
Implementation MFEP Method in Developing Recommendation System for *Program Keluarga Harapan (PKH) Recipients*

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ABSTRACT

Poverty occurs because of the imbalance between unlimited human needs and limited resources. This results in a lack of income to meet basic living needs. The Indonesian government's efforts to alleviate poverty include providing assistance to the poor or underprivileged with assistance called Social Assistance, one of which is the Program Keluarga Harapan (PKH). Problems often occur in determining who is entitled to receive PKH assistance. The conventional selection process is considered inefficient because it requires a long process and the influence of the committee's subjectivity in the assessment, the criteria used in the survey are not in accordance with government regulations and the limited quota of total PKH recipients, so there are still people who do not receive PKH even though they meet the criteria. This research uses the Multi Factor Evaluation Process (MFEP) method. System testing uses the black box method and Boundary Value Analysis techniques which focus on finding system errors. To test the system's accuracy by comparing the MFEP process from the system results and facts based on PKH recipients in 2022 and producing an accuracy value of 91%.

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INTRODUCTION

Poverty occurs because of the imbalance between unlimited human needs and limited resources. This results in a lack of income to meet basic living needs. Community welfare is one aspect of primary concern for the government (Parawangi & Wahid, 2023). According to the National Statistics Agency, the number of poor people in Indonesia in March 2024 was 25.22 million people or 9.03%. One of the causes of this condition is the impact of the economic recession that occurred and the high unemployment rate (Umasugi et al., 2024). Efforts to improve the economic conditions of weak communities towards economic stability with the aim of reducing poverty rates in Indonesia are known as poverty alleviation (Nata & Apridonal, 2020). Indonesian government uses two approaches to address poverty: helping families and community groups experiencing temporary poverty and helping

people living in long-term poverty by preventing new poverty (Putri et al., 2022). The government's efforts to alleviate poverty include providing assistance to the poor or underprivileged with assistance called Social Assistance, one of which is the *Program Keluarga Harapan* (PKH). This program is also called Conditional Cash Transfers (CCT) (Sari et al., 2024).

There are two objectives PKH, for short term by helping to ease the burden of expenditure on very poor families and in the long term is to break the chain of poverty and improve the quality of human resources. These objectives also support efforts to accelerate Millennium Development Goals achievement targets (Rohmi, 2022). PKH is a government assistance in the form of conditional cash that will be given to poor households. With PKH assistance, poor families are expected to be able to utilize basic social assistance for health, education, and nutritious food. (Saputra et al., 2022).

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People who wish to apply for assistance are required to follow the requirements set by the program with the provision that aid recipients are poor households that meet the BPS criteria and meet the requirements (Khasanah, 2023). There are differences in the criteria used by PKH and other aid programs, resulting in discrepancies in determining the priorities of the components of poor households that are participants or referred to as beneficiary families (Sasmita et al., 2021). The problem that often occurs is that selection is still carried out conventionally, so it takes a long time and participant selection can be influenced by the committee's objective assessment. The criteria for PKH recipients surveyed did not use government provisions and the total quota of recipients was limited, so there were still poor families who did not receive assistance (Pangestu, 2022). This condition also still occurs in Dagen Village, Karanganyar Regency, which is a case study in this research.

From the existing problems, it is necessary to create a decision support system that functions to facilitate and accelerate the village officials in selecting prospective aid recipients so that they are objective and on target. The system created aims to assist the committee in Dagen Karanganyar Village and minimize the level of public misunderstanding of the aid distribution steps taken by the committee. Decision Support System (DSS) is a system that has ability to provide semi structured and unstructured decisions (Sukanto et al., 2023). One of the systems implemented by DSS is where system is included in an interactive system that can help in decision making based on the data and methods used (Jannah et al., 2023). DSS is also part of an information system that is useful for helping in making decisions based on simple, easy and controllable considerations in order to achieve goals in solving a problem (Nasri et al., 2024).

The DSS developed in this research uses the MFEP method. MFEP method was chosen because it can calculate the value of the weight for each attribute, and can determine the best alternative choice through a ranking process. (Ersa et al., 2022). MFEP has predetermined calculations and calculations which are then weighted according to needs and are carried out subjectively and intuitively by considering several factors that influence the determination of aid recipients (Rubiyanto et al., 2023). The MFEP method is also called a scale score which requires a comparison norm so that it can be interpreted qualitatively and this is what makes the MFEP method an advantage (Warnilah et al., 2020). DSS was developed on a progressive web basis so that its appearance can be adjusted when accessed using a smartphone (Hasibuan et al., 2022).

