International Journal of Information System & Technology
Akreditasi No. 158/E/KPT/2021 | Vol. 5, No. 5, (2022), pp. 548-555

# Decision Making System on The Selection of Gypsum According To User Demand Using Sugeno Method

*Yosdarso Afero*

*Informatics Management, Akademi Manajemen Informatika Dan Komputer Kosgoro, Solok, West Sumatra, Indonesia*

*yosfero@gmail.com*

***Abstract***

*Gypsum is a ceiling that is often used by many people for housing parts that are on the ceiling of the house which serves to limit the height of a house or building that is useful for security, security and beauty in a room. Everyone has a desire to have a good gypsum building to be comfortable when in the house. The problem in the research is the lack of user knowledge in determining a good form of gypsum and having resistance for a long period of time. The purpose of this study is to assist users in selecting gypsum according to the wishes of the user. This study uses a decision-making system using the Sugeno method using the AND operator. Fuzzy logic has four work steps to obtain a decision-making system. The final output results obtained a value of 1 which is in the Interest Decision.*

***Keywords:*** *Gypsum, Decision Making System, Fuzzy Logic, Sugeno Method*

## 1. Introduction

The ceiling is part of the building construction that functions as the ceiling of the building. Basically, the ceiling is made with the intention of preventing hot or cold weather from entering the house directly after passing through the roof. However, nowadays the ceiling is no longer just a barrier to heat or cold, but also as a decoration that will further enhance the interior of a building. Ceilings are usually made with a certain height. However, as a variation there are also those that are not always flat. This variation is known as a drop ceiling. The ceiling is made higher than the others. Ceiling materials are very diverse, from wood, multiplex, asbestos cement sheet, hardboard, softboard, acoustic tile, particle board, aluminum, to gypsum. The cheapest and best option is gypsum board, because maintenance is easy. Here are some of the advantages when choosing gypsum board.

The problem in the research is the user's lack of knowledge in determining a good form of gypsum and having resistance for a long period of time. The purpose of this study is to assist users in selecting gypsum according to the wishes of the user. Decision support system (DSS) is a system that is able to provideproblem solving and communication skills for problems with semi-structured and unstructured conditions. This system is used to assist decision making in semi-structured and unstructured situations, where no one knows for sure how decisions should be made . Erna Ningsih The Analytical Hierarchy Process (AHP) method is a decision-making method that can carried out using two frameworks, including decision making without experimentation, carried out by systematically compiling general working methods before looking for solutions to the expected problems [1]. According to Kusrini (2007), the purpose of the Decision Support System is

a) Assist managers in making decisions on semi-structured problems.
b) Provide support at the manager's discretion and not intended to replace manager function.
c) Increased productivity.

ISSN : 2580-7250

d) Competitive [2].

Decision making can be done in two frameworks, including:

a) Decision making without trial.
b) Decision making based on a test.

Decision-making without experimentation is carried out by systematically compiling the general way of working before looking for a solution to the expected problem. This theory developed in line with a statistical approach in which, in simple terms,generated is attempted to have the effect of the error as minimal as possible [3].[4] Fuzzy Logic is a problem solving system that fits within a system.Starting from small things, simple and widely spread. Can be used as a reference in problem solving to make a decision [1]. In classical logic it is stated that everything is binary, which means it has only twoprobability, “Yes or No”, “True or False”, “Good or Bad”, etc. By Therefore, all of these can have a membership value of 0 or 1. However, logically fuzzy allows the membership value to be between 0 and 1. That is, it can be a state has two values “Yes and No”, “True and False”, “Good and Bad”together, but its value depends on the weight of its membership. Fuzzy logic provides a simple way to arrive at a definite conclusion based on fuzzy, ambiguous, inaccurate, noisy, or missing input information. Fuzzy logic begins with the concept of fuzzy sets. Professor L. A. Zadeh is a scientist who discovered the science of fuzzy logic. Several reasons why people use fuzzy logic among others:
The concepts used in fuzzy logic are easy to understand.

a) Fuzzy is very flexible,
b) Fuzzy has a tolerance for existing data
c) Fuzzy logic can build and apply the experiences of
d) experts directly without having to go through the training process [5].

