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Analysis of the article weight product method and weight sum method on decision support systems: Systematic Review

Khairina Eka Setyaputri[1], Wicaksono Yuli Sulistyo[2]
[1,2]Sistem Informasi, Universitas Siber Muhammadiyah, Indonesia

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ABSTRACT

A decision support system (DSS) is a problem processing system between two components consisting of one or more general problem manipulation capabilities required in decision making. Decision making is basically a form of selecting from various alternative actions. DSS has various methods of solving problems. In this literature review, research focuses on the use of the Weighted Product (WP) and Weighted Sum Model (WSM) methods in decision-making systems. Systematic reviews are limited to research in the form of articles that have been reviewed and published in journals. Eight articles were obtained to be reviewed in this study. The results of the literature show that the two methods have different decision outcomes. Another result is that the WP method has better decision outcomes than WSM in solving problems.

Corresponding Author:

Khairina Eka Setyaputri,
Sistem Informasi,
Universitas Siber Muhammadiyah,
Jalan HOS Cokroaminoto No. 17, RT 53 RW 12 Kota Yogyakarta, 55253, Indonesia.
Email: khairinaekasetyaputri@sibermu.ac.id

1. INTRODUCTION

A decision support system (DSS) is a computer-based system consisting of three components that interact with each other, the first is the language system, which is a mechanism for providing communication between users and other DSS components, the second is the knowledge system, namely the problem domain knowledge repository in the SPK or as data or as a procedure, the third is a problem processing system, namely the relationship between the other two components consisting of one or more general problem manipulation capabilities needed in decision making (Nofriansyah, 2015). DSS is an interactive information system that provides information, modeling, and data manipulation (Sesnika et al., 2016). Decision-making is basically a form of selecting from various alternative actions that may be selected later in the process through a certain mechanism, with the hope that it will produce the best decision (Nugraha et al., 2012).

DSS can be called an information system that is useful in processing data to support decision making (Fajariyanto & Wahyuningrum, 2021). SPK has many methods that can be implemented in solving problems. In this literature review the methods that will be discussed are the Weight Product Method and the Weight Sum Method in supporting problem solving in SPK. The Weight Product method is similar to the weight sum method which is also known as Multiplicative Exponential Weighting (MEW) (Yudistira & Sari, 2020). However, during the implementation performed by several researchers, it was

noted that the results of the two calculations were different. Therefore, this research is expected to provide an understanding of the method with calculation results that are in accordance with the criteria owned.

The Weighted Product (WP) method requires criteria and weights to be used as material for calculating (Supiyandi et al., 2020). The Weight Product method is a decision-making method that connects attribute ratings by means of multiplication, where the rating of each attribute must first be raised to the weight of the attribute in question (Seran et al., 2023). The weight sum method is a general modeling method that has been used for different applications such as robotics, processors, etc, this method is also often used in solving single dimensional problems (Irwansyah & Mesran, 2022). This method has difficulties if the criteria used are not single or multidimensional criteria (Sari et al., 2020). The Weight Sum method is a method that is simple and easy to understand in its application, because in the calculation concept this method only multiplies between the criteria weights and alternative values (Yetri, 2020). The WSM method can make an assessment quickly and precisely because it has determined the value of each criterion and preference weighting, then there is a ranking process to select the best alternative (Syahputra et al., 2022).

2. BACKGROUND OF THE STUDY

The use of the Weighted Product (WP) and Weighted Sum Model (WSM) methods in decision making systems is an interesting research topic because these two methods are popular and have been widely used in decision making. The WP method is similar to the WSM method, but has a different computation process, in which WSM uses addition, while WP uses multiplication (Ikhsanuddin, 2022). The WP method is one of the methods used to complete a decision-making system by considering the criteria and weights (Yoni, 2017). The WP method uses multiplication to connect attribute ratings, where the rating of each attribute must be raised to the first power of the attribute's weight. The process is the same as normalization (Hatta et al., 2016).

WSM is one of the algorithms which is very simple and easy to understand in its application because it simply multiplies between the weights of the criteria and the alternative values (Sunardi et al., 2021). The application of this method does not differentiate between benefit and cost criteria, so the range of weights greatly affects the calculation of best results (Pratama, 2023). Choosing research on the use of the WP and WSM methods in decision-making systems provides benefits in several aspects, one of which can provide a better understanding of the performance and reliability of these two methods in various decision-making situations.