The research results in a journal form written by Musaddad and Kriswibowo compared the results of PKH Big Data by SIKS-NG and machine learning based on the same poverty measurement data and indicators. 14 variables are used to determine the criteria for poor households and if at least 9 variables

are met, they can be categorized as poor households. From the results of the comparison of the two methods, it was concluded that Machine Learning with the Averaged Neural Network algorithm model which has a high level of accuracy can be an alternative recommendation for automatic decision making and innovative management practices (Musaddad & Kriswibowo, 2021). Scientific articles published in journal form by Ramadhani and Supriyanto produced DSS using a combination of AHP and promethee methods to determine recipients of PKH social assistance in Karanganyar Gunung Village, Candisari District, Semarang, Indonesia. A total of 14 criteria were used based on the Indonesian *Badan Pusat Statistik* (BPS). This research does not create or develop a computerized system, it only performs calculations using the two specified methods. The final result of the calculation is the order of residents who are entitled to social assistance (Supriyanto & Ramadhani, 2022). The results of the research presented in the proceedings by Ammar Ma'rif et al created a DSS to compare the C4.5 method with K-means to determine the eligibility of PKH assistance recipients. This research uses 11 criteria for calculations in both methods. From the comparison results, it was concluded that the C4.5 method was better than K-Means with an accuracy of 75% compared to 31% (Ma'rif et al., 2023).

This research uses 7 criteria, each of which has a value or sub-criterion and weight. The seven criteria include: house floor area, house floor type, house wall type, drinking water source, fuel for cooking, household head income, and highest education of family head. Alternatives or potential social assistance recipients are input by the user, so the number of alternatives is not determined by the system. From the system calculation results using the MFEP method, an accuracy test was then carried out by comparing data on PKH aid recipients in 2022.

RESEARCH METHOD

Several stages of research that will be carried out, system requirements that will be created and also problem solving of determining the priority of Beneficiary Family components as PKH targets using the MFEP method is presented in Figure 1.

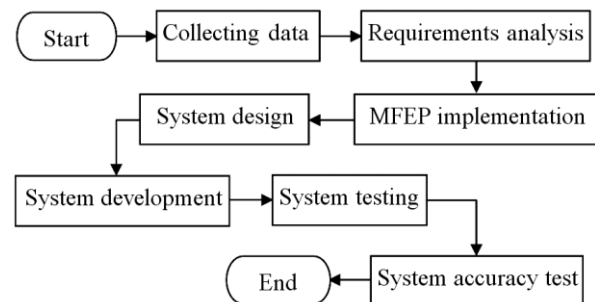


Figure 1. Research Flow

1. Collecting Data

There are two kinds of data collection methods, namely

interviews and documentation. Interviews with PKH committee at Dagen Village Karanganyar to determine criteria weight value as well as alternative values for each criterion. The interview results are in the form of alternative data, criteria, and criteria weights for PKH assistance recipients.

2. Requirements Analysis

The scope of the system requirements analysis stages is as follows:

- a. Divide the authority into 2 (two) parts, they are: admin to manage data and users to input data which will later be processed and the results can help users in determining the choice of PKH aid recipients according to the criteria.
 - b. The required tools used in system development are: PHP programming language, MySQL database, XAMPP web server, and Visual Studio (Code Editor).
- ## 3. MFEP Method Implementation
- There are 7 criteria used in the research and were obtained from interviews with Dagen Karanganyar Village employees assisted by an investment expert in determining weights using a value interval of 10-100. The seven criteria and their weights are presented in table 1.

Code	Criteria	Weight
C-1	House floor area (m ²)	
	1. > 250 m ²	10
	2. 101-250 m ²	50
	3. 40-100 m ²	75
	4. <40 m ²	100
C-2	House floor type	
	1. Ceramics	10
	2. High quality wood/board	30
	3. Low quality wood/board	50
	4. Bamboo	75
	5. Ground base	100
C-3	House wall type	
	1. Good wall	10
	2. Plastered wall	30
	3. Brick wall	50
	4. Wooden board	75
	5. Bamboo woven	100
C-4	Drinking water source	
	1. Packaged water	10
	2. PDAM water	30
	3. Artesian well	50
	4. Conventional well	75
	5. River/spring water	100
C-5	Total children	
	1. 1	10
	2. 2	30
	3. 3	50
	4. 4	75
	5. > 4	100
C-6	Household head income	
	1. > IDR 3.500.000	10
	2. IDR 2.500.000 – 3.500.000	30

3. IDR 1.500.000 – 2.500.000	50
4. IDR 1.000.000 – 1.500.000	75
5. < IDR 1.000.000	100
C-7 Highest education of family head	
1. Diploma/bachelor	10
2. High school/equivalent	30
3. Junior high school/equivalent	50
4. Elementary school/equivalent	75
5. Not completed in primary school	100

Source: (Observation results, 2024)

For example, calculation, 7 alternatives (potential PKH recipients) are presented. Alternative data classification and weight values are presented in table 2.

