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Research paper



The Expert Choice Implementation in Selecting the Electronic Voting Software

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Abstract

The voting service process conducted today is still done manually so that it becomes a decision to utilize the electronic voting. The electronic voting greatly reduces human control and human direct influence on this voting process. Problems faced by end users in the selection are there are so many choices of electronic voting software. Decision making, essentially a form of election of the various alternatives of action or multi-criteria decision making that can be selected. Decision support system in this research is used to select the type of electronic voting software. The method used in this research is the multi criteria decision making and analytical hierarchy process using expert choice software. And aims to make decisions that can make certain parties to take the best decision in choosing the type of electronic voting software. From the data processing is concluded that the first sequence is online voting 58.3%, express vote 17.2%, simply voting 17% and ballot online 7.5%. Processing of data obtained from the respondent expert inconsistencies value ratio is less than 0.1, thus the combined geometric calculation result data is fairly consistent.

Keywords: *Analytical Hierarchy Process; Decision support system; Electronics Election Processing; Expert Choice; Multi-Criteria Decision Making*

1. Introduction

Today there was a transition from manually voting service process into a decision to utilize the services processing electronic voting, by using the information communication technology in the implementation process of voting. Improved technology in elections is always a challenging project that requires careful consideration and planning. Electronic voting greatly reduces human control and human direct influence on this process. Provide an opportunity to resolve some of the problems that have long election but also provide a series of new concerns [1]. Problems faced by end users in the selection voting service process is there are many choices of software voting service process in the market today, they should use as a facility of voting, thus confusing users final selections.

The ability to take a decision is fast, precise and accurate will be the key to success in today's global competition. Decision support system is used to provide convenience to all potential voters voting who wish to use the processing electronic voting software by using several criteria, in order to take a decision according to predetermined criteria. The method used is using multi criteria decision making and analytical hierarchy process by using software or computer software expert choice. This method was chosen because it is able to choose the best alternative out of several alternatives to solve the problems of the software voting service process based on criteria specified. The research purpose is to make decisions that can help certain parties to take the best decision in choosing the type of software processing services electronic voting in order to achieve maximum results.

2. Literature Review

Decision support systems are interactive, computer based systems that aid users in judgment and choice activities. They provide data storage and retrieval, but enhance the traditional information access and retrieval functions with support for model building and model-based reasoning. They support framing, modeling, and problem solving [2].

Multi criteria decision making is one of the most widely used methods in the decision-making area. The objective of multi criteria decision making is to select the best alternative from several mutually exclusive alternatives based on their general performance regarding various criteria [or attributes] decided by the decision maker [3, 4].

In everyday life decisions often use intuition, despite a lot of shortcomings of this method thus developed a new systematic called decision analysis, namely intelligence, perception and philosophy. After using intelligence, perception and philosophy to create the model, determining the possible value, set a value on the expected results and assessing the preference for time and preference for risk, then to arrive at a decision required logic [5].

One model that can be used as a decision-making process is by using the analytic hierarchy process. Analytical hierarchy process was developed by Dr. Thomas L. Saaty of the Wharton School of Business in 1970 for organizing information and judgment in selecting the most preferred alternative [5, 6] By using analytical hierarchy process, an issue that will be resolved in a frame of mind that is organized, thus allowing can be expressed to take effective decisions on the issue. Complex problems can be simpli-

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fied and accelerated decision-making processes. In addition, the analytical hierarchy process also test the consistency of assessment, in case of deviation is too far from the value of perfect consistency it shows that the assessment needs to be repaired, or hierarchy should be restructured.

The analytical hierarchy process working principle is as follows:

1. Preparation hierarchy
   The problem that will be solved broken down into its elements, namely the criteria and alternatives, and then organized into a hierarchical structure.
2. Assessment Criteria and Alternatives
   Criteria and alternatives are assessed through paired comparisons. According to [5, 6], for a variety of problems, a scale of 1 to 9 is the best scale in expressing opinions. Values and definition of qualitative opinion on a scale of Saaty comparison can be seen in the following table:

Table 1: Comparison scale Saaty•, [reprocessed, [5]

VALUE	FACTS
1	Criteria/Alternative A, both important criteria/alternatives B
3	A little more important than B
5	A is clearly more important than B
7	A very obviously more important than B
9	A is absolutely more important than B
2,4,6,8	When hesitating between two adjacent values

A comparison with the B value is 1 [one] divided by the ratio of B to A.

3. Determination of priorities for each criteria and alternative should be paired comparisons [pairwise comparisons]. The values of relative comparison are then processed to determine the relative ranking of all alternatives. Both qualitative and quantitative criteria can be compared according to the judgment which has been determined to produce weight and priority. Weights or priority calculated by matrix manipulation or through completing mathematical equations.
4. Logical consistency for all the elements are grouped logically and consistently graded according to a logical criterion. Completion of decision making with analytical hierarchy process method can use the software expert choice for solving problems with analytical hierarchy process calculations already proven reliability.

