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Designing Software Application Decision With Multi Criteria Android-based Analytic Network Process Algorithm

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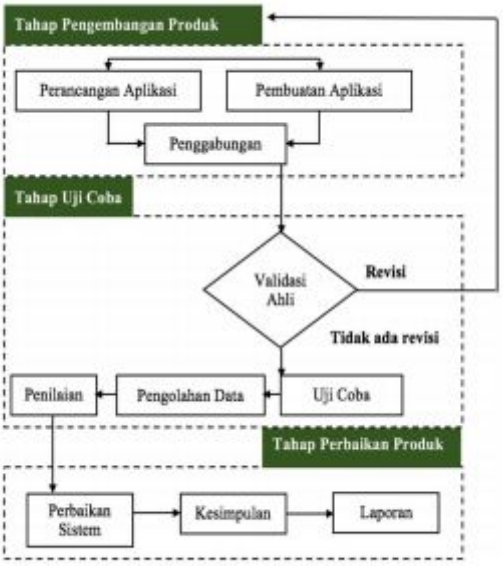
Abstract

Multi-criteria decision-making is one of the techniques in determining a choice of several alternative options. There are several methods in making decisions, one of which is ANP (Analytic Network Process). ANP is a development of AHP (Analytic Hierarchy Process) method. AHP is a hierarchical method in which any existing criteria will be compared first which will produce an ordinary matrix. While ANP is a network method that compares all things including criteria and alternatives that exist so as to obtain a super matrix is very complex. Currently ANP method is not only calculated but already there is software support one of them is Super Decisions. The software can be used to generate a decision by the ANP method. Every software must have advantages and disadvantages. That's why there is a need for software development that has been there before to appear new software better.

Keyword: Decision Support, Multiple Criteria Decision Making, Analytic Network Process, Super Decisions Software, Linear Algebra, Android Applications.

1. Introduction

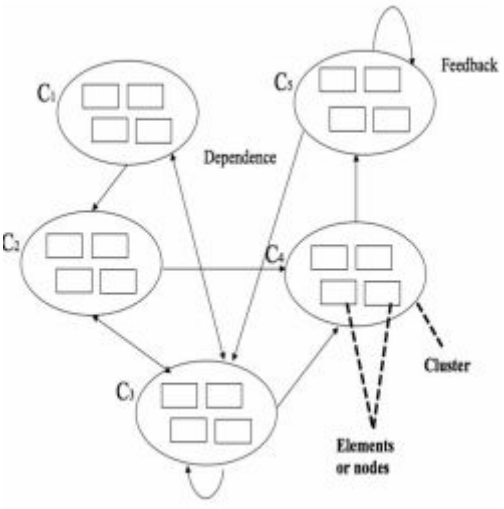
Decision-making system (Decision Support System) is part of a computer system which functions to process data into information to make decisions on specific semi structured problems. DSS always experiences developments to date, is no exception in an agency, organization or self. Decision support systems are used for support decisions from a variety of alternatives given, with the hope of making this decision can help process the problem properly and smoothly. Multi Criteria Decision Making (MCDM) is a method of making decisions to determine alternatives best of a number of alternatives based on certain criteria. Criteria are usually in the form of measures, rules or standards used in decision making [1]. There is some of the techniques or methods in MCDM, are wrong one of them is the Analytic Network Process (ANP). The ANP method is a development of the AHP (Analytic Hierarchy Process) method [2-5]. AHP is a method to solve a complex situations are not structured into several components in a hierarchical arrangement, by giving subjective values about its importance each variable in relative terms, and determine which variable has the highest priority in order to influence the results in the situation. Whereas ANP is a method.



