

ANALYSIS OF PSI METHOD IN DECISION SUPPORT SYSTEM TO SELECT THE FEASIBILITY OF COVID 19 PATIENT DATA SCANNER RESULTS

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Abstract: Hospitals play an important role in examining the scan results of patient data infected with the Covid 19 virus. However, there are problems when processing the scan results, namely that sometimes errors occur in the scan data, causing many failures and delays in sending data to the Health Office. The purpose of this study is to build a Desktop-based decision support system application that can facilitate hospitals in selecting the eligibility of the scan results of Covid 19 patient data. The urgency in examining the scan results of Corona patient data is a very pressing public health issue, because the long-term impact is very significant for patients. Thus, a scientific discipline is needed that can support the decision-making process, namely the Decision Support System using the Preference Selection Index (PSI) method. PSI is a simple and easy calculation method, based on statistical concepts without having to determine attribute weights. The results of this method are clear and firm values based on the level of strength of the rules applied. The results of the research conducted on the PSI process can be concluded that valid Covid 19 patient data is Recap File I with a value of 0.2042 which is declared valid and accepted.

Keywords: covid-19; decision support system; PSI

Abstrak: Rumah Sakit memainkan peran penting dalam memeriksa hasil scan data pasien yang tertular virus Covid 19. Tapi, ada permasalahan saat mengolah hasil scan tersebut, yaitu kadang terjadi kesalahan dalam scan data, sehingga menyebabkan banyak kegagalan dan keterlambatan dalam pengiriman data ke Kantor Dinas Kesehatan. Tujuan penelitian ini adalah membangun sebuah aplikasi sistem pendukung keputusan berbasis Desktop yang dapat memudahkan pihak Rumah Sakit dalam menyeleksi kelayakan hasil scanner data pasien covid 19. Urgensi dalam memeriksa hasil scan data pasien Corona ini adalah isu kesehatan masyarakat yang sangat mendesak, karena dampak jangka panjangnya sangat signifikan bagi pasien. Dengan demikian, diperlukan suatu disiplin ilmu yang dapat mendukung proses pengambilan keputusan, yaitu Sistem Pendukung Keputusan dengan menggunakan metode Preference Selection Index (PSI). PSI merupakan metode perhitungan yang sederhana dan mudah, berdasarkan konsep statistik tanpa harus menentukan bobot atribut. Hasil dari metode ini berupa nilai yang jelas dan tegas berdasarkan tingkat kekuatan aturan yang diterapkan. Hasil penelitian yang dilakukan pada proses PSI dapat disimpulkan bahwa data pasien covid 19 yang valid adalah File Rekap I dengan nilai 0,2042 yang dinyatakan valid diterima.

Kata kunci: covid 19; PSI; sistem pendukung keputusan



INTRODUCTION

Hospitals are one of the health facilities and places to organize health efforts aimed at realizing optimal health for the community [1]. Hospitals have an important role in selecting patient data scanner results. One of the efforts made by the Hospital is in the form of Covid 19 health services [2]. The research conducted by discussed a system capable of determining the criteria for COVID-19 patients. The test results with the highest accuracy value reached 81.25% [3]. Research related to Covid-19 which is also related to the research being conducted is [4]. Then, research on Covid-19 regarding the accuracy value on a dataset with 127 data of patients infected with Covid-19 using the k-nearest neighbor algorithm has been carried out by [5].

The problem that occurs when scanning data is that the processing of scanner results often causes many delays and failures when sending files to be sent to the Health Office and incorrectly detects Covid 1 patients. The case of a COVID-19 patient being mistakenly identified refers to a situation where a person who is not actually infected with COVID-19 or has mild non-COVID symptoms/symptoms is mistakenly declared positive, isolated, or even treated as a COVID-19 patient [6] [7]. So a scientific field is needed that can help in decision making, namely the Decision Support System (DSS) [8]. DSS is a system that can overcome problems with semi- and unstructured conditions [9]. DSS helps decision making where no one knows for sure how decisions should be made [10].

DSS does not replace human decision-making, but rather provides information, models, and analytical tools to

support the decision-making process [11]. This system refers to a computer-driven information system designed to aid the decision-making process, especially in addressing semi-structured and unstructured problems [12][13].

The Preference Selection Index (PSI) is a relatively simple multi-criteria decision-making (MCDM/MCDA) method used to rank alternatives based on multiple criteria.

The PSI method helps decision-makers select the best alternative from a set of alternatives in a systematic and objective manner [15]. The Preference Selection Index (PSI) is a multi-criteria decision-making (MCDM) method used to determine the best alternative from a number of options based on several criteria considered [16]. Research on PSI has been conducted [17] using the PSI method, which states that PSI has 90% accuracy and is superior to the AHP, Topsis and Promethee methods.

PSI is an approach that involves minimal and straightforward computations, as it relies solely on statistical principles without requiring attribute weighting [18]. The inference result on each rule is defined as a strict value based on the rule ignition strength [19]. The Preference Selection Index (PSI) is a technique that employs straightforward and minimal computations, as it relies on statistical principles without requiring attribute weighting [17]. As a result, the output of the inference result on each rule is defined as a strict value (crips) based on the rule ignition strength [19].