Calculation consistency index [CI], the measurement is intended to determine the consistency of the answers that would affect the validity of the results [5]. The formula is:

$$CI = \frac{\lambda_{max} - n}{n-1} \quad (1)$$

To determine whether the CI with a specific amount is good enough or not, please note that the ratio is considered good, if:

$$CR \leq 0.1 \quad (2)$$

The formula Consistency Ratio [CR] is:

$$CR = \frac{CI}{RI} \quad (3)$$

CR is a parameter that is used to check whether the pairwise comparisons have been conducted with consistent or not. RI value is a random value index released by Oarkridge Laboratory as shown in table 3 below:

Table 2: Random value index scale Oarkridge Laboratory•, [reprocessed,[5]]

N	1	2	3	4	5	6	7	8	9	10	11	12	13
RI	0.000	0.000	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56

Assessment of secondary data relevant to this research as follows:

1. [7] The voting system is unsuitable for use in a general election. Any paperless electronic voting system might suffer similar flaws, despite any "certification" it could have otherwise received.
2. [8] Electronic Voting, Electronic voting systems promise benefits in terms of ease of use, especially for disabled voters.
3. [9] Analytical Hierarchy Process Method, with the aim of identifying the type of antivirus allowing to be selected and used by users on their PC user based on computer specifications, with reference to the understanding on a web based decision support system can be realized.
4. [10] With the aim of determining the election results of the alternatives for the hotel, with a very effective method for calculating Promitee by three votes leaving flow value, entering flow and net flow.
5. [1] Electronic voting is often seen as a tool for making the electoral process more efficient and for increasing trust in its management.
6. [11] with the aim to create software applications those are web based which can provide convenience to everyone who wants to buy a mobile phone.
7. [12] aims to help the user in taking the decision to choose the best laptop of choice alternatives that exist.
8. [13] with the aim of selecting school supervisor at the Department of Education Bone Bolango, to assist the Department of Education in determining the superintendent of schools.
9. [14] Capable of providing an alternative ranking system from the calculation of weighted value of the lecturer in accordance with the Analytical Hierarchy Process method.

3. Methodology/Materials

The conceptual framework of this research can be seen in the image below:

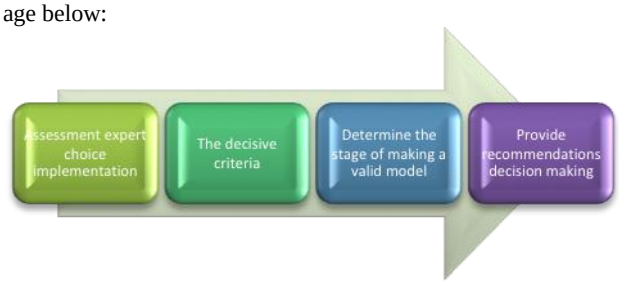


Fig. 1: The conceptual framework

Overview of the process or steps performed in this research:

1. The sequence begins with an assessment of the application of methods of multi criteria decision making software selection services in processing electronic voting is to obtain the basic foundation of thought, by looking through the study of literature references, interviews and discussions with experts respondents using focus group discussion.
2. Then the process is continued in the next stage of the decisive criteria for research using focus group discussion.
3. The next process of determining the alternative study of the application of methods of multi criteria decision making software selection services in processing electronic voting. To avoid inconsistencies in the modeling, the focus group discussion with expert respondent to determine the stage of

• Marimin. *Teknik dan Aplikasi Pengambilan Keputusan Kriteria Majemuk*. Penerbit PT Grasindo, Jakarta, 2005.

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making a valid model with elements that significantly affect models.

4. This method uses iterative approach in which the attributes are not feasible through the analysis process eliminated so that the remaining attributes really are important attributes for research.

In order to determine the priority measures software selection processing services electronic voting, then in the criterion proposed ten criteria and four strategic alternatives that support software selection processing services electronic voting. The criteria and strategic alternatives can be detailed in the following:

