

Implementation of Forward Chaining Method to Detect User Criteria in Using Smartphone

Putri Aylin Marshai¹, Erry Rimawan², Ia Asih³, Ivan Kristianto⁴

¹Magister of Management, Mercu Buana University, Jakarta, Indonesia.

^{2,3,4}Magister of Industrial Engineering, Mercu Buana University, Jakarta, Indonesia.

Abstract:- Indonesia was the big fifth smartphone user in the world, smartphone user always increase signed by the increasing internet user. This research was conducting to know the users necessary to buy smartphone based on their characteristic. Forward chaining method was using rule base and "if then" principle, which is provide convenience to search. This research was using three criterias and three costs range. The three criterias was consisted by hobby, job and social networking. Each of criteria has four questions that users have to answer. The forward chaining method was implemented to the system by PHP programming language and database MySQL. The test was resulting about 21 matching data which was conducting the test by the rule base system implementation. These 21 data was matching by the rule base and give the accuracy about 100%.

Keywords:- Forward chaining, Rule base, Smartphone.

I. INTRODUCTION

In the current digital era smartphone shipments reached 341.6 million units per year in the second quarter of 2017. This indicates that the growth of smartphone users is increasing and increasing [1]. Indonesia is "the Asian digital technology giant who is sleeping". Indonesia's population of 250 million is a large market. Indonesian smartphone users are also growing rapidly. Digital marketing research institute Emarketer estimates that in 2018 there will be more than 100 million active smartphone users in Indonesia. With such a large number, Indonesia will become the country with the fourth largest active smartphone user in the world after China, India, and America. The increasing number of smartphone users is marked by a very rapid increase in internet users. 50% of smartphone users in Indonesia use smartphones to access the internet and make these devices as the main telecommunications tools [2]. In addition to the type of smartphone that continues to grow, the needs and characteristics of users in buying a smartphone are also increasingly diverse. The diversity of the needs and characteristics of users of smartphones and then me n be material to research conducted by Nielsen Informate Mobile Insights together with Vserv as providers as a smartphone with smart data for mobile and e-commerce. This becomes very important because when the user wrongly determines the smartphone selection process many things

become useless and cannot be utilized for a long time [3]. The diversity of types, brands, prices and increasingly diverse features of smartphones has an impact on the behavior of smartphone users in buying and choosing the right smartphone. Some studies have also carried out to obtain the results of the analysis of the influence of the needs and style of life users of smartphones on the factor of social, factors of personal and factors psychological [4]. At the same time smartphone users also often make the process of buying a smartphone which is due to the influence of brand equality, attachment and connection to a brand, which greatly affects the user in the process of buying a smartphone [5].

Several studies of similar methods are used to analyze the needs of smartphone users including Ian Gatra Sandika, research conducted using the forward chaining method using four criteria, namely Adventures, Entertainers, Elegant and Social Media Addicts [6]. Maria Bellanar Ismiati also perform prose s research using decision support system with four main criteria that is elegant, entertainer, adventurer, and also social media. Decision trees made using the forward chaining method are added by giving priority weights to get maximum results [7]. Zeraida wele conducted research using the forward chaining method with representation techniques using rule based reasoning to diagnose damage to cars. The rule base technique chosen is the best search technique in the forward chaining method [8]. Isaac uses a rule base expert system with a forward chaining method to predict the quality of batik cloth, the research uses inference flow to predict the quality of batik cloth that is good, moderate and not good [9]. Indra Hidayatulloh conducted a research that is a decision support system using the Moora method with a price-quality ratio approach for smartphone selection recommendations [10]. This research proposes the implementation of the forward chaining method to detect user needs for smartphone use in accordance with the criteria required using a web - based application. Methods forward chaining is a method that start from the fact, using rules or so-called rule bases [11]. The study was conducted using 3 main criteria, namely Hobby, Job, and Social Networking [12]. These three criteria are built based on data and literature studies that have previously been studied to strengthen user criteria to create a rule base that can accommodate the ongoing research using the forward chaining method.