Table 2. Alternative Data Classification And Weight

Alternative	C-1	C-2	C-3	C-4	C-5	C-6	C-7
Samiyem	100	75	100	75	75	75	100
Leman	75	75	75	75	100	50	100
Suyatmi	75	75	50	100	100	75	100
Harjosemito	75	50	50	75	100	75	75
Sugiyatmi	100	75	75	75	100	75	50
Suyono	75	50	75	100	50	75	75
Sutarno	75	100	50	75	100	100	50

The next step is to create preference weights, at this calculation stage the data can be used to calculate each input criteria weight from the user and at the final stage to determine PKH recipients based on the MFEP method. Some data was taken from people who had entered user input weight values by answering a questionnaire in the DSS application to calculate user preference weights.

Criteria	Selected	Weight
C-1	<40 m ²	100
C-2	High quality wood/board	30
C-3	Good wall	10
C-4	Conventional well	75
C-5	3	50
C-6	IDR 1.000.000 – 1.500.000	75
C-7	High school/equivalent	30
Total		370

The next step is the calculation process using the MFEP method, which starts with determining the factor weight values as below.

$$\text{Factor weight formula: } FW = \frac{x}{\sum x} \quad (1)$$

(Dewi et al., 2023)

$$FW \text{ C-1} = \frac{100}{370} = 0.27 \quad FW \text{ C-2} = \frac{30}{370} = 0.081$$

$$FW \text{ C-3} = \frac{10}{370} = 0.027 \quad FW \text{ C-4} = \frac{75}{370} = 0.203$$

$$FW \text{ C-5} = \frac{50}{370} = 0.135 \quad FW \text{ C-6} = \frac{75}{370} = 0.203$$

$$FW \text{ C-7} = \frac{30}{370} = 0.081$$

Next, the classification of alternative data from the results of table 3 is multiplied by each factor

weight and then added up. From these calculations, evaluation weights for each alternative are obtained which are presented in table 4.

Table 4. Evaluation Weight Calculation

	A-1	A-2	A-3	A-4	A-5	A-6	A-7	weight
C-1	100	75	75	75	100	75	75	0.27
C-2	75	75	75	50	75	50	100	0.081
C-3	100	75	50	50	75	75	50	0.027
C-4	75	75	100	75	75	100	75	0.203
C-5	75	100	100	100	100	50	100	0.135
C-6	75	50	75	75	75	75	100	0.203
C-7	100	100	100	50	50	75	50	0.081
weights	85.1	66.8	74	80.7	83.1	75	79	

From the evaluation weight calculations results in table 4, a descending alternative sequence can be created. In this study, alternatives with an evaluation weight value ≥ 75 will be determined as PKH recipients.

Table 5. Evaluation Weight Calculation

Ranking	Alternative	Evaluation Weights
1	Samiyem	85.1
2	Sugiyatmi	83.1
3	Harjosemito	80.7
4	Sutarno	79
5	Suyono	75
6	Suyatmi	74
7	Leman	66.8

From the ranking results and evaluation weight values in table 5, there are 2 alternatives whose weight is < 75 and are not entitled to receive PKH. Alternatives who are not entitled to receive PKH assistance because their score is < 75 are Suyatmi and Leman.

RESULTS AND DISCUSSION

1. System Design

The developed system flowchart is presented in Figure 2.

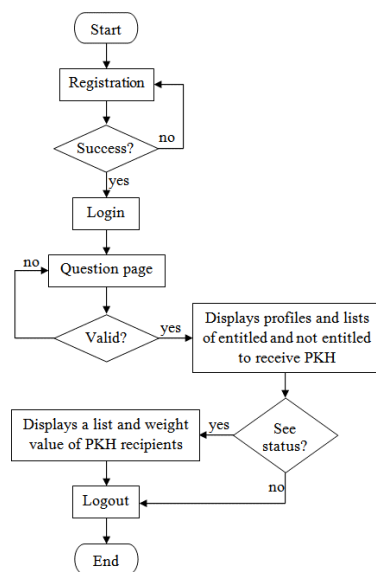


Figure 2. System Flowchart

The developed system flow starts from user

having to register to be able log in. After user successfully logs in, and will enter question page and user is required to answer all the questions. After completing all the questions, will be directed to profile page where user profile contains the data that has been entered and information that must be eligible to receive PKH. Users can also see the list and ranking of all PKH recipients.