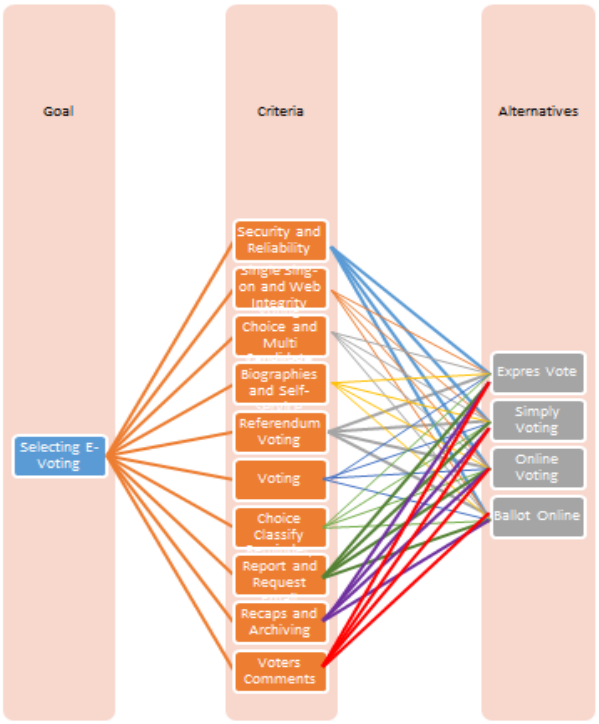


Fig. 2: Hierarchy and Decision Diagram

4 Results and Findings

The weight of each criterion affecting electoral considerations services software processing electronic voting of the respondents experts are sorted from highest priority to lowest priority:

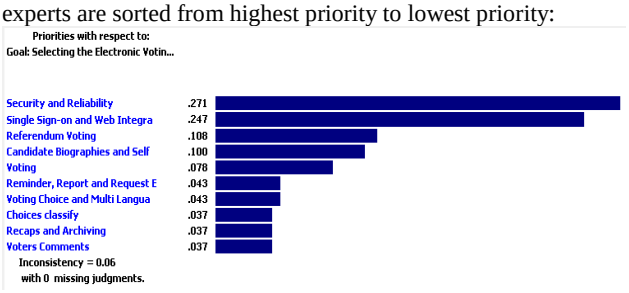


Fig. 3: Value each criterion

1. Security and Reliability 27.1%;
2. Single Sign-on and Web Integration 24.7%;
3. Referendum Voting 10.8%;
4. Candidate Biographies and Self-service 10%;
5. Voting 7.8%;
6. Voting Choice and Multi Languages 4.3%;
7. Reminder, Report and Request Email 4.3%;
8. Choices classify 3.7%;
9. Voters Comments 3.7%;
10. Recaps and Archiving 3.7%.

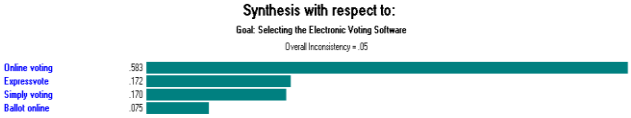


Fig. 4: Values globally

Online-Voting 58.3%; Express-Vote 17.2%; Simply-Voting 17%; and Online-Ballot 7.5%.

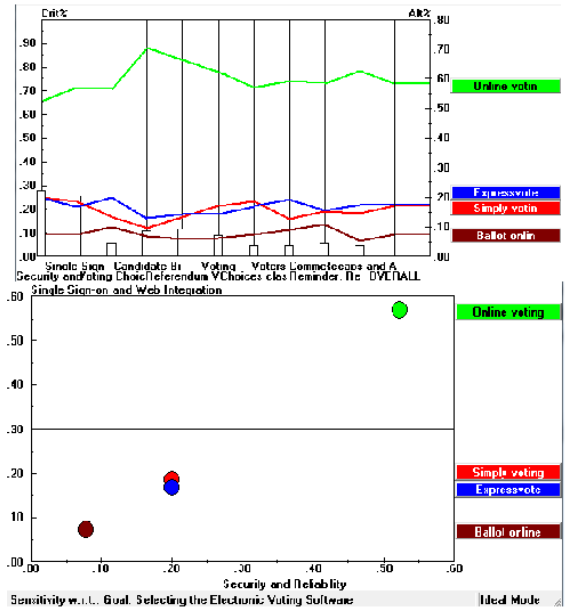


Fig. 5: Analysis of Alternative Ratios Globally

Based on the graph above it can be concluded that of the four strategic alternatives Online-Voting 58.3%; Express-Vote 17.2%; Simply-Voting 17%; and Online-Ballot 7.5%. Inconsistency ratio or the ratio of the weight values inconsistent data has been collected from the respondents expert is a parameter that is used to check whether the pairwise comparisons have been conducted with consistent or not. Data inconsistency ratio is considered well if its value CR $\leq$ 0.1. It can be concluded that the pairwise comparisons that respondents experts have inconsistencies ratio value smaller than 0.1 as the maximum value of the ratio of inconsistency. Thus the results of the combined geometric calculation respondent data expert.

5. Conclusion

From the data processing is concluded that the first sequence is Online-Voting 58.3%, Express-Vote 17.2%, Simply-Voting 17% and Online-Ballot 7.5%. Processing of data obtained from the respondent's expert inconsistencies value ratio is less than 0.1, thus the combined geometric calculation result data is fairly consistent expert respondents. By doing this research, strategy decision support system software selection processing services electronic voting can be applied.

Acknowledgement

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