II. RESEARCH METHODS

The research method carried out in this study uses the following stages :

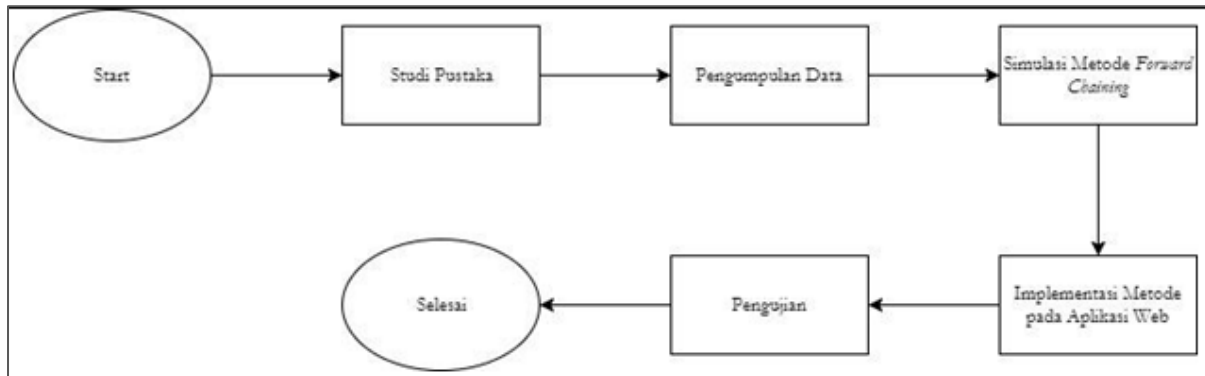


Fig 1:- Research Stages three user habits have different needs

➤ *Literature Study*

At the literature study stage an assessment of the research that has been carried out before, on similar research methods and processes. Stages of literature study are conducted to assess the research to be conducted. Literature studies are also conducted in order to strengthen the research that will be used.

➤ *Data Collection*

At the data collection stage, the process of collecting user data and smartphone data is carried out . Data collection is related to the criteria to be determined as well as smartphone user data which is used as test data. Based on a survey conducted by Baidu Indonesia, the user habits when using a smartphone are obtained by three conclusions. Namely users, players, and beginners [13] .

These and smartphone usage criteria . The survey results released by Our Mobile Planet and Google regarding where users access smartphones strengthen the development of criteria to be able to determine the user's needs in choosing a smartphone based on the criteria [14] . The latest survey results released by Tech In Asia regarding what activities the user does when using a smartphone [15]. In this study the user criteria used were only 1 main criterion. Based on data collection and study of literature that is produced above then create three criteria when users use smartphones. The process of data collection is done by way of questionnaires that di contents by respondents in various circles. Respondent test data used were 21 data. The (v) mark in the data collection table means Yes's answer from the user to the question that has been answered.

No	Nama	Hobby				Job				Sosial Networking				Result
		Travell	Game	Video	Fotografi	Rapat	Fitur	Email	Reading	Koneksi	Sosmed	Shopping	Akun	
1	person 1		v	v		v	V	v	v	v	v			Job
2	person 2				v	v	V	v	v					Job
3	person 3	V	v	v	v		V	v	v	v	v		v	Hobby
4	person 4		v	v				v	v	v	v	v	v	Sosial Networking
5	person 5	V	v	v	v		v	v	v	v	v	v		Hobby
6	person 6	V	v	v	v			v	v	v	v			Hobby
7	person 7				v			v	v	v	v	v	v	Sosial Networking
8	person 8	V	v	v	v	v		v	v	v				Hobby
9	person 9			v	v			v	v	v	v	v	v	Sosial Networking
10	person 10	V	v	v	v		v	v		v	v	v		Hobby
11	person 11	V	v	v	v		v	v	v	v	v			Hobby

12	person 12	V		v	v		v	v	v	v	v	v	v	Sosial Networking
13	person 13	V	v	v	v		v		v	v	v		v	Hobby
14	person 14	V	v	v	v	v		v	v				v	Hobby
15	person 15			v		v	v	v	v					Job
16	person 16	V	v	v	v	v	v	v		v	v			Hobby
17	person 17		v	v	v	v	v	v	v	v	v	v		Job
18	person 18		v	v	v	v	v	v	v	v	v			Job
19	person 19	V	v	v	v		v	v	v		v		v	Hobby
20	person 20	V	v	v	v	v		v	v	v	v		v	Hobby
21	person 21	V	v	v	v				v	v	v			Hobby

