DESIGN AND BUILD A MICRO INFLUENCER RECOMMENDATION SYSTEM AS A SOCIAL MEDIA PROMOTION TOOL USING A SIMPLE ADDITIVE WEIGHTING ALGORITHM

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ABSTRACT

Social media usage globally has change marketing strategy. It has become an important marketing strategy to build business. One of the social media is promotion through influencers on Instagram. Customers probably made decision as a result of watching influencers on social media. Business owners who promote their business using social media often feel confused about choosing the right micro influencer to promote their business. Micro influencer is the level of influencer who has followers ranging from 1,000 to 100,000. However, choosing the right micro influencers is not easy task because more people gaining number of followers in social media. Finding the right micro influencer becomes crucial, therefore we proposed a website to choose the right micro influencer according to their preferences. Decision support system to facilitate micro influencer decision making process was named a micro-influencer recommendation system using the Simple Additive Weighting algorithm. This algorithm Simple Additive Weighting was chosen to determine the weight value of each criterion that will select the best alternative from a number of alternatives and the assessment will be more precise because it is based on predetermined criteria values and preference weights. Testing has been carried out to ensure that the algorithm used runs as it should. User testing has also been carried out and has a final satisfaction value of 87.41 % using the End User Computing Satisfaction method.

Keywords: *End User Computing Satisfaction, Micro-Influencer, Simple Additive Weighting, Recommendation System Website*

1. INTRODUCTION

The development of social media dates back to 2002 with Friendster, the first online interaction application with a reasonably broad scope in its time. After a few years, a new social media called Facebook emerged with a central feature that allows users to exchange messages and send friend requests much wider than Friendster [1]. Year after year, the development of social media is getting faster, and new names are emerging that offer their advantages. Twitter, WhatsApp, and LINE, to Instagram, have their own benefits. Therefore, we can now easily interact online without time restrictions anytime and anywhere in seconds.

Technological developments have given us a lot of ease in interacting and communicating. The number of social media applications in this day and age makes social media have its enthusiasts. The results of a survey from 'Populix' at the end of March in the framework of Indonesia's Social Media Day, which falls every June 10, of the many types of social media, the social media that Indonesians are interested in today are YouTube (94%) and Instagram (93%) as the most popular social media in Indonesia [2]. Currently, social media is no longer used as a means of finding entertainment alone but is also used as a business opportunity, especially Instagram, which occupies the second position in the most widely used social media surveys of Indonesians. Sri Widowati, as Country Director of Facebook Indonesia, said that 80% of Instagram users follow at least one business account. The data shows that Indonesians are increasingly aware of the other role of social media as a means of a business that is currently on the rise

[3]. Instagram social media is beneficial in increasing brand awareness and also allows its users to get a broad reach. However, in conducting promotional campaigns, business actors need help; namely, the promotions they do have less impact because of the small space or scope. Therefore, promotional campaigns need to be assisted by influencer services [3].

Research conducted by Suci Dwi Rahmawati in 2021 stated that influencers are a marketing method that uses people who are considered to have an influence on society and target consumers in specific categories who are used as promotional targets of a product [4]. Based on a survey conducted by 'Sociabuzz' in 2018, the purpose of using influencers is to increase brand awareness (98.8%), educate target consumers (62.7%), increase sales (50.6%), increase followers (39%) and Search Engine Optimization (SEO) (25.3%). At the same time, the most used social media is Instagram, at 98.8%. This proves that using the services of influencers has a significant influence on businesses and companies [5]. The problem is, in choosing influencers, business actors will be faced with quite a lot of attributes from influencers. Therefore, it is difficult for business actors to make their choice choosing the right influencer for the business they are running.

Based on previous research conducted on designing an influencer recommendation system using the Multi-Objective Optimization by Ratio Analysis (MOORA) method, it was explained that a system is needed that can provide recommendations and help business actors in determining influencers as their promotional media because of the many considerations and benchmarks in choosing influencers. In the design of this influencer recommendation application, a decision support system is needed to provide recommendations for business actors in determining influencers.