User or public access rights in the system include being able to register, log in, view dashboard pages, input data and also view ranking results. Access rights for the committee or admin can login, view the dashboard, view ranking results and also be able to manage data which includes adding, changing and deleting data. The processes that can be carried out by both actors (user and admin) are depicted in the use case diagram presented in Figure 3.

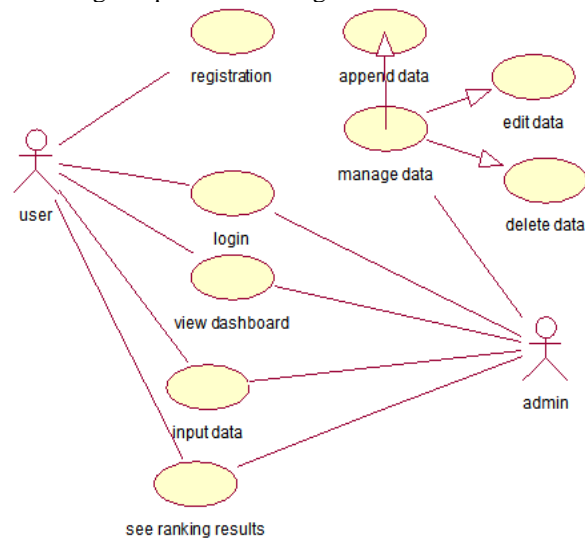


Figure 3. Use Case Diagram

There are five tables required in developing this system which are depicted in the form of a class diagram as shown in Figure 4.

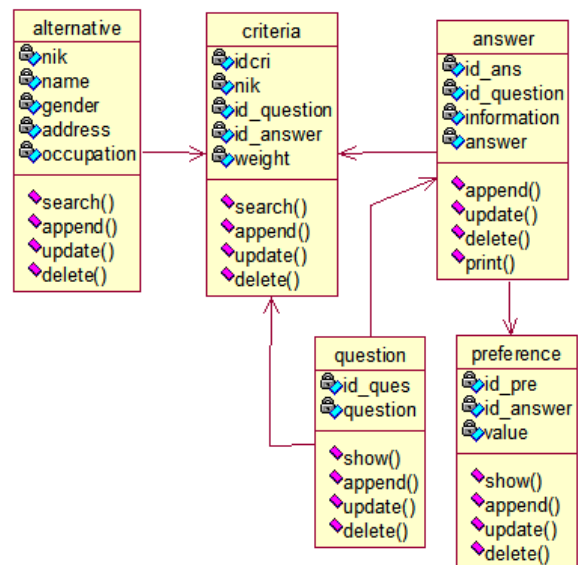


Figure 4. Class Diagram

2. System Development

Development system is translating the design stage based on analysis results into a language that is understood by system, as well as the software in real conditions. Software used to develop a PKH recipient recommendation system includes: Windows 10, XAMPP, VS Code, and Crome. Hardware that has been developed for this system includes Dell Notebook PC, Intel Core i7 Gen 5, 8GB RAM, 512GB SSD, Nvidia MX130 2GB.

Registration is a registration process that must be done by the user if they do not have an account. Figure 5 is a registration page that contains several inputs., namely NIK, password, full name, occupation and proof of the user's salary slip. After registering, the user will be able to enter the system.

The registration form contains the following fields and values:

- NIK: 3313115705610004
- Password: [masked]
- Cek Password: [masked]
- Nama Lengkap: SUGIYATMI
- Pekerjaan: Ibu Rumah Tangga
- Bukti Slip Gaji: Choose File | Slip_sugiyatmi.jpg

Buttons: Registrasi, Kembali

Figure 5. Registration Form

User profile is a question page given to users or people who will register as PKH assistance recipients. The list of questions provided is the criteria used in calculating the MFEP method. The user profile display and list of questions that must be answered by the user are presented in Figure 6.

The question page displays the following questions:

- Luas Lantai Bangunan Tempat Tinggal (m2)?
 - > 250 m2
 - 101 - 250 m2
 - 40 - 100 m2
 - < 40 m2
- Jenis lantai tempat tinggal?
 - Keramik
 - Kayu/papan kualitas tinggi
 - Kayu/papan kualitas rendah
 - Bambu
 - Tanah
- Jenis dinding tempat tinggal?