Gambar 1. Alur *Research and Development*

shaped network. ANP allows interaction and feedback from the elements inside cluster (inner dependence) and between clusters (outer dependence) [6,7]. Decision making is one thing which must be done in determining an option. In making a decision requires the existence of criteria before deciding on the choice of the various alternatives that exist. Criteria indicate the definition of a problem in its form real and sometimes seen as goals or objectives to be achieved. Analysis of the criteria was carried out to obtain a set of standards measurement, to then serve as a tool in comparing various alternatives. The current decision making is done in a way that is modern with the help of an application. However, not many applications have played a role in helping to make a decision. Super Decisions is an application that is used to make decisions. The application uses the ANP method for its decision processes and outcomes [8-11]. To Furthermore, related to the ANP method, will be the main discussion in this study by making an application which is a development from Super Decisions or other pre-existing applications.

The purpose of this research is to create an Android-based application that is easy to use understood and used. And without losing the accuracy of the data to be generated and the time effectiveness afforded by the application which will be created.



2. Research Method

The method used in this research is the R & D (Research and Development) method. This is in accordance with the research objectives, namely to developing decision support applications. Research and Development is a research method used to produce products certain by testing the effectiveness of the product. This method is used to develop or validate the products used in education and learning. So the use of R&D research methods goes hand in hand with what those stated by the experts are also in accordance with the objectives of this study [12]. For more The details will be explained in Figure 1. In this method 3 stages are carried out, namely: Product Development Stage At this stage, the design and manufacture of the application will be carried out from the design and the manufacture will be combined into one unity of application. Trial Phase After the first stage is complete it will be validated in advance, if there are still errors will revised and returned to the first stage. But if it is correct, the test will be continued try the application by processing existing data and then conduct an assessment on the results of processing the data.

Gambar 3. *Flow Chart* Perancangan Aplikasi

Product Repair Stage The last stage is to hold repairs on system that has been created if it is needed there is an improvement, then then it can be withdrawn the conclusion of the application for manufacture the overall report. Analytic Network Process (ANP) is mathematical theory that allows one to treat dependence and feedback systematically which can capture and combine tangible and intangible factors [13]. ANP consists of two parts, the first is a hierarchical control or network of criteria and subcriteria that control interaction and that the second is a network that describes mutual influence between elements. As in Figure 2, which briefly describes the Network Model of the ANP. In Figure 2, it can be explained about the stages of forming a cluster in the Network Model ANP, namely: The first stage is a hierarchical control that shows the relationship between criteria and sub the criteria. On this control does not need hierarchical structure as in the AHP method. The next stage is linkage control which shows the interrelationship between the criteria or cluster.

Design of a system to be made is a very important stage in making a program or continuing to the next step, because the planning is expected to get good and maximum results not only in terms of appearance

TABEL 1.
SPESIFIKASI *SMARTPHONE*

	Spesifikasi *Smartphone* I	Spesifikasi *Smartphone* II
Merk	Xiaomi Redmi Note 3	Xperia M5 Dual
RAM	3 GB	4 GB
Sistem Operasi	Android OS 5.0.2 (Lollipop)	Android OS 6.0 (Marshmallow)

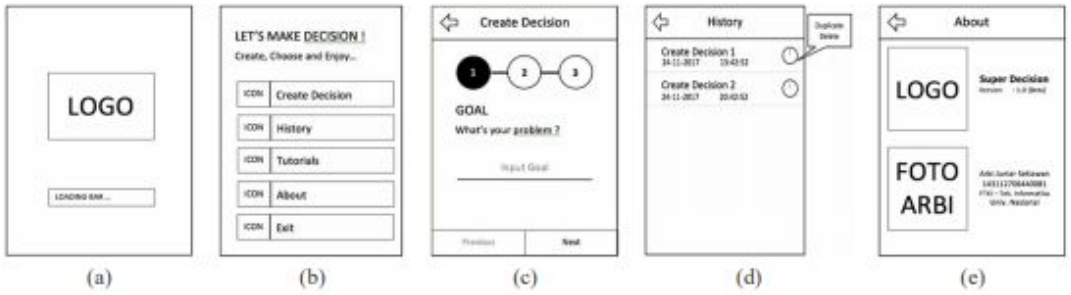
TABEL 2
PENGUJIAN TINGKAT KECEPATAN

Pergantian *Scene*	*Smartphone* I	*Smartphone* II
Splash screen	5 Detik	3 Detik
Super Decision	2 Detik	2 Detik
Create Decision	1 Detik	1 Detik
History	2 Detik	1 Detik
Tutorial	2 Detik	1 Detik
About	1 Detik	1 Detik