Gan [6] was introducing technique for ranking micro-influencer based on the similarity of the image and text in influencer and brand posts using custom neural network. Elwood [7] proposed a novel multi-task learning framework to ranked micro influencer based on multimedia content. The influencer recommendation system in this study used the Simple Additive Weighting (SAW) method to improve accuracy. SAW method is suitable for candidate selection or prioritization sorting. Specifically, SAW has many benefits for explaining the decision-making process. By using SAW, problems will be solved in an organized framework so that they can be expressed to make

effective decisions about the problem of selecting the right influencer for the business being run by business actors. Complex issues can be simplified and speed up the decision-making process [8][9][10].

2. LITERATURE REVIEW

2.1 Social Media

Social media is a term often used to refer to new forms of media that involve interactive participation. Media development is divided into two eras: the broadcast age and the interactive age. Social media can also be interpreted as a medium for socializing online, which allows users to interact without space and time limitations [11].

2.2 Influencer

An influencer has more power to lead the opinion of his followers or many people. Influencers can influence many people because they have many followers and credibility on social media. Influencers are divided into three categories: Mega-influencers, Macro-influencers, and Micro-influencers [12]. Micro-influencers are people who have 1,000 to 100,000 followers on their social media accounts and have a very close relationship with followers. The average influencer in the micro category has followers with the same inclinations and hobbies [13].

2.3 Niche Market

Niche market is a term often used in building a business, meaning a more specific target consumer or audience. Niche market is a crucial attribute for influencers with a persona or personal branding. This attribute dramatically influences the engagement rate of an influencer because each of them has a niche market; they also have a specific audience or market. For example, influencers who have a beauty influencer niche, then The content that influencers will most often create is content around beauty, make-up, or skin care. Based on previous research on influencer marketing in identifying millennial behavior, it was explained that there would be more influencers with a specific niche market to get insights on their social media.

2.4 Engagement Rate

Engagement rate is a standard benchmark used as a reference in social media promotion in measuring performance in the content on social media, such as Instagram and other social media [14]. The engagement rate is significant for influencers and digital marketers to understand to

assess the quality of audience interaction with the content being shared [14]. The higher the engagement rate of the influencer, the better the quality of the audience interacting with the influencer's content. Based on previous research on the analysis of engagement rates on Instagram like and comment phenomena, it was explained that the low engagement rate of influencers has a significant impact on audience interaction with content. The exchange includes the number of likes, comments, and how many people share or are interested in the range.

2.5 Promotion

Promotion is an attempt to introduce a product or service to attract an audience that has the potential to use the product or service being promoted [15]. The definition of promotion, according to Laksana (2019), is communication between sellers and buyers originating from the correct information that aims to change the attitude and behavior of buyers who previously did not know to become familiar so that they become buyers and still remember the product [3].

2.6 Decision Support System

Galih said that the decision support system (SPK) has a purpose to provide information, guides, provide predictions, as well directs users of the information to be able to make retrieval better decision [16]. SPK can also be said for a computer system which can process data into information for decision making from a specific problem.

2.7 Simple Additive Weighting

Simple Additive Weighting (SAW) or weighted sum method with the basic concept is to find the weighted sum of the performance ratings for each alternative on all attributes. The Simple Additive Weighting method requires a process normalization of the decision matrix (x) to a comparable scale with all existing alternative ratings [17].

2.8 Licert Scale

Licert scale is a measurement scale developed by Rensis Likert in 1932. The Likert scale uses several questions to measure individual behavior by responding to 5-point choices on each item question, strongly agree, agree, undecided, disagree, and strongly disagree agree [18].

2.9 End User Computing Satisfaction

End-User Computing Satisfaction is a valuable method for evaluate the level of satisfaction of users of an application or website using the comparison method between expectations and reality Definition of End-User Computing Satisfaction of an information system is an evaluation of the overall experience of users of information systems they are using the system [19].

