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Taxonomy of Decision Support System Based on Software and Calculation Method

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Abstract:-The decision-making process was always conducted in all daily activities, both in the household or the company. In decision-making process, many criteria of assessment required as the basis. As the decision support systems progressed, the criterias and basics for assessing a performance are growing as well. The number of criteria and limited resources sometimes makes the decision-making process takes a long time. Therefore a solution is created by creating a Decision Support System to assist decision makers in doing their work. Currently there are many studies that raise cases about the system. The research aims to make Taxonomy on Decision Support System based on a collection of Decision Support System's cases and classify it based on the tools used, the type of implementation and the methods that are used often.

Keywords: - Taxonomy, Decision Support Systems, Technology, IT.

I. INTRODUCTION

All aspects of daily activities cannot be separated from technology, including in corporate governance. One of the activities of corporate governance is decision making, decision making that requires a fast response is also requires a system that capable of processing it quickly. The decision-making process certainly involves many criteria, which if done manually certainly will take a long time and also less efficient. In addition, the potential for error is also quite large. Decision-makers are often confronted with decision-making difficulties resulting from almost equal value of the criteria. The solution of this problem is to build a system capable of processing the criteria used in the assessment automatically. With the help of IT technology, the decision-making process that previously only conducted manually, now can be done by computerized manner.

Decision Support System is a system that has the capability to provide both problem-solving ability and communication capability for semi-structure problems. Another definition of decision support systems is a system that supports the work of a manager or a group of managers in solving semi-structured problems by providing information or suggestions leading to a particular decision [1]. The use of computerized decision support systems has many advantages, for example, compared to manual systems, decision makers can use a limited amount of assessment criteria, another usefulness of decision support system is that decision support system is also able to differentiate and determine a slight value on criteria that have almost equal value, so it can produce more accurate assessment results more accurate.

This research was discussed about the taxonomy of Decision Support System, this research will focused on tools and methodology that used at Decision support systems. If a company or decision makers want to build a good decision support system, a good tools and methods should be implemented. Before the decision makers were able to choose the correct tools and method for these Decision support systems, a classification should be made first to determine the tools and methods.

II. METHODOLOGY

This research was conducted by doing some surveys on the research results that published in national journals or national seminars with the topic of Decision Support System. The obtained paper then analyzed and documented for classification.

Classification is the processing to find a model or function that describes and characterizes the concept or class of data, for a particular purpose [2]. Classification is done on various references obtained. In this research, classification is conducted to classify the types of Decision Support System based on the elements of builds such as the type of tools and calculation methods used. Based on the results of this classification, an analysis will be made to determine the use of the most appropriate and widely used tools and method on the system.

III. RESULT AND DISCUSSION

A. Research Review

Research on decision support systems was conducted in 2011 with issues on concerning the selection of scholarship students at Panca Marga University Probolinggo [3], the aim of the research was to build a java based decision support system to assist the decision-making process. This is considered very important given the large number of students who will be selected. This is considered very important given the large number of students who will be selected. In addition, the number of assessment factors in the form of criteria in accordance with the type of scholarship also will certainly make the decision-making process very time consuming considering the type of scholarships that will be offered more than one. The result from this system is the best alternative based on highest to lowest ranking of prospective scholarship recipients.

In the following year, Nandang Hermanto [4] also conducted a research on Decision support system using SAW method. Research with the aim to solve the case of determining student's major at SMK Bakti Purwokerto produced a web-based decision support system that can be accessed anywhere. The system is designed to assist decision makers in determining prospective majors according to the ability of prospective students based on the criteria of value determined by the school. The criteria are the values of mathematics, Indonesian language capability, English language capability, Science and basic computer skills. Based on these criteria then the new student registration team will be able to determine the appropriate majors for prospective students. The reason that underlies the need for such a system is the large number of applicants available. Surely this will be very time consuming if the process conducted manually.