3. RESEARCH METHOD

This research has several process steps in searching for literature that is in accordance with the guidelines in PRISMA (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*). PRISMA is a minimum evidence-based series that aims to help authors report various systematic reviews and meta-analyses that assess benefits, the process steps can be seen in Figure 1, namely identification, screening, eligibility and inclusion (Sastypratiwi & Nyoto, 2020).

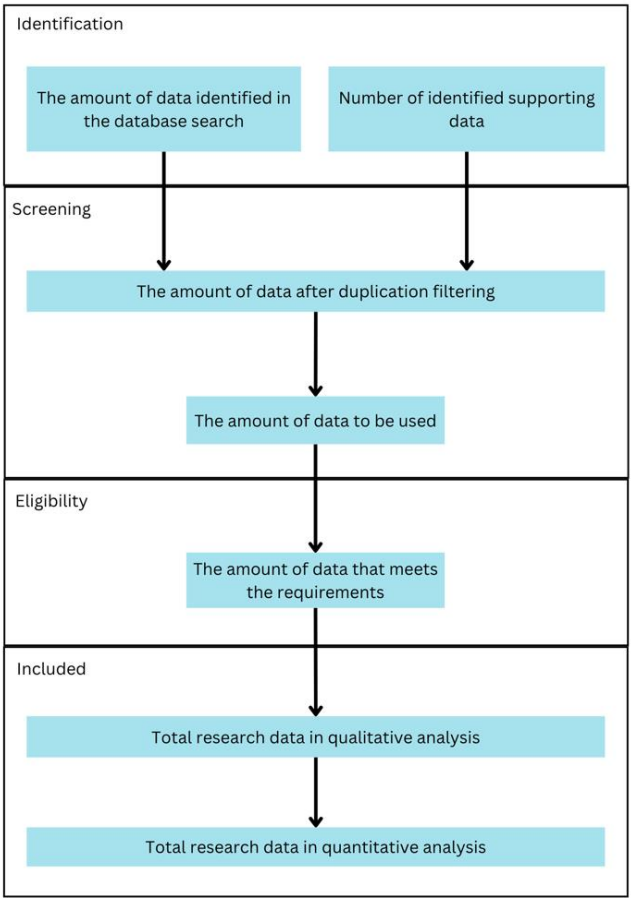

Figure 1. PRISMA Method Flow

The literature search process in Figure 1 involves many steps. The identification step, a literature search was carried out through an online database is Google Scholar, then a selection of supporting data was carried out. The screening step, filtering duplication of articles, then obtaining articles that will be used. In the eligibility step, at this step articles that meet the requirements to be used are articles that have been published and articles that discuss the weighted product method and the weighted sum method in decision-making. The final step is to categorize the items according to the case studies used.

The specific search range in this study is from 2016 – 2021. This search is based on the keyword index used, namely the use of the weighted product method and the weighted sum model method in decision support systems. Systematic reviews are limited to research in the form of articles that have been reviewed and published in journals. Sources were collected from Google Scholar both on a national and international scale. The search results that have been found can be seen in Table 1.

Table 1. Article Search Results

No	Autor	Year	Title
1	Jhoanne Fredricka, Lena Elfianty	2020	Sistem Pendukung Keputusan Pemilihan Sekolah Kejuruan dengan Metode Weighted Product dan Weight Sum Model
2	Solikhun	2017	Perbandingan Metode Weighted Product dan Weighted Sum Model dalam Pemilihan Perguruan Swasta Terbaik Jurusan Komputer
3	Nur Hayati, Sri Rahayu, Tri Ichsan Saputra	2021	Sistem Informasi Pemilihan Asisten Laboratorium

			dengan Metode Weighted Product dan Weighted Sum Model
4	Ivan Siagian, Sulindawaty, Bosker Sinaga	2017	Sistem Pendukung Keputusan Pemilihan Asuransi dengan Metode Weighted Product dan Weighted Sum Model pada PT. Prudential
5	Agam Junius Putra, Leon Andretti Abdillah, Helda Yudiastuti	2016	Penentuan Sekolah Dasar Negeri Terbaik Kota Palembang dengan Metode Weighted Sum Model (WSM) dan Weighted Product Model (WPM) Menggunakan Visual Basic.net 2015
6	Ade Rizka	2022	Penerapan Metode Weighted Product Model dan Weighted Sum Model dalam Penentuan Produk yang akan Dipasarkan
7	Tuslaela, Jerry Kristian Nazarius	2021	Analisis Pemilihan Siswa untuk Jalur SNMPTN dengan Metode Weighted Product (WP) dan Weighted Sum Model (WSM)
8	Asyahri Hadi Nasyuha, Suardi Yakub, Widarti Rista Maya, Yohanni Syahra, Saniman	2021	Analisis WSM dan WP dalam Menentukan Pupuk Terbaik dengan Pendekatan WSM-Score dan Vector