3. METHODOLOGY

In this study, we proposed the simple additive weighting technique (SAW) to the system's recommendation process, then create a web-based application that can recommend micro-influencers as a means of social media promotion. We illustrate the proposed framework in Figure 1.
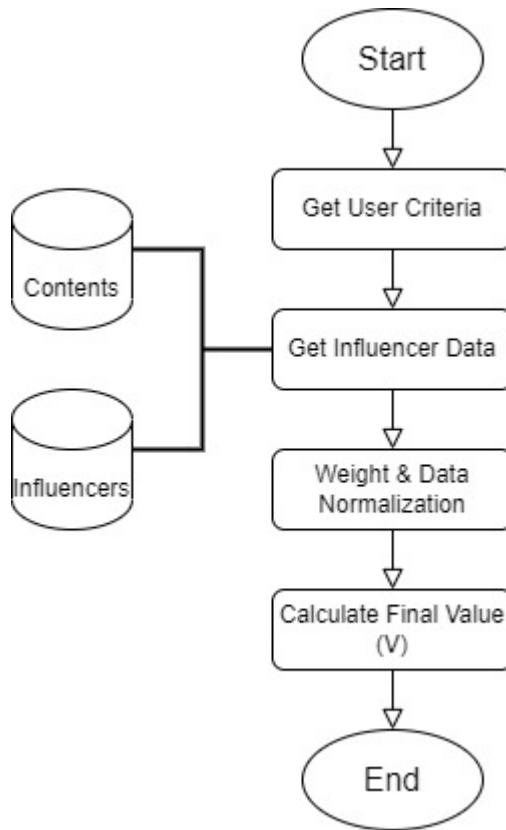

Figure 1: Proposed Framework of SAW

SAW is a method of decision making by adding weights based on the performance of each object. The algorithm will work after the user determines the category and criteria preferences. Therefore, we proposed this following equation 1:

$$r_{ij} = \begin{cases} \dfrac{X_{ij}}{Max\,X_{ij}} & \text{If j is an attribute/criteria benefit} \\ \dfrac{Min\,X_{ij}}{X_{ij}} & \text{If j is an attribute/criteria cost} \end{cases} \quad (1)$$

Information:

ry = normalized performance rating value
xij = attribute value owned by each criterion
MaxiXij = the greatest value of each criterion i
Mini Xij= the smallest value of each criterion i
Benefit = if the greatest value was the best
Cost = if the smallest value was the best

3.1 Application Design

Several processes are needed to realize a good application at the application design stage, such as making a sitemap, flowchart, database schema, database structure, and interface design.

3.2 Application Implementation

The application implementation stage is building a pre-designed decision support system. Development is carried out according to the topic under study, namely the Simple Additive Weighting method for a decision support system for selecting micro-influencers.

3.3 Application Testing

At this stage, application testing is carried out on a system built to find problems or evaluate the application so that the application can realize a good application for its users using End User Computing Satisfaction (EUCS) method.

4. RESULT AND DISCUSSION

4.1 Application Design

The website that will be created is a website that can make it easy for business owners to find micro-influencer recommendations to promote social media, especially Instagram social media. This website can also facilitate micro-influencers as a new bridge to work with business owners or brands.

Figure 2: Sitemap

It is the sitemap design of the recommendation system selection of micro-influencers. In this sitemap, there are two parts, namely, section user site user and site admin. The user section has two pages that can be accessed access, namely the main

page, recommendation page, influencers list page, and influencers registration page. The main page features four influencers who just registered and approved by admin. The about us page displays detailed information about the influential search website. Page recommendations feature one category and four assignable criteria according to user preference. Before the user can enter the admin page, the user will be redirected to the admin login page. After the admin login authentication process is successful then will display three data, namely influencers who are waiting for approval, currently active influencers, and rejected influencers. Admins can change, approve, and delete influencers who are no longer active or invalid data.
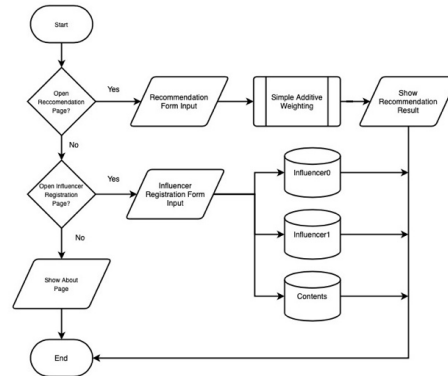