Figure 6. Profile or Question Page Display

After answering all questions in figure 6 display then user will save all answer and system will

display proof of pay slip, answers or data that has been filled in by user and a statement or information so that user can know that the application has been registered in prospective PKH recipients list. The user answers and uploaded files display is presented in figure 7.

The answer results display shows the following table:

No	Pertanyaan	Jawaban
1	Luas Lantai Bangunan Tempat Tinggal (m2)?	< 40 m2
2	Jenis lantai tempat tinggal?	Bambu
3	Jenis dinding tempat tinggal?	Bambu
4	Sumber air minum?	Sumur
5	Bahan bakar untuk memasak?	Arang
6	Penghasilan kepala rumah tangga?	201.000 - 300.000
7	Pendidikan tertinggi kepala keluarga?	Tidak bersekolah

Keterangan: Anda dinyatakan lolos dalam tahap administratif Program PKH dari pemerintah karena hasil dari jawaban yang sudah anda isi lebih dari 75 yaitu sebesar 90, kami dari pihak pemerintah akan mengpeki data-data yang anda masukkan sesuai atau tidak. Jika terjadi kesalahan kami dari pemerintah akan membatalkan PKH kepada keluarga anda. Dari kami mengucapkan terima kasih.

Figure 7. User Answer Results Display

Ranking results are PKH aid recipients results. This page shows who received PKH according to data that has been filled in on the question page. The PKH aid recipients list include NIK, name, grades and rankings is presented in Figure 8.

NIK	Nama	Bobot	RANK
3313114912550002	MARDIONO	88,6	1
3313115010810001	RUKMINI	87,4	2
3313116812740002	SAMIYEM	85,1	3
3313115705610004	SUGIYATMI	83,1	4
3313116602610003	HARJOSEMITO	80,7	5
3313116507720004	SUTARNO	79	6
3313115106740001	SUYONO	75	7

Figure 8. PKH Recipient Ranking Display

3. System Testing

Testing on this system uses Black Box testing which aims to observe the results of the application that has been developed without having to see the code structure of the application. The technique used is Boundary Value Analysis which focuses on finding errors from outside or inside the software.

Table 5. Evaluation Weight Calculation

Modul	Procedure	Input	Output	Result
register	input user profile	user profile	data saved successfully	valid
login	login to system	NIK and password	system successfully	valid
profile	answer all	user	data saved	valid

questions select the ranking menu	answer click menu	successfully displays ranking results	valid
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4. System Accuracy Test

Table 6. Evaluation Weight Calculation

Alternative	Result	
	System	Reality
Mardiono	Accepted	Accepted
Rukmini	Accepted	Accepted
Samiyem	Accepted	Accepted
Sugiyatmi	Accepted	Accepted
Harjosemito	Accepted	Accepted
Sutarno	Accepted	Accepted
Suyono	Accepted	Accepted
Suyatmi	Unaccepted	Accepted
Leman	Unaccepted	Unaccepted

In comparing system results ranking and the facts contained in table 6, comparative data is obtained from which the accuracy value will be calculated. To calculate the accuracy value using the equation:

$$\text{accuracy} = \frac{\text{appropriate data}}{\text{data amount}} \quad (2)$$

(Firasari et al., 2020)

From the equation above, user accuracy data is obtained, with following calculations:

Total appropriate data = 224

Data amount = 247

$$\text{accuracy} = \frac{224}{247} = 91\%$$

The accuracy value of 91% indicates that system results are in accordance with reality. There were several discrepancies (9%), the causes of which included rankings having different weights based on data entered by users and the results of interviews with the committee.

CONCLUSION

The problem that often occurs is that selection is still carried out conventionally, so it takes a long time and participant selection can be influenced by the committee's objective assessment. The criteria for PKH recipients surveyed did not use government provisions and the total quota of recipients was limited, so there were still poor families who did not receive assistance. This condition also still occurs in Dagen Village, Karanganyar Regency, which is a case study in this research. This research uses 7 criteria, each of which has a value or sub-criterion and weight. The seven criteria include: house floor area, house floor type, house wall type, drinking water source, fuel for cooking, household head income, and highest education of family head.

From the test results using MFEP method, the best results were obtained so that it can help the PKH assistance recipient selection committee in determining PKH assistance recipients. Proven in the accuracy test

that has been explained, it states that the system submission to 247 users by comparing it with reality, it was found that 224 users were in accordance with reality, where the system can work as expected. So, the accuracy value from comparing reality with the system obtained an accuracy value of 91% and this was considered very good so that the system could be used as intended. In this system, if the value is <75%, user will automatically not be on the PKH recipient list, and if user is included in the PKH recipient list.

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