In addition to the academic field, decision support systems are also needed in non-academic activities such as recreation or vacation. The number of hotels available sometimes makes the visitors difficult in choosing the appropriate hotel to stay. In addition, checking the hotel one by one will be troublesome and will take a long time. The existence of decision support system will greatly help solve the problem, with decision support system, the travelers will be get a help in choosing the hotel as needed efficiently. Based on that issue, Dwi Citra [5] conducted a research on the selection of hotels in Palembang, in the research, the authors use SAW method as the method chosen in the decision-making system process. The SAW method is chosen because according to the author, the method uses the weighting assignment for each attribute. The value of this weighting assignment will affect the assessment results in the form of ranking of the best hotels suggested according to visitor's needs. The criteria used as assessment of decision-making are hotel room rental rates, hotel location, hotel facilities and hotel class. Based on these 4 criteria, then will be produced alternative best hotel that will be offered to the visitor.

Another similar system was developed by Henny Yuanita Kurniawan [6] the system's main concern is how to decided which hotel appropriate for visitor in Malang. This WebGIS-based system is expected to assist visitors in determining the hotel as an existing lodging facility in Malang. According to the authors, SAW method was chosen because the method has a concept and calculation that systematically simple and easy to understand. The criteria used as judgment of decision-making is not much different from previous research which include: price, location, rate and facility of the hotel.

Decision support system is also very needed in the banking field, one of the usefulness in banking field is to assist the decision-making process of the best employee selection on the position of Account Officer. The decision on determining the productivity level of an Account Officer is needed to determine the incentives for Account Officers. In a research conducted by Adikusuma and Erawan [7] the selection was performed using a decision support system made using VB 6 as the tool and SAW method as the method of calculation. In this system, decision makers have determined the main criteria of financial, internal business processes and customers. Based from these three main criterias there are sub criterias with more specific assessment criteria have been made. The output of the system is best alternative choices presented in the form of ranking which can be used as consideration by the decision maker.

In addition to the hotel, the selection of places to eat like a restaurant is also needed when visiting a place. With the large number of restaurants that exist, will certainly make visitors confused in choosing a restaurant. Similar to the selection of hotels, the selection of restaurants is also based on the criteria of visitor desire, in research conducted by Fuspita, Vatresia, and Andreswari [8] criterias taken to make the decision support system were : food menu, price, facilities, condition of the place, capacity and typical food. This android based system is expected to help the visitors to choose the appropriate restaurant or a place to eat.

At a restaurant, recipes are needed in the processing of food making. This turned out to be an idea for research conducted by Salsabella [9], which in the resulted in a decision support system for determining recipes based on food ingredients availability. This SAW Method web-based decision support system is considered to be enough to help the chefs or housewives to make cuisine. The criteria used to make the system are: ingredients, cooking spices, difficulty level, cooking time, type of food and how to cook. Although this study provides a major focus on the availability of food ingredients, the researchers also include other elements in the criteria for determining the results given more accurately.

Research regarding WP method decision support system has been done a lot, one of them is research conducted by Lestari [10] where WP method is used for application in selection of candidate employees. In this research, the WP method is able to solve multi-dimensional and one-dimensional cases as well. This makes the WP method a good alternative to solving a case of decision-making.

In the research conducted by Aning Setiya Rini [11] and Suryeni, Agustin, and Nurfitria [12] which the case is about selection of poor people who have the right for becoming rice recipients, the WP method has also chosen as the method of settlement. According to the researchers, calculations on WP methods are considered more specific to the weight of the value in each criteria. By making decision support system using WP method, it is expected that the system is able to assist decision makers to determine criteria of poor people who have the right to receive rice donation, even the large number of potential recipients who will take a long time if it the decision-making process is conducted manually.

In the academic field, the use of WP methods is also quite in demand by some researchers as in the conducted by [13] and [14] which in both research aimed at a decision support system concerning the interest of students. In the research conducted by [13] was also obtained the results of accuracy testing of decision support system application by 93.2%, calculations on accuracy testing are also conducted on the research [14] with 85% accuracy result. In other research, which is conducted by [15], was also obtained the results of accuracy testing with a maximum value of 100%. The test results are based on the result's comparison between manual calculations and system's calculations. Based on the three accuracy calculations that are above 50%, WP method becomes one of the best choices in making a decision support system.