Figure 3: Main Flowchart

This is the main flowchart of the website being built, and This flowchart becomes a symbolic representation as a guide in creating a recommendation system. The first time a user accesses the website, the main page will be displayed, which contains the recommendations section, the last section, and the about section. If the user chooses one of the three sections, the website will direct the user to the module that the user selects.
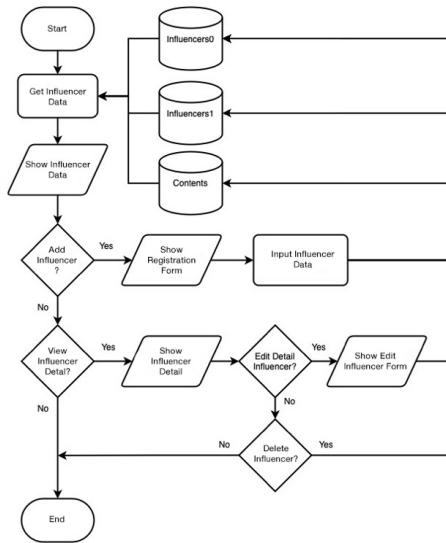
Figure 4: Admin Flowchart

Figure 4 is a flowchart for the admin page. The admin page will be displayed after the admin has successfully logged in on the login page. Admins will get a new menu. Namely, the admin menu contains all influencer data starting from influencers who have just signed up and are waiting for approval, approved and rejected influencers. Admin users to have the freedom to add, change, and delete existing influencer data.
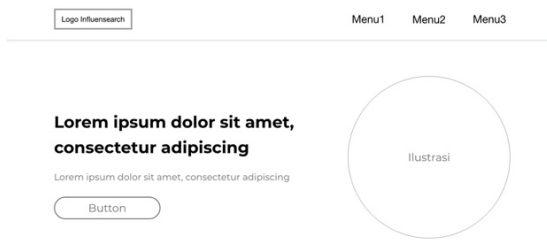

Figure 5: Main Wireframe

The main page designs. On every page there is a helpful navigation bar to make it easier for users to move to another page. The navigation bars that can be pressed are menu1, menu2, and menu3. Then there are illustrations and information that explain the system's micro-influencer recommendations. The button functions to direct the user directly to the recommendation system section.
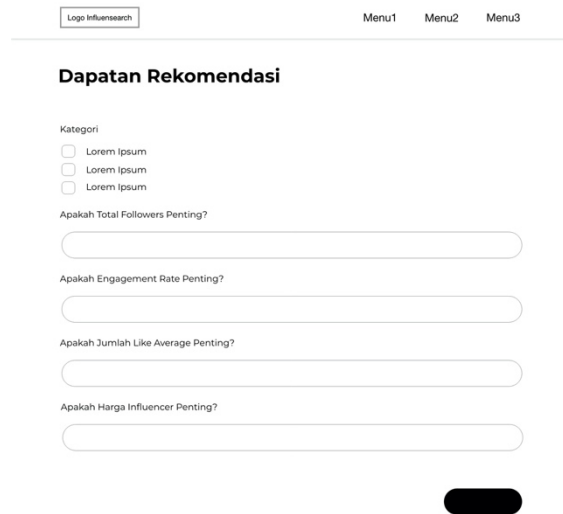

Figure 6: SAW Wireframe

It is the design of the influencer's recommendation page. In addition to being accessible via the main page button, section one, "Give Recommendation!" The user can also access the recommendation page via the navigation bar. On the recommendation page, several forms can be filled in by the user to get micro-influencer recommendation results according to the preferences user. After the "Submit" button is pressed, the user will be shown the recommendation results based on the rating generated by the system.

