria table:
5 = Very Good
4 = Fine
3 = Good Enough
2 = Not Good
1 = Bad

Then, in line with the agency's evaluation in each business, execute a multiplication calculation between the weight value and the evaluation weight value as follows:

1. Business 1

In the following, it can be seen that business 1 has a total evaluation weight of 4.3, where the weight of this evaluation is the multiplication of the criterion value with the factor weight.

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Table 2. Multiplication of Weights and Evaluation

FaCtor	Factor Weight	Criteria Value	Evaluation Weight (Factor Weight * Criteria Value)
Marketing Aspect	0,3	5	0,3 * 5 = 1,5
Financial Aspect	0,3	4	0,3 * 4 = 1,2
Production Aspect	0,25	4	0,25 *4 = 1
Administrative Aspect	0,15	4	0,15 * 4 = 0,6
Total			4,3

2. Business 2

In the following, it can be seen that Usaha 02 has a total evaluation weight of 3.75, where the weight of this evaluation is the multiplication of the criterion value with the factor weight.

Table 4. Multiplication of Weights and Evaluation

Factor	Factor Weight	Criteria Value	Evaluation Weight (Factor Weight * Criteria Value)
Marketing Aspect	0,3	4	0,3 * 4 = 1,2
Financial Aspect	0,3	4	0,3 * 4 = 1,2
Production Aspect	0,25	3	0,25 *3 = 0,75
Administrative Aspect	0,15	4	0,15 * 4 = 0,6
Total			3,75

3. Business 8

In the following, it can be seen that Usaha 08 has a total evaluation weight of 3.6, where this evaluation weight is the multiplication of the criterion value with the factor weight.

Table 5. Multiplication of Weights and Evaluation

Factor	Factor Weight	Criteria Value	Evaluation Weight (Factor Weight * Criteria Value)
Marketing Aspect	0,3	3	0,3 * 3 = 0,9
Financial Aspect	0,3	5	0,3 * 5 = 1,5
Production Aspect	0,25	3	0,25 *3 = 0,75
Administrative Aspect	0,15	3	0,15 * 3 = 0,45
Total			3,6

So, in accordance with the regulations of the Medan City Cooperatives and UKM Office, UKM, with a final value of 4.0, is the appropriate alternative to be identified as recipients of business development assistance. As shown in the table below:

Table 6. Decision

No	Alternatif	Evaluation Weight	Decision
1	Business 1	4,3	Worthy
2	Business 2	3,75	Not Feasible
3	Business 3	3,6	Not Feasible
4	Business 4	4,1	Worthy
5	Business 5	4,55	Worthy
6	Business 6	4,55	Worthy
7	Business 7	3,85	Not Feasible
8	Business 8	3,6	Not Feasible

3.2 Program Flowchart

This diagram depicts the sequence of processes in the SMART technique. The SMART approach is depicted in the flowchart diagram below and an explanation.

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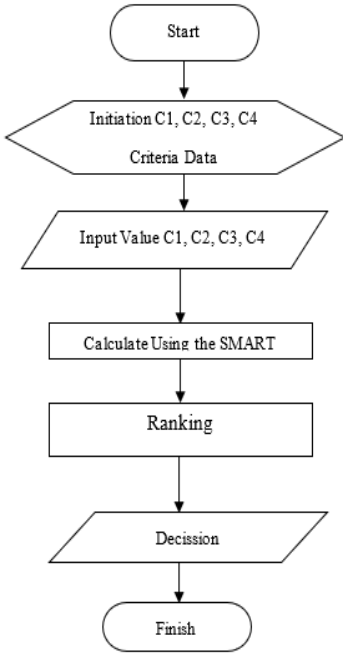

Figure 2. Program Flowchart

The sequence of processes in the SMART approach can be explained using the flowchart above. Starting from the beginning, enter the small and medium business data input, the criteria data, the criteria weight data, and finally, the SMART method calculation process. After completing the computations, it can move on to the next procedure, ranking, after which the ranking results are known, and the process is completed.

After carrying out the implementation process, the next process is a trial with the aim of finding out that the application that has been made is according to needs. After testing, it produces a report, namely a report on the results of the decision as shown below:

DINAS KOPERASI DAN

UKM KOTA MEDAN

Laporan Kelayakan Bantuan Usaha Pengembangan Bagi UKM

No.	Kode UKM	Nama UKM	Nilai K1	Nilai K2	Nilai K3	Nilai K4	Total Nilai	Keputusan
1	UKM01	Usaha Pembuatan Temp	1,50	1,20	1,00	0,60	4,30	Layak
2	UKM02	Usaha Pabrik Roti	1,20	1,20	0,75	0,60	3,75	Tidak layak
3	UKM03	Usaha Pembuatan Tahu	1,20	0,90	0,75	0,75	3,60	Tidak layak
4	UKM04	Usaha Kerajinan Mebel	0,90	1,20	1,25	0,75	4,10	Layak
5	UKM05	Usaha keripik pisang	1,20	1,50	1,25	0,60	4,55	Layak
6	UKM06	Usaha Pabrik Roti	1,50	1,20	1,25	0,60	4,55	Layak
7	UKM07	Usaha jamur tiram	1,20	1,20	1,00	0,45	3,85	Tidak layak
8	UKM08	Usaha jajanan ringan	0,90	1,50	0,75	0,45	3,60	Tidak layak

Figure 3. Display of Decision Result Report

4. CONCLUSION

The issues encountered by the Medan City Cooperatives and UKM Office in selecting which UKM merit business development assistance can be handled utilizing the Simple Multi-Attribute Rating Technique (SMART) method applied to a decision support system. So that the expected decisions are made. he results of the calculations are the same as those obtained manually by using the decision support system method and implementing the SMART algorithm to determine which SMEs deserve to be given proper and accurate business development assistance by the choices that can be used as the basis for rationally choosing.

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