The purpose of this study is to build a Desktop-based decision support system application that can facilitate hospitals in selecting the eligibility of the scan results of Covid 19 patient data. By developing this decision support system,

it is hoped that it can provide recommendations for the appropriate Covid-19 patient scanner data based on relevant criteria so that it can assist hospital staff in scanning Covid-19 patient data.

METHOD

The methods used in completing this research include: First, collecting data and information related to data related to the eligibility of Covid-19 patient data which includes information on summary files, file sizes, completeness of data, scanner results and Lab results. Data is obtained from the patient data scanner section at the Hospital and from the Covid-19 health guide.

Second, analyzing user needs, namely the Covid-19 patient data scanner section officers at the Hospital to understand their preferences and needs related to the eligibility of a truly valid Covid patient scanner. Conducted through surveys, interviews, or direct case studies to the Hospital.

Third, designing an appropriate decision support system. This includes designing the system architecture, the Preference Selection Index (PSI) algorithm, and an intuitive and easy-to-use desktop-based user interface. Fourth, ensuring the quality, reliability, and performance of the application. Then, a comprehensive system test is carried out to provide recommendations for the feasibility of the Covid-19 patient data scanner.

The algorithm used is the Preference Selection Index (PSI) which does not require the determination of relative importance between attributes [20]. This algorithm is useful when there is a conflict in determining the relative importance between attributes. At the PSI

Preference Selection Index calculation stage [21].

This research will follow a series of stages starting from problem analysis to implementation of the solutions that have been analyzed. The research methodology process is depicted in the following figure.

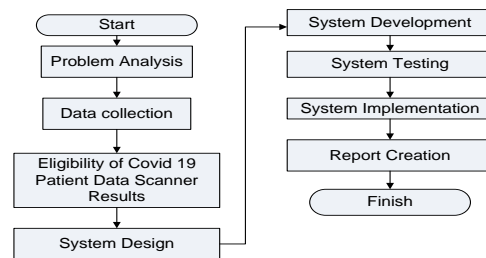


Figure 1. Research Flowchart

Problem analysis is carried out through the development of a decision support system that is able to provide a solution for the feasibility of good Covid-19 patient data scanner results and in accordance with national standards. The main problems faced include the inaccuracy of officers in detecting Covid 19 patients.

Comprehensive and relevant data collection to support the development of an intelligent system that is appropriate and effective in selecting the eligibility of Covid 19 patient data scanner results to prevent errors in detecting Covid 19 disease in patients and avoid delays in the process of sending files to the Health Office.

A literature review is carried out to enhance understanding of the research problem and to identify appropriate methods for solving it. The review draws on sources such as textbooks, journals, previous research, and online information. Observations were made to the Hospital to collect data related to the eligibility of Covid-19 patient data. Data in the form of files and test results related to

the Covid-19 disease.

After completing the problem analysis and collecting the required data, the PSI approach is utilized to resolve the selection of eligible Covid-19 patient scan results using a decision support system. In the system design step, a system design is made, starting with designing a system with UML, creating a database in the form of questions, designing an input interface, and creating an output interface.

After the design is complete, the next step is to develop a system prototype. This includes coding a Desktop application with the Visual Studio programming language according to the UI design that has been designed, as well as implementing the Preference Selection Index (PSI) algorithm for the Preference Selection Index.

Some steps and formulas in the PSI method are:

Normalize the decision matrix.

$$A_{i,n} = x/\text{Max} \quad (1)$$

$$\sum_{n=1}^N A_{i,n} = R_{i1} + R_{i2} + \dots + R_{in} \quad (2)$$

$$\phi_j = \sum_{i=1}^N [N_{i1} - N_{i2}] \quad (3)$$

$$\Omega_j = 1 - \phi_j \quad (4)$$

$$W_j = \Omega_j / (\sum \Omega_j) \quad (5)$$

After integration, the system prototype will be thoroughly tested to identify bugs or performance issues. This test will help ensure that the system runs as expected and can provide accurate rec-

ommendations for the eligibility of Covid-19 patient scanner results.

Table 1. Criteria

Criteria	Attribute	Weight
C1 (File Size)	Cost	5
C2 (Completeness)	Benefit	4
C3(Scanner Result)	Benefit	3
C4 (Lab Result)	Benefit	2

After all stages of development are complete and the system is considered ready for use, the final step is to implement the system widely and launch it to the public. This involves rolling out desktop applications to appropriate distribution platforms, as well as providing ongoing technical support and system maintenance. Reporting is done after all stages of the from the beginning until the system implementation has been completed.

RESULT AND DISCUSSION

As a reinforcement in conducting this research, several studies related to the research conducted are presented, presented in the following table 1.

The criteria used in the decision support system for determining the eligibility of Covid-19 patient data at Mitra Sejati Hospital as a basis for assessing and determining the eligibility of Covid-19 patient data. The criteria are as in the following table.