4.2 Application Implementation

The application implementation stage is building a pre-designed decision support system. Development is carried out according to the topic under study, namely the Simple Additive Weighting method for a decision support system for selecting micro-influencers.
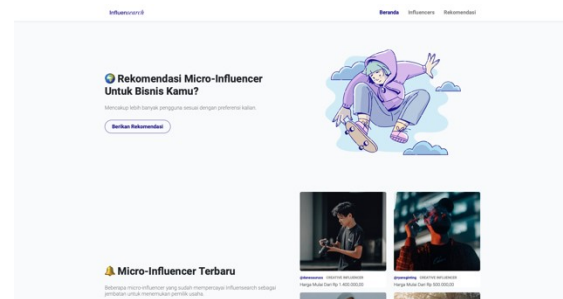

Figure 7: Main Page

It is the primary page implementation. Every page has a helpful navigation bar to make it easier for users to move to other pages. The navigation bar that can be pressed is the homepage, influencers,

and recommendations. Then there are illustrations and information that explain about micro-influencer recommendation system. The "Give Recommendations" button directs the user directly to the recommendation system section.
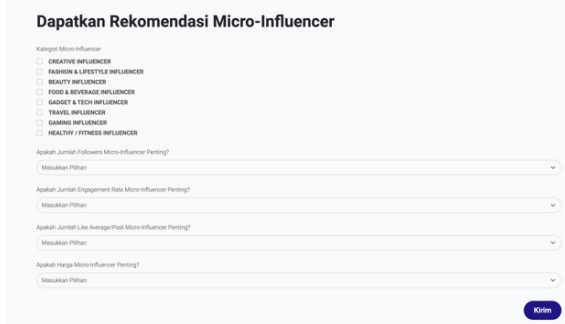

Figure 8: Recommendation Page

Recommendation page is the implementation of the recommendation page influencers. Besides being accessible via the "Give Recommendations" button to go to the recommendation page can also be accessed via the navigation bar. On the recommendation page, several forms can be filled in by the user to get micro-influencer recommendation results according to the preferences user. After the "Submit" button is pressed, the user will be shown the recommendation results based on the rating generated by the system.

Table 1: Criteria and Atribute

Code	Criteria	Atribute	Weight
B1	Price	Cost	5 (0,357142875)
B2	Total Followers	Benefit	2 (0,142857143)
B3	Engagement Rate	Benefit	4 (0,285714286)
B4	Like Average	Benefit	3 (0,214285714)

At this stage, an algorithm test is carried out to prove and ascertain whether the calculations through the system with manual calculations are appropriate. If the system and manual calculations are appropriate, it can be said that the system is running properly. Tabel 1 is a table that explains each registered micro-influencer data's criteria, attributes, and weights. Each criterion has different attributes, and the attributes of each of these criteria will be the basis for calculating the Simple Additive Weighting algorithm. Each criterion has a weight that has its importance on each criterion, a

significant weight on one or each criterion will also produce a significant value when calculating the final Simple Additive Weighting algorithm.

Table 2: Micro-Influencer Data

Code	Price	Total Followers	Engagement Rate	Like Average
MI1	1400000	19348	13,44	2574
MI2	500000	8234	8,3	300
MI3	1000000	2473	36,81	826
MI4	150000	2109	18,71	368
MI5	300000	1030	9,04	94
MI6	100000	1554	13,39	197

Tabel 2 is the test scenario for the Simple Additive Weighting algorithm. In this trial, six alternative micro-influencer data will be used, and each piece of data is different. Then the process is continued by using manual calculations and checking the similarities between system and manual calculations.

Table 3: Normalitation Result

Code	B1	B2	B3	B4
MI1	0,071428571	1	0,365118174	1
MI2	0,2	0,425573703	0,225482206	0,116550117
MI3	0,1	0,127816829	1	0,320901321
MI4	0,666666667	0,109003515	0,508285792	0,142968143
MI5	0,333333333	0,053235477	0,245585439	0,036519037
MI6	1	0,080318379	0,363759848	0,076534577

Table 3 is a table of the results of normalization calculations that have been carried out. After the normalization process is complete, the next step is calculating the multiplication of the normalization results with the criterion weights.