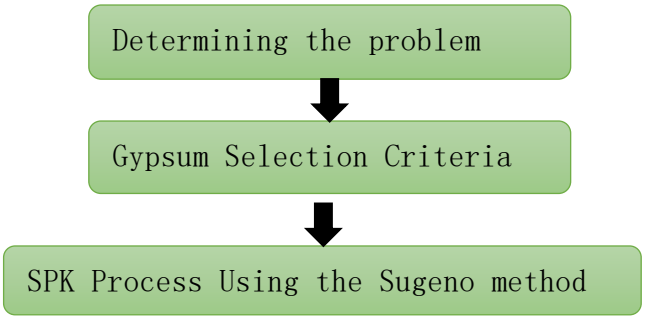
Fuzzy set theory is an extension of Boolean logic theory which states the level of numbers 1 or 0 or statements are true or false, while in fuzzy logic theory there are levels of value, namely:

1) One (1), which means that an itembecome a member of a group,
2) Zero (0), which means that an item is notbecome a member of a group [6].

Researcher Uroan (2019) said that Fuzzy Logic presents a trend for decision making, classification and prediction where problems can be formulated by mapping input variables with output variables or where simple solutions do not exist. There are three basic steps for a fuzzy inference system such as Fuzzification, rule evaluation and Defuzzification. Fuzzification means converting numeric values into linguistic values. Human intuition method is well received as a worldwide membership function value assignment method. Machine Fuzzy inference produces results after rule evaluation also in terms of linguistic value. All results were collected and defuzzified by the Defuzzification method [7].

## 2. Research Methodology

The stages in this research are determining the problem, selecting criteria, using a decision-making system using the Sugeno method, and designing the application display (user interface) so that it can be applied to making a decision support system for [8] gypsum selection.



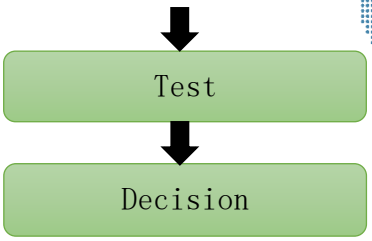



**Figure 1.** Research process

## 3. Results and Discussion

### 3.1. Fuzification

The design of the decision-making system for the selection of gypsum consists of four input variables and one output variable. The input variables consist of product brand, material thickness, size and price, while the output is a decision.

**Table 1.** Universe of Fuzzy Sets

| Function | Variable Name | Universe of Fuzzy Sets |
|---|---|---|
| Input | Product Brand | [0 100] |
| | Material Thickness | [6,5 12] |
| | Size | [0 80] |
| | Price | [0 100] |
| Output | Decision | [0 100] |

The following is a table of the fuzzy set of input and output variables used in this study along with the domain of the fuzzy set.

**Table 2.** Domains of Fuzzy Sets

| Function | Variable Name | Set | Universe of Fuzzy Sets | Domain |
|---|---|---|---|---|
| Input | Product Brand | Very good | [0 100] | [75 85 100] |
| | | Good | | [60 75 80 ] |
| | | Quite good | | [0 50 65] |
| | Material Thickness | Very thick | [6-16] | 14 15 16] |
| | | Thick | | [10 12 14] |
| | | Thin | | [6.5 8 11] |
| | Size | Large | [0 80] | [50 60 80] |
| | | | | [35 45 55] |
| | | Small | | [0 30 40] |
| | Price | Low | [0 100] | [48 53 80] |
| | | Currently | | [80 90 95 ] |
| | | Tall | | [157 175 220 ] |
| Output | Decision | Not interested | [0] | [0] |
| | | Interest | [1] | [1] |

Source: Processed Data (2021)

The following is the formation of a fuzzy set of product brand variables:

$$\mu \text{ Quite good } [x] = \begin{cases} 1 & ; \quad x \leq 50 \\ \frac{60-x}{60-50} & ; \quad 50 \leq x \leq 60 \\ 0 & ; \quad x \geq 60 \end{cases}$$

$$\mu \text{ Good}[x] = \begin{cases} 0 & ; \quad x \leq 60 \text{ atau } \geq 80 \\ \frac{x-60}{70-60} & ; \quad 60 \leq x \leq 70 \\ \frac{80-x}{80-70} & ; \quad 70 \leq x \leq 80 \end{cases}$$

$$\mu \text{ Very Good } [x] = \begin{cases} 0 & ; \quad x \leq 75 \\ \frac{x-75}{85-75} & ; \quad 75 \leq x \leq 80 \\ 1 & ; \quad 85 \leq x \leq 100 \end{cases}$$