Table 1:- User Data Collection

➤ *Simulation of Forward Chaining Method*

From the results of the user data above, three criteria are made that are able to solve the research problem that will be done, including:

No	Characteristics	Question	Core Clause
1.	Hobby	Do you often travel far?	Travell
		Do you like playing games?	The game
		Do you like watching videos?	The video
		Do you like photography?	Photography
2.	Job	Do you often have meetings using a smartphone?	Meeting
		Do you often use smartphone features (ms word, ms excel, ms power point) to get the job done?	Feature
		Do you often send e-mails, sms and MMS to friends?	e-mail
		Do you like reading news, books, or magazines using a smartphone?	Reading
3.	Social Networking	Apakah andaharus selalu terkoneksi dengan internet setiap waktu?	Koneksi
		Apakah anda sering menggunakan social media?	Sosmed
		Apakah anda sering berbelanja online?	Shopping
		Apakah anda memiliki lebih dari 5 akun social media pada smartphone anda?	Akun

Table 2:- Table of criteria, questions and core clauses used.

From each table above each criterion, there are four questions that the user must answer with the Yes / No answer. Each question has a core clause that will later be used in the search process on the rule base that will be built. Each characteristic can only be combined with the characteristic itself so that the results obtained are of certainty. The core clause of the table above criteria can only be combined with a range of prices. There are three price classes including low 0 - 1,000,000, medium 1,000,000 - 2,000,000 and high in 2,000,000 - 3,000,000 .

The following is the *rule base* used:

- IF** Travell AND Game AND Video AND Photography AND Price_1 THEN Hobby AND Price_low
- IF** Travell AND Game AND Video AND Photography AND Price_2 THEN Hobby And Price_medium
- IF** Travell AND Game AND Video AND Photography AND Price_3 THEN Hobby AND Price_high

4. **IF** Meeting AND Features AND E-mail AND Reading AND Price_1 THEN Job AND Price_low
5. **IF** Meeting AND Features AND E-mail AND Reading AND Price_2 THEN Job AND Price_Medium
6. **IF** Meeting AND Features AND E-mail AND Reading AND Price_2 THEN Job AND Price_high
7. **IF** Connection AND Social Media AND Shopping AND Account AND Price_1 THEN Job AND Price_low
8. **IF** Connection AND Social Media AND Shopping AND Account AND Price_2 THEN Job AND Price_medium

9. **IF** Connection AND Social Media AND Shopping AND Account AND Price_3 THEN Job AND Price_high

➤ *Implementation of the Method in Web Applications*

In this study also built a web-based application system to facilitate users in conducting the survey process. Web applications are built using the PHP programming language with a Code Igniter framework and Mysql database

An overview of the system can be seen in the following activity diagram :