$V(MI1) = (0,35*0,071428571) + (0,14*1) + (0,28*0,365118174)$
$+(0,21*1) = \mathbf{0{,}486972543}$
$V(MI2) = (0,35*0,2) + (0,14*0,425573703) + (0,28*0,225482206)$
$+(0,21*0,116550117) = \mathbf{0{,}221623327}$
$V(MI3) = (0,35*0,1) + (0,14*0,127816829) + (0,28*1)$
$+(0,21*0,320901321) = \mathbf{0{,}408452687}$
$V(MI4) = (0,35*0,666666667) + (0,14*0,109003515) + (0,28*$
$0,508285792) + (0,21*0,142968143) = \mathbf{0{,}429527711}$
$V(MI5) = (0,35*0,333333333) + (0,14*0,053235477) + (0,28*$
$0,245585439) + (0,21*0,036519037) = \mathbf{0{,}204645463}$
$V(MI6) = (0,35*1) + (0,14*0,080318379) + (0,28*0,363759848)$
$+(0,21*0,076534577) = \mathbf{0{,}488948563}$

Figure 9: Multiplication Calculation Process

Table 4: Final Score Ranking

Rank	Micro-Influencer Name	Final Score
1. MI6	Fahri Taufik Ridwan	0,488948563
2. MI1	Dane	0,486972543
3. MI4	Zaki Rahman Prasidya	0,429527711
4. MI3	Muhammad Azel	0,408452687
5. MI2	Ryan Ginting	0,221623327
6. MI5	Dzaky Abdullah	0,204645463

Table 4 is the weighting that has been done. The results are also sorted manually from the highest final score in the first position to the lowest absolute value in the last post. Based on the results that have been calculated, it can be concluded that manual calculations have been successful and have the same results as system calculations.
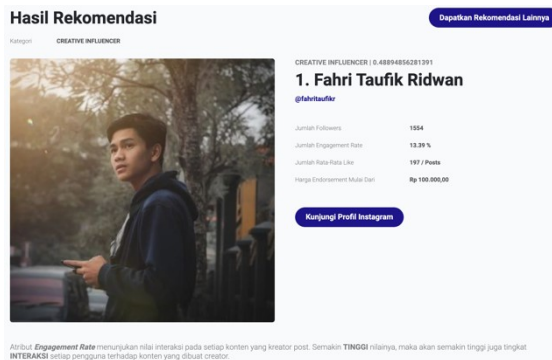

Figure 10: Website Final Score Result

Manual calculations have also been carried out to prove that the system created is running as it should. Based on the results that have been calculated, it can be concluded that manual calculations have been successful and have the same results as system calculations.

4.3 Application Testing

Five evaluation components of EUCS method were content, accuracy, format, ease of use and timelines from 40 respondents using google form showed that more than 85 % respondents were satisfied (Figure 11).
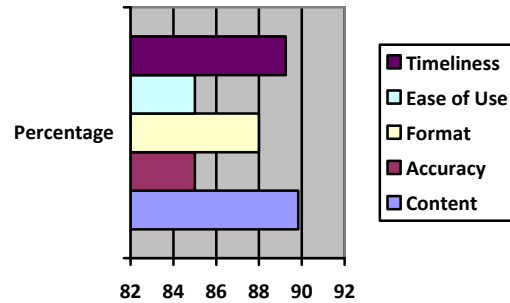

Figure 11: Application Testing Result

In this work, we proposed a web-based application that can recommend micro-influencers as a means of social media promotion. We have improved on the state of the art in micro influencer ranking on the work of [6] and [7] by exhibited application testing with more than 85% of respondents' satisfaction.

5. CONCLUSION

The micro-influencer recommendation system has been successfully built according to the existing design and uses a simple additive weighting algorithm to provide recommendations for choosing the right micro influencers. This website has features and functions that can give micro-influencer recommendations to business owners and register as part of Influensearch. This website was designed and built using the Laravel framework with PHP, CSS, and Bootstrap 5 programming languages. Manual calculations have also been carried out to prove that the system created is running as it should. Based on the results that have been calculated, it can be concluded that manual calculations have been successful and have the same results as system calculations showed that more than 85 % respondents were satisfied with the system.

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