and the functions that are in it too. In designing the system that is made is a development of an android-based decision support system application. Accordingly, researchers make a pre-existing system design with updates which will later be integrated into a unit and become an application that can function and be useful as expected. Figure 3 shows the flow of designing a software engineering display application decisions to be made. Meanwhile, the application is developed in an Android studio environment by using the Java programming language, PHP, MySQL. The design is built using Adobe Photoshop software on the Windows operating system. Computer specifications used include using a processor Intel Core i5 3337U (1.8 Ghz), 750 GB (Serial ATA, 5400 Rpm); RAM of 4 GB DDR3 SODIM 1600 MHz and VGA with Nvidia GT 720M (2GB). The application display design is then poured sequentially in the form of a storyboard. Figure 4 is an overview storyboard scenarios from software engineering application decision multi criteria with ANP method.

3. Results and Analysis Implementation

Implementation is a stage for change the results of the system design that have been compiled based on the plot and storyboard into a real form, in this case in the form of software engineering decision application running on the platform android. The choice of making this application aims to develop supporting applications to



Gambar 4. *Storyboard* Aplikasi Keputusan: (a) *Splash Screen*, tampilan awal aplikasi sebelum masuk ke menu utama; (b) Tampilan Main Menu/ Menu Awal yang berisi button *Create Decision*, *History*, *Tutorials*, *About*, dan *Exit;* (c) Tampilan pada Menu "Create Decision" berisi beberapa step, untuk step awal yaitu form input untuk memasukkan tujuan dari pengambilan keputusan, lalu selanjutnya mengikut step yang telah disediakan; (d) Pada menu "History" terdapat list mengenai data pengambilan keputusan yang telah dilakukan sebelumnya; (e) Menu "About" terdapat informasi mengenai aplikasi dan tentang pembuat aplikasi

decisions in the field of information technology dul application software engineering decisions multi criteria with analytic network algorithm process based on android. Figure 5 shows multiple view application decisions.

Splash Screen The Splash Screen is an initial display or opening an application to be used before entering the main menu display.

Main Menu Scene Main Menu display is the main display of this decision application. Inside the page This main menu consists of several selection buttons which can be accessed for users, namely the "Create Decision", "History", "Tutorial", "About", "Settings" and "Exit" buttons.

Scene Create Decision Step 1 The Input Goal view is a step view first in making a decision, at in this view the user must enter a destination of the decision making. After me- enter the destination, the next step is to click Next button to go to the next stage.

Scene Create Decision Step 2 The Input Criteria display is a display requires the user to enter multiple teria who support in its goal of protecting bill a decision. The criteria input is not limited to the number you want to enter.

Scene Create Decision Step 3 The Input Alternative display is the display which requires the user to enter several pa alternative choices that will be in the final result will be given a decision to choose the alternative. The alternative input is not tasi the amount to be entered.