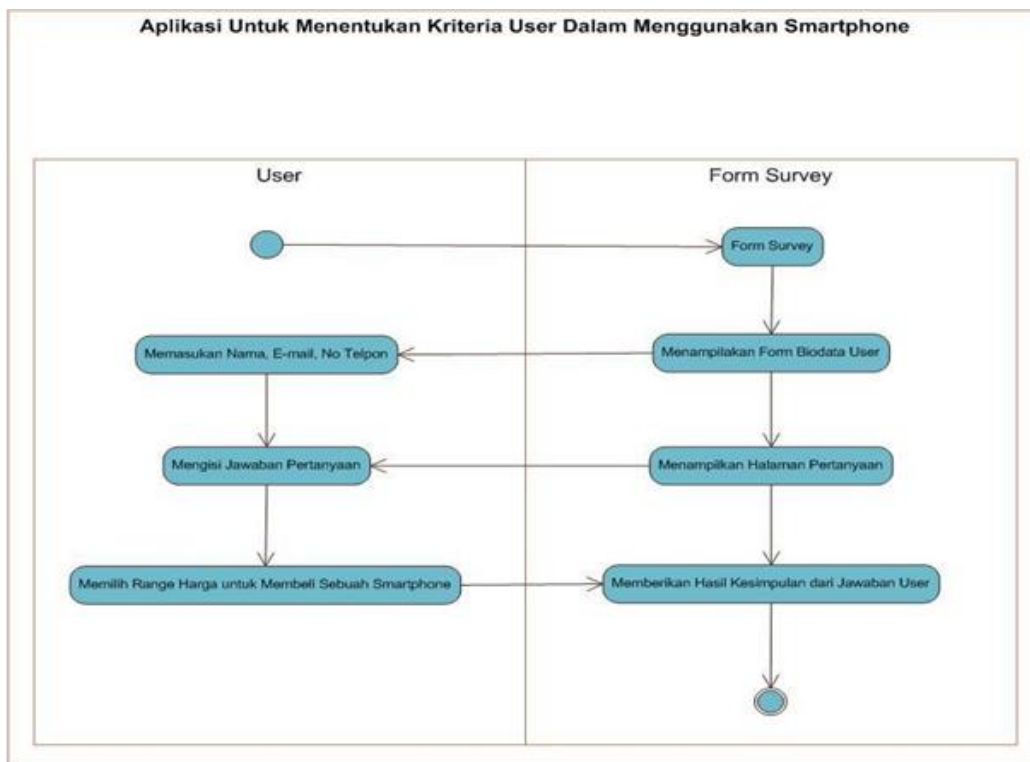


Fig 2:- Sequence Diagram of Survey Menu



Fig 3:- Main Page Web Application

Fig 4:- User Data Page

No	Pertanyaan	Jawaban
1	Apakah anda sering berpergian jauh?	<input type="radio"/> Yes <input type="radio"/> No
2	Apakah anda suka bermain game?	<input type="radio"/> Yes <input type="radio"/> No
3	Apakah anda suka menonton video?	<input type="radio"/> Yes <input type="radio"/> No
4	Apakah anda menyukai fotografi?	<input type="radio"/> Yes <input type="radio"/> No

Fig 5:- Sample Question Page

➤ *Testing*

Method testing is done by selecting the dataset that has been collected previous. Meccanism testing is done in 2 ways namely, through the process of eliminating data that does not fit into the criteria in the forward chaining method and IF Then testing process. Based on research conducted, obtained the following data. The results of the data below are data that has been tested and adjusted to the rulebase that has been built. The testing process by tracing the survey answers starts from the right with the IF Then formula. From the number of respondents as much as 50 data, the data shown below is data that is in accordance with the research conducted which has 1 main criterion.

The data below is data that has been tested using a rule base that has been built. The results of the data collection are as follows:

No	Nama	Kriteria	Rule Base	Hasil Akhir
1.	Person 1	Job	IF Rapat AND Fitur AND E-mail AND Reading AND Price_2 THEN Job AND Price_high	Job High
2.	Person 2	Job	IF Rapat AND Fitur AND E-mail AND Reading AND Price_2 THEN Job AND Price_Medium	Job Med
3.	Person 3	Hobby	IF Travel AND Game AND Video AND Fotografi AND Price_3 THEN Hobby AND Price_high	Hobby High
4.	Person 4	Sosial Networking	IF Koneksi AND Sosmed AND Shopping AND Akun AND Price_2 THEN Sosial Networking AND Price_medium	Sosial Networking Med