Table 2. Criteria

Criteria	Attribute	Description
C1	File Size	Cost
C2	Completeness	Benefit
C3	Scanner Result	Benefit
C4	Lab Result	Benefit

The larger the file, the slower the process of sending data
Data Contains KTP, KK, Birth Certificate, BPJS and Medical History Letters from Other Hospitals
Scanner results with good quality images or not.
The results indicated the presence of symptoms such as fever, coughing, fatigue, impaired sense of taste or smell, sore throat, headaches, muscle and joint pain, diarrhea, rashes or discoloration on fingers and toes, eye irritation, shortness of breath, trouble speaking or moving, confusion, and chest pain

Table 3. Criteria Set

Criteria	Description	Set	Weight
File Size	More than 10 Megabytes	$X > 10 \text{ Mb}$	5
	7 Megabytes to 10 Megabytes	$X > 7 \text{ Mb and } X \leq 10 \text{ Mb}$	4
	5 Megabytes to 7 Megabytes	$X > 5 \text{ Mb and } X \leq 7 \text{ Mb}$	3
	3 Megabytes to 5 Megabytes	$X > 3 \text{ Mb and } X \leq 5 \text{ Mb}$	2
	Under 3 Megabyte	$X \leq 3 \text{ Mb}$	1
Completeness of Personal File Data	Complete Health Certificate and BPJS	Very Complete 8 Files	5
	Personal Files, and BPJS	Complete $X > 6 \text{ and } X \leq 8$	4
	Complete Personal Files and BPJS Management	Quite Complete $X > 4 \text{ and } X \leq 6$	3
	Personal Files Still Missing	Less Complete $X > 1 \text{ and } X \leq 4$	2
	Incomplete File	Incomplete $X \leq 1$	1
Scanner Results	Image Results Easy to Read	Very Clear	5
	Image Results Easy to Read But slightly Blurry	Clear	4
	Still Easy to Read and Blurry Results	Quite Clear	3
	Blurry Results and Slightly Readable	Less Clear	2
	Unreadable and Blurry Results	Not Clear	1
Lab Results (Analysis Specime)	Lab Results Meet Symptoms	Very Complete 14 Symptoms	5
	Lab Results Meet Symptoms, There Are Few Symptoms Not Yet Identified	Complete $X > 10 \text{ and } X \leq 14$	4
	Lab Results Meet Symptoms, There Are Few Symptoms Not Yet Identified	Quite Complete $X > 7 \text{ and } X \leq 10$	3
	Slight Symptoms Identified	Incomplete $X > 5 \text{ and } X \leq 7$	2
	None Identified	Incomplete Data $X < 5$	1

Alternative values for each criterion can be seen in the following table. Where the value of each criterion is given

a weight for each fact based on the data above.

Table 4. Alternative Value Data

Summary File	File Size	Completeness	Scanner Results	Lab Results Data
Summary Record I	5	5	5	5
Summary Record II	3	5	2	2
Summary Record III	3	3	3	3
Summary Record IV	2	5	2	2
Summary Record V	1	5	1	1
Summary Record VI	2	5	2	2
Summary Record VII	2	5	2	2
Summary Record VIII	1	5	1	1
Summary Record IX	1	5	1	1
Maximum Value	5	5	5	5
Minimum Value	1	1	1	1

Table 5. Results of the matrix ϕ_j

Summary File	File Size	Completeness	Scanner Results
Summary Record I	0,309	0,002	0,334
Summary Record II	0,024	0,002	0,000494
Summary Record III	0,024	0,126	0,032
Summary Record IV	0,002	0,002	0,000494
Summary Record V	0,060	0,002	0,000494
Summary Record VI	0,002	0,002	0,000494
Summary Record VII	0,002	0,002	0,000494
Summary Record VIII	0,060	0,002	0,049
Summary Record IX	0,060	0,002	0,049
TOTAL	0,542	0,142	0,516

Table 6. Criteria Weighting Result

Criteria	Value Weight
Criteria	
File Size	0,200
Completeness	0,375
Scanner Result	0,212
Lab Result	0,212

From the results of the PSI process, it can be concluded that the appropriate Covid-19 patient data is the Recapitulation File I that was received.

Table 7. Final Results With Ranking

Summary File	Total	Rank
Summary Record I	0,2042	Valid
Summary Record II	0,0058	Not Valid
Summary Record III	0,0657	Not Valid
Summary Record IV	0,0013	Not Valid
Summary Record V	0,0337	Not Valid
Summary Record VI	0,0013	Not Valid
Summary Record VII	0,0013	Not Valid
Summary Record VIII	0,0337	Not Valid
Summary Record IX	0,0337	Not Valid

CONCLUSION

Based on the objectives of the research and the research results obtained, it can be concluded that From the results of the PSI process, it can be concluded that the eligible Covid-19 patient data is Recapitulation File I with a value of 0.2042 which is declared acceptable.

Development of a decision support system application using a desktop-based system in decision making using the PSI method in determining scanner data at Mitra Sejati Hospital.

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