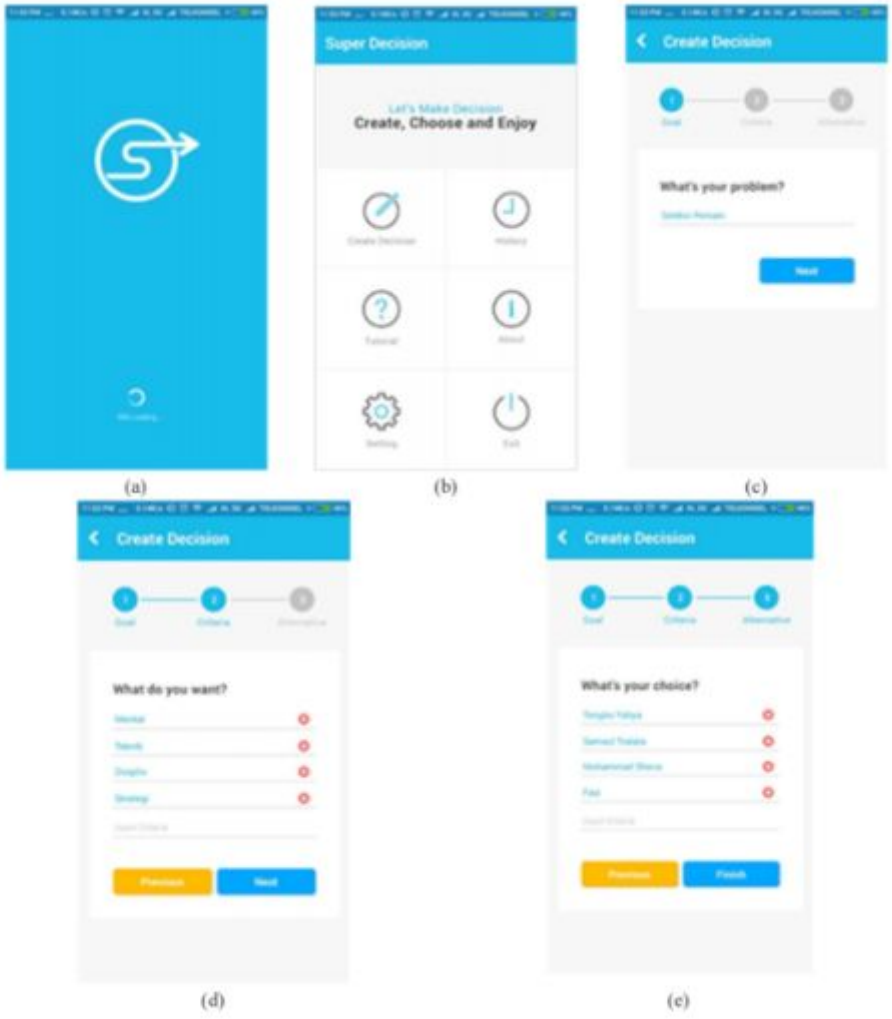
Alternative Comparison Scene The Alternative Comparison Input Display is Use the view to make a comparison between all alternatives against each node on cluster criteria (Appendix Figure I).

Scene Comparison Criteria In this display the user must enter r comparison between all existing criteria against dap each node in the alternative cluster (Appendix Figure II).

Selection Result Scene This view is the last Scene on the Menu Create Decision. This display shows the da user is the final result to rank the alternatives that could be used in decision making (Att. ran Figure III).

Scene History The History display is a display that show the decision making data that has been previously done by the user. At tam- This menu allows the user to see which decision has been made along with the date the decision was made, copy the previous decision, and delete existing decision data (Appendix Figure IV (a)).

Scene Tutorial The Tutorial view is a display that contains about the procedure for using the application of each existing menu features (Appendix Figure IV (d)).



Gambar 5. Tampilan Aplikasi Keputusan: (a) *Splash Screen*; (b) Tampilan Main Menu; (c) Tampilan pada Menu "Create Decision" *step* 1; (d) Tampilan pada Menu "Create Decision" *step* 2; (e) Tampilan pada Menu "Create Decision" *step* 3

The About display is a display that contains information regarding applications and information about application maker (Appendix Figure IV (c)).

Application Testing In testing this application, the specifications of the smartphone and the level of speed are tested. Test result- can be seen in Tables 1 and 2.From the jian, that the rate of speed of each each smartphone has a speed level yes- in different but dominant speed for In addition, black testing was also carried out box. Black box testing aims to understand hui software function in operation applications and black box test results from the application. Table 3 shows the results of the black box test. Based on view the table, the virtual buttons used it's already going as expected by the user or users.