5.	Person 5	Hobby	IF Travel AND Game AND Video AND Fotografi AND Price_3 THEN Hobby AND Price_high	Hobby High
6.	Person 6	Hobby	IF Travel AND Game AND Video AND Fotografi AND Price_3 THEN Hobby AND Price_high	Hobby High
7.	Person 7	Sosial Networking	IF Koneksi AND Sosmed AND Shopping AND Akun AND Price_2 THEN Sosial Networking AND Price_medium	Sosial Networking High
8.	Person 8	Hobby	IF Travel AND Game AND Video AND Fotografi AND Price_3 THEN Hobby AND Price_med	Hobby Med
9.	Person 9	Sosial Networking	IF Koneksi AND Sosmed AND Shopping AND Akun AND Price_2 THEN Sosial Networking AND Price_medium	Sosial Networking Med
10.	Person 10	Hobby	IF Travel AND Game AND Video AND Fotografi AND Price_3 THEN Hobby AND Price_high	Hobby High
11.	Person 11	Hobby	IF Travel AND Game AND Video AND Fotografi AND Price_3 THEN Hobby AND Price_high	Hobby High
12.	Person 12	Sosial Networking	IF Koneksi AND Sosmed AND Shopping AND Akun AND Price_2 THEN Sosial Networking AND Price_high	Sosial Networking High
13.	Person 13	Hobby	IF Travel AND Game AND Video AND Fotografi AND Price_3 THEN Hobby AND Price_Med	Hobby Med
14.	Person 14	Hobby	IF Travel AND Game AND Video AND Fotografi AND Price_3 THEN Hobby AND Price_high	Hobby High
15.	Person 15	Job	IF Rapat AND Fitur AND E-mail AND Reading AND Price_2 THEN Job AND Price_Medium	Job Med
16.	Person 16	Hobby	IF Travel AND Game AND Video AND Fotografi AND Price_3 THEN Hobby AND Price_high	Hobby High
17.	Person 17	Job	IF Rapat AND Fitur AND E-mail AND Reading AND Price_2 THEN Job AND Price_Medium	Job Med
18.	Person 18	Job	IF Rapat AND Fitur AND E-mail AND Reading AND Price_2 THEN Job AND Price_High	Job High
19.	Person 19	Hobby	IF Travel AND Game AND Video AND Fotografi AND Price_3 THEN Hobby AND Price_Med	Hobby Med
20.	Person 20	Hobby	IF Travel AND Game AND Video AND Fotografi AND Price_3 THEN Hobby AND Price_high	Hobby High
21.	Person 21	Hobby	IF Travel AND Game AND Video AND Fotografi AND Price_3 THEN Hobby AND Price_Med	Hobby Med

Table 3:- Data Testing Table

III. RESULTS AND DISCUSSION

Based on the research results described above, then the second questionnaire was distributed to ensure conclusions generated by the forward chaining method and test data have the same final conclusions by the user. The second questionnaire obtained the following results:

No	Name	Final Criteria	Result
1.	Person 1	Job High	Agree
2.	Person 2	Job Med	Agree
3.	Person 3	Hobby High	Agree
4.	Person 4	Sosial Networking Med	Agree
5.	Person 5	Hobby High	Agree
6.	Person 6	Hobby High	Agree
7.	Person 7	Sosial Networking High	Agree
8.	Person 8	Hobby Med	Disagree
9.	Person 9	Sosial Networking Med	Agree
10.	Person 10	Hobby High	Agree
11.	Person 11	Hobby High	Agree
12.	Person 12	Sosial Networking High	Agree
13.	Person 13	Hobby Med	Agree
14.	Person 14	Hobby High	Agree
15.	Person 15	Job Med	Agree
16.	Person 16	Hobby High	Disagree
17.	Person 17	Job Med	Agree
18.	Person 18	Job High	Disagree
19.	Person 19	Hobby Med	Agree
20.	Person 20	Hobby High	Agree
21.	Person 21	Hobby Med	Agree

Table 4:- Results and Discussion

From the above data it can be concluded into the calculation formula for accuracy, as follows:

$$\text{Accuration Value} = \frac{n \sum \text{match}}{\sum \text{tp}} \times 100$$

$\sum \text{match}$ = The correct number of classifications

$\sum \text{tp}$ = Amount of testing data [16]

Then based on the formula above accuracy, the results of the accuracy of this study become:

$$\frac{19}{21} \times 100\% = 90\%$$

21

IV. CONCLUSION

Based on data obtained from this study, the conclusion is:

- Research using the forward chaining method after testing the data and testing on the main system gets high accuracy results. The level of accuracy is obtained from the end result of the user answers when answering the questionnaire and compared to the rulebase that has been built.
- The forward chaining method used gives a very accurate final result.