The following is the formation of the fuzzy set of Material Thickness Variables:

$$\mu \text{ Thin } [x] = \begin{cases} 1 & ; \quad x \leq 8 \\ \frac{11-x}{11-8} & ; \quad 8 \leq x \leq 11 \\ 0 & ; \quad x \geq 11 \end{cases}$$

$$\mu \text{ Thick}[x] = \begin{cases} 0 & ; \quad x \leq 10 \text{ atau } \geq 14 \\ \frac{x-10}{12-10} & ; \quad 10 \leq x \leq 14 \\ \frac{14-x}{14-12} & ; \quad 12 \leq x \leq 14 \end{cases}$$

$$\mu \text{ Very thick } [x] = \begin{cases} 0 & ; \quad x \leq 14 \\ \frac{x-14}{15-14} & ; \quad 14 \leq x \leq 15 \\ 1 & ; \quad 15 \leq x \leq 16 \end{cases}$$

The following is the formation of the fuzzy set of Size Variables:

$$\mu \text{ Small } [x] = \begin{cases} 1 & ; \quad x \leq 30 \\ \frac{40-x}{40-30} & ; \quad 30 \leq x \leq 40 \\ 0 & ; \quad x \geq 40 \end{cases}$$

$$\mu \text{ Currently}[x] = \begin{cases} 0 & ; \quad x \leq 35 \text{ atau } \geq 55 \\ \frac{x-35}{45-35} & ; \quad 35 \leq x \leq 45 \\ \frac{55-x}{55-45} & ; \quad 45 \leq x \leq 55 \end{cases}$$

$$\mu \text{ Currently}[x] = \begin{cases} 0 & ; \quad x \leq 50 \\ \frac{x-50}{60-50} & ; \quad 50 \leq x \leq 60 \\ 1 & ; \quad 60 \leq x \leq 80 \end{cases}$$

The following is the formation of a fuzzy set of Price Variables:

$$\mu \text{ Low } [x] = \begin{cases} 1 & ; \quad x \leq 53 \\ \frac{80-x}{80-53} & ; \quad 5\,3 \leq x \leq 90 \\ 0 & ; \quad x \geq 80 \end{cases}$$

$$\mu \text{ Currently } [x] = \begin{cases} 0 & ; \quad x \leq 85 \text{atau } \geq 95 \\ \frac{x-80}{90-80} & ; \quad 80 \leq x \leq 90 \\ \frac{95-x}{95-90} & ; \quad 90 \leq x \leq 95 \end{cases}$$

$$\mu \text{ Tall}[x] = \begin{cases} 0 & ; \quad x \leq 157 \\ \frac{x-157}{175-157} & ; \quad 157 \leq x \leq 175 \\ 1 & ; \quad 175 \leq x \leq 2200 \end{cases}$$

The shape of acomputations used in theory The fuzzy inference system is a rule andfuzzy set. Large share of value inputcrisp is entered into the FIS, then continued into the knowledge base and rules in the form of IF THEN.If the number ofrules is more than one theninference from the whole rule [9]. In the Sugeno method, the implication function used is Max. However, before entering the implication function, the rules are determined first. In general, rules are made by experts intuitively. Rules are qualitative statements written in if then form, so they are easy to understand.