4. Conclusion

Android-based decision support application can be the right choice in helping to resolve problems regarding taking to decision. The abilities that can be the provisions of the application include: 1) then bough in use; 2) input on criteria and alternatives are not restricted; and 3) on the final result given a graphic so that the user can be more detailed know the comparison between each food criterion up to every alternative.

References

[1] Velasquez, Mark, and Patrick T. Hester. “Ananalysis of multi criteria decision making methods.”International Journal of Operati-ons Research 10.2 (2013): 56-66.

[2] Ergu, Daji, et al. “Analytic network process in risk assessment and decision analysis.”Computers & Operations Research 42 (2014): 58-74.

[3] Zafeirakopoulos, Ilke Bereketli, and Mujde Erol Genevois. “An Analytic Network Process approach for the environmental aspect selection problem—A case study for a hand blender.” Environmental Impact Assessment Review 54 (2015): 101-109.

[4] Zavadskas, Edmundas Kazimieras, Zenonas Turskis, and Simona Kildienė. “State of art surveys of overviews on MCDM/MADM methods.” Technological and economic development of economy 20.1 (2014): 165-179.

[5] Khademi, Navid, et al. “An algorithm for the analytic network process (ANP) structure design.” Journal of Multi-Criteria Decision Analysis 19.1-2 (2012): 33-55.

[6] SAATY, Thomas L. Analytic network pro-cess. In: Encyclopedia of Operations Research and Management Science. Springer US, 2001. p. 28-35.

[7] Yang, Jiann Liang, and Gwo-Hshiung Tzeng. “An integrated MCDM technique combined with DEMATEL for a novel cluster-weighted with ANP method.” Expert Systems with Applications 38.3 (2011): 1417-1424.

[8] LIU, Rui, et al. Introduction to the ANP Super Decisions Software and Its Application [J]. Systems Engineering-theory & Practice, 2003, 8: 024.

[9] Baity, Rizky Dwi, and Chainardy Congrone-goro. “Business Excellence and ICT as Ena-bler: Sustainable Supplier Evaluation Using Super Decision Software and Analytic Network Process (ANP).” International Journal of Applied Engineering Research 9.22 (2014): 12819-12826.

[10] Nazir, Shah, et al. “Software component se-lection based on quality criteria using the analytic network process.” Abstract and App-lied Analysis. Vol. 2014. Hindawi Publishing Corporation, 2014.

[11] Adams, William JL, and Rozann Saaty. “Su-per Decisions Software Guide.” Super Decisions 9 (2003).

[12] Haryati, Sri. “Research and Development (R&D) sebagai Salah Satu Model Penelitian dalam Bidang Pendidikan.” (2013).

[13] Azis, Iwan J. “Analytic network process with feedback influence: a new approach to impact study.” Paper for Seminar Organized by De-partment of Urban and Regional Planning, University of Illinois at Urbana-Campaign. 2003.

[14] Mulyanto, A., et al. “Implementation of ANP Method in Determining Supplier to Improve Service towards Supermarket Consumers.” IOP Conference Series: Materials Science and Engineering. Vol. 180. No. 1. IOP Pu-blishing, 2017.

[15] Rekik, Rim, Ilhem Kallel, and Adel M. Alivmi. “Ranking criteria based on fuzzy ANP for assessing E-commerce web sites.” Systems, Man, and Cybernetics (SMC), 2016 IEEE International Conference on. IEEE, 2016.

[16] Amin, Ruhul. “Penerapan Metode Analytical Network Process (Anp) Pada Pemilihan Wisata Pantai Untuk Dikembangkan Di Gunung Kidul.” Konferensi Nasional Ilmu Sosial & Teknologi 1.1 (2013).

[17] Pernadi, Dody, and Andri Hanafi. “Implementasi Analytical Hierarchy Process (AHP) untuk Penilaian Kinerja pada Bagian Customer Service Representative (CSR) di PT. Bank Permata Tbk.” Jurnal Ilmiah KOMPUTASI 14.1 (2017).