REFERENCES

- [1]. e-Marketer, "Over half of mobile phone users globally will have smartphones in 2018," Strategy Analytic, 11 December 2014. [Online]. Available: <https://www.emarketer.com>. [Accessed 10 May 2017].
- [2]. D. W. Ningrum, "20% Pengguna Smartphone di Indonesia Rakus Konsumsi Data," Tekno Indonesia, 4 December 2015. [Online]. Available: <http://www.liputan6.com>. [Accessed 4 May 2017].
- [3]. Vserv, "Vserv unveils the first Smartphone User Persona Report (SUPR) in Indonesia," Vserv, 24 November 2015. [Online]. Available: <http://www.vserv.com>. [Accessed 10 May 2017].
- [4]. H. Mayasar, "Analisis Perilaku Pembelian Ponsel Cerdas Antara Kebutuhan dan Gaya Hidup Konsumen di Kota Padang," Jurnal Manajemen dan Kewirausahaan, vol. 3, no. ISSN : 2086 - 5031, pp. 1-10, 2012.
- [5]. S. Hartin, "Perilaku Pembelian Smartphone: Analisis Brand Equity dan Brand Attachment," Jurnal Mitra Ekonomi dan Manajemen Bisnis, vol. 3, no. ISSN 2087-1090, pp. 5-15, 2012.
- [6]. A. E. P. S. S. Ian Gatra Sandika, "Penentuan Karakteristik Pengguna Sebagai Pendukung

- Keputusan," in Prosiding Snatif, Yogyakarta, 2014.
- [7]. L. H. Maria Bellanar Ismiati, "Sistem Pendukung Keputusan Pemilihan Gadget Berdasarkan Karakteristik Dan Budget Pengguna," in Konferensi Nasional Teknologi Informasi dan Komunikasi (KNASTIK), Yogyakarta, 2016.
- [8]. [8] E. M. Zeraida Wele, "Penerapan Metode Forward Chaining Dengan Teknik Representasi Rule Base Reasoning Untuk Diagnosa Kerusakan Mobil Berbasis Android," Penerapan Metode Forward Chaining Dengan Teknik Representasi Rule Base Reasoning Untuk Diagnosa Kerusakan Mobil Berbasis Android, pp. 1-4.
- [9]. M. Z. S. Ishak, "Rule Base Expert System Dengan Metode Forward Chaining Untuk Memprediksi Kualitas Kain Batik," Jurnal Ilmiah Sains dan Komputer (SAINTIKOM), Vols. -, no. ISSN : 1978-6603, pp. 1-6, 2015.
- [10]. I. Hidayatulloh and M. Z. Naf'an, "Metode MOORA dengan Pendekatan Price-Quality Ratio Untuk Rekomendasi Pemilihan Smartphone," in Prosiding SINTAK 2017, Semarang, 2017.
- [11]. K. Hinkelmann, "Example OF A Declarative Knowledge Base," in Forward Chaining vs. Backward Chaining, Northwestern Switzerland, Kerber, 2004, pp. 2-10.
- [12]. P. A. Auliani, "Hasil Riset Google Mengenai Penggunaan "Smartphone di Indonesia"," Kompas Tekno, 19 November 2015. [Online]. Available: <http://Kompastekno.com>. [Accessed 1 June 2017].
- [13]. B. Kartika, "Tech In Asia," Baidu Indonesia, 2 December 2014. [Online]. Available: <http://techinasia.com>. [Accessed 20 October 2017].
- [14]. W. Mitra, "Dengan Fitur Our Mobile Planet dari Google Anda Bisa Melihat Banyak Data Industri Mobile," Our Mobile Planet By Google, 24 September 2014. [Online]. Available: <http://educationstartupentrepreneur.com>. [Accessed 20 October 2017].
- [15]. Y. Paragian, "Kondisi Pasar Smartphone Indonesia," Tech In Asia, 12 December 2013. [Online]. Available: <http://techinasia.com>. [Accessed 21 October 2017].
- [16]. N. Syafitri, "PERBANDINGAN METODE K-NEAREST NEIGHBOR (KNN) dan METODE NEAREST CLUSTER CLASSIFIER (NCC) DALAM PENGKLASIFIKASIAN KUALITAS BATIK TULIS," Jurnal Teknologi Informasi dan Pendidikan, vol. 2 No 1, no. ISSN : 2086 – 4981, pp. 45-47, 2010.