**a. Composition Rules**

1) [R1] If the product brand is ENOUGH, and the material thickness is THIN, and the SIZE is SMALL, and the price is LOW, then the result of the decision is NOT INTEREST= 0
2) [R2] If the product brand is ENOUGH, and the material thickness is THIN, and the SIZE is SMALL, and the price is MEDIUM, then the result of the decision is NOT INTEREST= 0
3) [R3] If the product brand is ENOUGH, and the material thickness is THIN, and the SIZE is MEDIUM, and the project price is LOW, then the result of the decision is NOT INTEREST= 0
4) [R4] If the product brand is ENOUGH, and the material thickness is THIN, and the SIZE is MEDIUM, and the project price is MEDIUM, then the result of the decision is NOT INTEREST= 0
5) [R5] If the product brand is GOOD ENOUGH, and the material thickness is THIN, and the SIZE is SMALL, and the project price is LOW, then the result of the decision is NOT INTEREST= 0
6) [R6] If the Product Brand is GOOD, and the Material Thickness is THICK, and SIZE IS SMALL, and the Project Price is LOW, then the Decision Result is NOT INTEREST= 0
7) [R7] If the product brand is GOOD, and the thickness of the material is THICK and SIZE LUAS, and the price is MEDIUM, then the result of the decision is NOT INTEREST= 0
8) [R8] If the product brand is GOOD, and the material thickness is THICK and SIZE LUAS, and the price is MEDIUM, then the result of the decision is NOT INTEREST= 0
9) [R9] If the product brand is GOOD, and the thickness of the material is VERY THICK and the SIZE is LUAS, and the price is HIGH, then the result of the decision is NOT INTEREST= 0
10) [R10] If the product brand is VERY GOOD, and the thickness of the material is THICK and the SIZE is LUAS, and the price is HIGH, then the result of the decision is INTEREST = 1
11) [R11] If the product brand is quite good, and the thickness of the material is THIN and the SIZE is LUAS, and the price is MEDIUM, then the result of the decision is INTEREST = 1
12) [R12] If the product brand is GOOD, and the thickness of the material is THICK and SIZE LUAS, and the price is MEDIUM, then the result of the decision is INTEREST= 1
13) [R13] If the product brand is VERY GOOD, and the thickness of the material is THICK and the SIZE is MEDIUM, and the price is MEDIUM, then the result of the decision is INTEREST= 1
14) [R14] If the product brand is VERY GOOD, and the material thickness is THICK and SIZE LUAS, and the price is MEDIUM, then the result of the decision is INTEREST= 1
15) [R15] If the product brand is VERY GOOD, and the material thickness is THICK and SIZE LUAS, and the price is MEDIUM, then the result of the decision is INTEREST = 1
16) [R16] If the product brand is VERY GOOD, and the material thickness is VERY THICK and the SIZE is SMALL, and the price is MEDIUM, then the result of the decision is INTEREST= 1
17) [R17] If the Product Brand is VERY GOOD, and the Material Thickness is VERY THICK and MEDIUM SIZE, and the Price is EDANG, then the Decision Result INTEREST= 1

18) [R18] If the product brand is VERY GOOD, and the material thickness is VERY THICK and SIZE LUAS, and the price, then the result is LOW DECISION INTEREST= 1
19) [R19] If the product brand is VERY GOOD, and the material thickness is VERY THICK and SIZE LUAS, and the price is EDANG, then the result of the decision is INTEREST= 1

**b. Application Function Implication**

The resolution of the problem for the decision-making case in the Gypsum Selection, is as follows:

1. Input : Product Brand = 76, Material Thickness = 14, Size = 55, Price = 177. Look for the degree of membership of each variable.
   a. Product Brand, consisting of 3 fuzzy sets, namely very good, good and bad. If the product brand is known to be 76, then

| | |
|---|---|
| Very good[76] | = (c-x)/(c-b) |
| | = (80-75)/(80-70) |
| | = 4/10 |
| | = 0.4 |
| Good[76] | = (x-a)/(b-a) |
| | = (76-75)/(90-70) |
| | = 1/15 |
| | = 0.67 |
| Pretty good[76] | = 0 |

   b. Material Thickness, consisting of fuzzy sets, which are very thick, thick and thin. If the thickness of the material is 14, then

| | |
|---|---|
| Very total[14] | = (x-a)/(b-a) |
| | = (14-14)/(15-14) |
| | = 0/1 |
| | = 0 |
| Thickness[14] | = 0 |
| Thin[14] | = 0 |

   c. Size , consisting of fuzzy sets, namely area, medium and small, If the size is 55, then

| | |
|---|---|
| Very Thick[55] | = (c-x)/(c-b) |
| | = (55-55)/(55-45) |
| | = 0/10 |
| | = 0 |
| Thickness[55] | = (x-a)/(b-a) |
| | = (55-50)/(60-55) |
| | = 5/10 |
| | = 0.2 |
| Small[55] | = 0 |

   d. Price, consists of 3 fuzzy sets, namely low, medium, and high. If it is known that the price is 177 then

| | |
|---|---|
| Height[15] | = (c-x)/(c-b) |
| | = (220-177)/(220-175) |
| | = (43/45) |
| | = 0.9 |
| Medium[177] | = 0 |
| Low[177] | = 0 |

**c. Defuzzification**

$$z = \frac{(\alpha^1 * z^1) + (\alpha^2 * z^2) + (\alpha^3 * z^3) + (\alpha^4 * z^4)}{\alpha^1 + \alpha^2 + \alpha^3 + \alpha^4}$$

$$z = \frac{(0{,}4 * 1) + (1 * 0{,}67) + (1 * 0) + (1 * 0) + (1 * 0{,}2) + (1 * 0{,}9)}{0{,}4 + 0{,}67 + 0 + 0{,}2 + 0 + 0{,}9}$$

$$z = \frac{30{,}4 + 50{,}92 + 0 + 0 + 11 + 0{,}75 + 123{,}9}{2{,}17}$$

$$z = \frac{2{,}17}{2{,}17}$$

$$z = 1$$

The final step in solving problems in fuzzy logic is defuzzification of the fuzzy output resulting from the composition of the rules. The method used is the Centroid method. For that, we first calculate the moment for each area. Based on the results that have been obtained from foraging results, the results obtained are as large as 1 which is in the range of interests. If you want to get varied results, just enter each x value and it will produce the next output value.