Research on decision support systems using TOPSIS method has been conducted in research [16] by researching on cases of housing selection. The research was conducted with the aim to assist prospective buyers in choosing a home in accordance with the desired criteria. The result of this research is the housing ranking with the greatest preference value that will become the recommendation. The criteria used in the system are: distance to the highway, distance to economic activities, and distance to educational facilities. There was also a similar studies that have been conducted by [17] on the case of scholarship selection. Based on that research, there was a fact that TOPSIS method can be used to process fuzzy and crisp data. By using the calculation results then obtained result is the ranking score of the highest value as a scholarship recipient.

B. Tools Based Taxonomy

The taxonomy that classifies Decision Support Systems based on the used tools is shown on Figure 1. Figure 2 is a sub-taxonomy of Figure 1, which classifies Decision Support Systems based on desktop applications
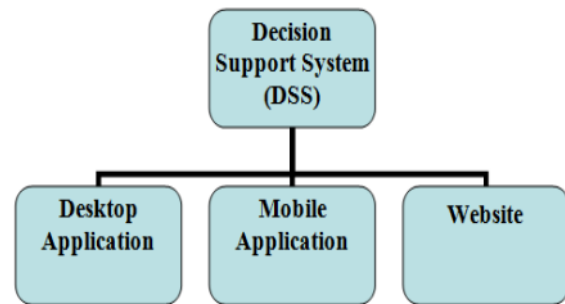

Fig. 1: Taxonomy of DSS Based on System Implementation.

a). Desktop Application Sub-Taxonomy

A desktop application is an application that runs offline on a desktop PC. Even though computers are connected on a network, desktop applications cannot be accessed by others within the same network. This is because the desktop application is a stand-alone application that can only be used by the computer that installed the application. Desktop application decision support systems can be divided according to commonly used programming languages such as : Java and Visual Basic.
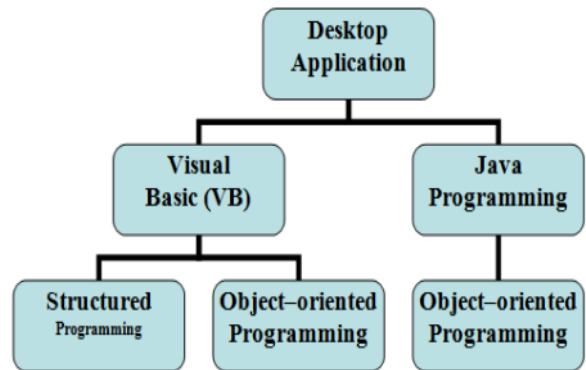

Fig. 2: Desktop Application Sub-Taxonomy

b). Mobile Application Sub-Taxonomy

Mobile application is an application that able to run online or offline on mobile devices / smartphone. This application is made with the aim of making it easier for users to make decisions anywhere and anytime. However, this application should still have a platform for its use. The widely used platform is Android and iOS. In both Android and iOS, the programming languages that support for the development of the application are just Java programming languages. Figure 3 shows the taxonomy of Decision Support System based on mobile application.
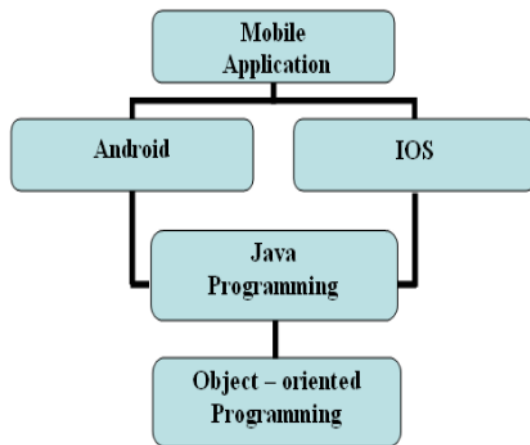
Fig. 3: Mobile Application Sub-Taxonomy

c). Visual Basic (VB)

Visual Basic is a programming language that can be running on a computer. Visual Basic is a derivative of the BASIC programming language. In the implementation of decision support systems, VB is in demand because the language and script order is easy to understand. In addition, java programming also supports structured and object-oriented programming types. In some research, this can be seen from the use of the type of flow diagram.

d). Java Programming

Java programming can be used in developing computer applications in many platforms, including mobile OS. The Java programming language adopts the syntax found in C and C ++ but in Java, the object model syntax is made simpler, it makes Java Programming is easier for users of previous programming languages. However, the Java programming language only supports object-oriented programming type.

e). Website

Web-based decision support system is one option that is widely used by developers of system builders because the website is easily accessed on the network using the browser, so it is easier than desktop-based application. Unlike the website, desktop-based applications require users to install on a computer first. Website can be accessed using various forms of devices as long as they are connected to the network and have a browser.