4. RESULTS AND DISCUSSIONS

The total research that can be reviewed is eight articles with search keywords, namely the use of the product weight method and the weight sum method in decision support systems. Based on a review of the literature sources that have been carried out, it was found that in the Vocational School Selection Decision Support System research using the Weighted Product Method and the Weight Sum Model, the results were the same for each of these methods, according to Jhoanne Fredricka and Lena Elfianty, the Weighy Product method and the Weighted Sum method. Models can help in determining the best choice of vocational school (Fredricka & Elfianty, 2020). Similar to the research case conducted by Solikhun, namely the Comparison of the Weighted Product Method and the Weighted Sum Model in the Selection of the Best Private Colleges for the Computer Department, the same results were obtained using the two methods, namely alternative X1 as the best choice of private tertiary institutions (Solikhun, 2017). The two studies above have the same subject matter, namely finding the best choice of main schools and obtaining alternative results that are similar to the two methods used.

In the research on Information Systems for Selection of Laboratory Assistants using the Weighted Product and Weighted Sum Model methods that have been carried out by Nur Hayati et al, the system has been built at 100% success in selecting prospective assistants administratively so that the process of determining assistants is carried out more quickly and in a systematic manner (Hayati et al., 2021). Research on Insurance Selection Decision Support Systems using the Weighted Product and Weighted Sum Model Methods at PT. Prudential, which has been carried out by Ivan Siagian et al. Has succeeded in building a decision support system using the Unified Modeling Language (UML) modeling and using the Visual Basic 2.0 programming language and Ms Access as the databases (Sinaga et al., 2017). Research on the Best Public Elementary Schools in Palembang City using the Weighted Sum Model (WSM) and Weighted Product Model (WPM) methods using Visual Basic.net 2015 can be carried out quickly and precisely in the process of determining the best elementary schools (Putra et al., 2016). WSM and WP analysis research in determining the best fertilizer that has been carried out by Asyahril et al. Obtained the same alternative results but with different values for the two methods, namely compost being the best alternative obtained (Nasyuha et al., 2021). The four studies above have the same calculation results for the two methods used, the alternative results of the Weighted Product method in this study are the same as the alternative results of the weighted sum model method. Among the successes produced in these studies, there are those that successfully implement them into a system.

Ade Rizka conducted research on the application of the Weighted Product Model and Weighted Sum Model methods to identify products for commercialization, alternative value in accordance with the criteria of benefits and costs in the study (Rizka, 2022). Similar to the research on Student Selection Analysis for the SNMPTN Pathway using the Weighted Product (WP) and Weighted Sum Model (WSM) Methods that have been carried out by Tuslaela and Jerry Kristian Nazarius, this research has different results on the two methods used to select colleges that appropriate, the application of the two methods has different alternative results (Tuslaela & Kristian Nazarius, 2021). The two studies above have different assessment results than the studies described in the previous paragraph, in which the results obtained are different between the two methods used.

5. CONCLUSION

This research only deals with the use of the Weighted Product Method and the Weighted Sum Model Method and seeks methods with better results according to their criteria. The results of the literature study that has been carried out show that the Weighted Product (WP) Method and the Weighted Sum Model (WSM) Method have alternative results or conclusions that are relatively the same, but sometimes both have different conclusions or suggested alternatives. Subsequent results based on the literature study that has been carried out, significantly obtained a method that has results that are in accordance with the criteria owned, namely the Weighted Product method. The weighted product method in its application has alternative results that are more precise and in accordance with the criteria in various research cases that have been described in the results and conclusions section.

6. LIMITATION AND FUTURE WORK

In subsequent systematic literature research, it should be able to display the level of precision of each method, namely the WP and WSM methods. It is also possible to explain in more detail the advantages and disadvantages of each of these methods.

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