## 4. Conclusion

Based on the final results of the selection of gypsum according to user needs using a decision-making system, In the selection of gypsum according to user needs, four input variables and one output variable are obtained. The input variables consist of Product Brand, Product Thickness, Size and Price, while the output is a decision of interest and not interest. The Sugeno method is able to solve the problem of choosing gypsum according to user needs and using the concept of a decision-making system. The search results for each value of x are product brand x76, material thickness 14, size x55 and price x177 with the final result of fusion with result 1 which is in the range of interest

## References

[1] K. Yusnitha *et al.*, "JEPIN (Jurnal Edukasi dan Penelitian Informatika) Sistem Pendukung Keputusan Pemilihan Wilayah Prioritas Intervensi Kegiatan Keluarga Berencana dengan Metode AHP-SMART," vol. 5, no. 1, pp. 99–105, 2019.

[2] S. Saefudin and S. Wahyuningsih, "Sistem Pendukung Keputusan Untuk Penilaian Kinerja Pegawai Menggunakan Metode Analytical Hierarchy Process (Ahp) Pada RSUD Serang," *JSiI (Jurnal Sistem Informasi)*, vol. 1, no. 1, pp. 33–37, 2017, doi: 10.30656/jsii.v1i0.78.

[3] . F. and S. D. H. Permana, "Sistem Penunjang Keputusan Pemilihan Sekolah Menengah Kejuruan Teknik Komputer Dan Jaringan Yang Terfavorit Dengan Menggunakan Multi-Criteria Decision Making," *Jurnal Teknologi Informasi dan Ilmu Komputer*, vol. 2, no. 1, p. 11, 2015, doi: 10.25126/jtiik.201521123.

[4] S. N. Rizki, "Fuzzy logic memprediksi tingkat kecelakaan kerja pada PT.Galang Kapal di kota Batam," *Digital Zone: Jurnal Teknologi Informasi dan Komunikasi*, vol. 9, no. 2, pp. 151–161, 2018, doi: 10.31849/digitalzone.v9i2.1980.

[5] S. N. Rizki and H. Tipa, "Implementasi Fuzzy Inference System Untuk Menentukan Tingkat Kriminalitas Di Kota Batam," *Digital Zone: Jurnal Teknologi Informasi dan Komunikasi*, vol. 10, no. 2, pp. 206–221, 2020, doi: 10.31849/digitalzone.v10i2.3090.

[6] J. Jufriadi, G. W. Nurcahyo, and S. Sumijan, "Logika Fuzzy dengan Metode Mamdani dalam Menentukan Tingkat Peminatan Tipe Motor Honda," *Jurnal Informatika Ekonomi Bisnis*, vol. 3, pp. 7–11, 2020, doi: 10.37034/infeb.v3i1.60.

[7] L. Auditya, C. Kartiko, and C. Wiguna, "Jurnal Edik Informatika Jurnal Edik Informatika," *Penelitian Bidang Komputer Sains dan Pendidikan Informatika*, vol. 7, no. 1, pp. 9–18, 2020.

[8] T. Noviyanti, "Sistem Penunjang Keputusan Dalam Penerimaan Beasiswa Ppa Menggunakan Metode Analytic Hierarchy Process (Ahp) (Studi Kasus: Universitas Gunadarma)," *Jurnal Ilmiah Teknologi dan Rekayasa*, vol. 24, no. 1, pp. 35–45, 2019, doi: 10.35760/tr.2019.v24i1.1932.

[9] N. Jarti and W. Lestari Putri, "Penerapan Fuzzy Inference System Pemilihan Desain Interior," *JURTEKSI (Jurnal Teknologi dan Sistem Informasi)*, vol. 7, no. 1, pp. 75–82, 2020, doi: 10.33330/jurteksi.v7i1.921.