C. Most Used Method Based Taxonomy

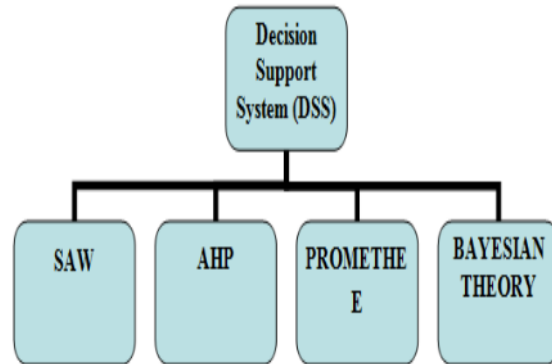Taxonomy based on most used methods is shown in Figure. 4 [18].

Fig. 4:Method Based Taxonomy

Simple Additive Weighting (SAW) method is the best known and most widely used method for dealing with Multiple Attribute Decision Making (MADM) type of DSS. This method requires the decision maker to determine the weight of each attribute. A total score for alternative builders is obtained by summing all the multiplication products between ratings [8]. The concept of SAW method is to find the weighted sum of performance ratings for all attributes [7]. The SAW method requires the process of normalizing the decision matrix (X) to a scale that can be compared to all existing alternative ratings [17].

The Analytical Hierarchy Process (AHP) approach is almost identical to the model of political behavior, which is a decision model that using a collective approach of its decision-making process. AHP was developed by Thomas L. Saaty, this method can solve complex problems with a lot of criteria [19]. AHP is also widely used in decision support systems for many criteria, planning, resource allocation and prioritization of strategies owned by people working in conflict situations [20].

Promethee is a method of determining the order or priority in multicriteria analysis. From the existing priorities an assessment is used in outranking relationships, then to indicate priorities and preferences for each criteria, this method focuses on values without concerning about calculation method [21]. Promethee provides users with the ability to use data directly in the form of simple multicriteria tables. Promethee has the ability to handle many comparisons. Decision-makers only define their own scale without restriction, to indicate their priorities and preferences for each criteria by focusing on values only, no need to thinking about the method of calculation. Promethee uses the criteria and weights of each criteria which are then processed to determine the field's

alternative selection, which results in a sequence based on its priorities [22]

To determine a decision statistically, Bayes's theorem can be used to calculate the statistical method, because Bayes's theorem is able to calculate the probability of the occurrence of an event based on the effect that can be obtained as a result of observation, for example : in the framework of problem solving decision-making containing uncertainty [23]. Bayes method is also a method for generating parameter estimation by combining information from samples and other information that available previously [24].

IV. CONCLUSION

Based on the taxonomy research that has been conducted, it can be concluded that the Decision Support System can be divided into two groups, these groups are tools and methods. In tool based taxonomy, the Decision Support Systems can then be subdivided into 3 subgroup, these subgroups are Desktop, which is offline, and the platform is on a PC / laptop, and Mobile applications that can be running on android or ios platform on the smartphone / tablet as a device and a website that can be accessed via any device connected to the internet. In desktop applications can then be subdivided according to the form of programming, these forms are structured programming and object-oriented programming. Mobile-based Decision Support System can be divided according to the platform : Android and iOS. There are also several reviews that have been listed showing that decision support system is very useful and needed in the decision-making process. Method-based taxonomy has been made based on the information about most commonly used method of a decision support system. This method-based taxonom divided into 4 most commonly used methods namely Simple Additive Weighting (SAW), Analytical Hierarchy Process (AHP), Promethee and Bayesian Theorem.

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