

Implementation of Simple Additive Weighting (SAW) Method for Determining Social Customer Relationship Management (SCRM) Model as Business Strategy in University

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Abstract: The rapid growth of Internet and social media led to new developments in the field of social customer relationship management (SCRM). An organization was required to determine the direction of business strategies by utilizing the technology in various activities so that the large-scale business was identified through the speed, accuracy, and efficiency of the information development. The quality of good business strategies was achieved by providing social media-based facilities in the form of various predetermined assessment indicators that were able to make a good contribution for companies. The objective of this study was developing the website-based application for analyzing and calculating the characteristics of each of SCRM models as a business strategy through the Simple Additive Weighting (SAW) approach. The system developed in this study was extreme programming system development and black box testing. The variables of this study were Facebook, Instagram, Twitter, and YouTube. Moreover, the dependent variable of this study was the SAW method. The result of this study showed that YouTube social media was the recommended social media used as a business strategy for higher education by 0.888.

Keywords : Social Customer Relationship Management, Simple Additive Weighting, Business Strategy

1 INTRODUCTION

As a form of technological advancement that integrated the physical, digital, and biological worlds, the industrial revolution 4.0 had the impact of major changes [1] in the activity of turning the wheels of the organization which triggered the allocation of appropriate IT capital investment budgets [2]. Organizational activities today were inseparable from the application of information systems that were integrated with each other so that it required organizations to be able to determine the direction of business strategy as it was needed to increase large-scale business change through the speed, accuracy, and efficiency of information exchange [3]. Currently, the number of tertiary institutions registered in Indonesia reached 5,660 units [4]. The tighter competition between one and another university had resulted in each university that affected to make various efforts to manage its institution professionally, especially providing quality services to customers [5]. One of the strategies to win business competition was to identify and understand customers [6].

The quality of a good business strategy was carried out by providing social media-based facilities with very mature considerations by assessing various predetermined assessment indicators of social media [7]. The advances of information technology - social media and the internet - was inseparable from each other. This was evidenced by the increasing number of internet users and social media every year. In 2018, the number of internet and social media users reached 4 billion, equivalent to 52.96% of the world's total population of 7.59 billion people [8]. The function of social media in an organization became a point to promote products or services and created an online community [9]. Observing the growth and development of the internet and developing social media, new developments of customer relationship management (CRM) emerged and known as social customer relationship management (SCRM). CRM signified the entire process of establishing and maintaining relationships with customers where these relationships were a way to maximize customer loyalty

[10], while SCRM was a combination of CRM and social media that combined conceptual elements including social networks, communication technology, community, strategy, customer value, and relationships [11]. The incorporation of social networking features was used to analyze the CRM behavior of recipients and users business customers [12] and to recognize engagement behaviors and the company's ability to capture and pass value back to customers [13].

The simple additive weighting method or better known as SAW was a method of calculation carried out by determining alternatives in which each alternative was assessed based on predetermined criteria and had been given weight on each criterion assessment [14]. The decision making for selecting the right SCRM model through the assessment of indicators determined on social media was through the SAW method.

This study was the development of previous research on the selection of social media as a means of online business through a categorical test approach with the variables e.g., social media Facebook, Twitter, Google +, and Instagram [15]. In addition, the other studies that used social media variables richness and frequently content with the results of the study were in terms of the loyalty of higher education institution that was partially influenced by the richness variable [16].

The difference between this study and previous research was that the independent variable used social media youtube, whatsapp, facebook, and instagram, while the dependent variable for the SCRM model used the SAW method. This study generated an application that functioned to analyze and calculate the characteristics of each SCRM model as a basis for decision making in selecting the SCRM model to support business strategy.

2. LITERATURE REVIEW

This stage explains some definitions of the terms used in this research such as Social Media, CRM, SCRM and Business Strategy.

a. Social Media

Online social media was one of the online media categories in which users were able to connect, interact, produce, share network message content. People, organizations, and industry consumed media content produced and distributed by social media [17].

b. Customer Relationship Management (CRM)

CRM was used since 1990 as one of the fastest growing businesses [18]. Information technology companies tended to use the term CRM to describe software applications used to support the marketing, sales and service functions of a business [19]. To improve customer relations, organizations generally focused on the four main components of a business e.g., people, processes, technology, and knowledge [20]. An increasing number of customers was able to implement a CRM strategy by utilizing technology and social media as alternatives [21].

c. Social Customer Relationship Management (SCRM)

SCRM was a philosophy and a business strategy to support and integrate technology platforms, business rules, business processes, and social characteristics designed to generate customer engagement in order to provide beneficial value within the scope of the business environment [22]. The advent of Web 2.0 technology had enabled the creation of new customer relationship strategies based on interactive collaborations in order to increase customer engagement and satisfaction [23]. Collaborative SCRM systems provided excellent opportunities and challenges for businesses [24].

d. Business Strategy

The strategy for achieving goals, known as business strategy, was the company's ability to analyze the company's external and internal environment, formulate strategies, implement plans designed to achieve company goals and evaluate to get feedback in formulating future strategies [25].

This research is the development of research [16] which researched at the Universitas Teknokrat Indonesia with the title The Effect of Media Richness and Frequently Updates on Loyalty of the Higher Education Academic Community, with research samples of students of information systems study programs class 2016, 2017, and 2018. The social media variables used are media richness, and frequently updated content. This study shows that the media richness variable has a partial role in the loyalty of the academic community. As for the previous research, including research on the selection of social media as an online business facility through a categorical test approach with variables used, namely social media facebook, twitter, google+, and instagram. This study resulted in the social media Facebook, Twitter and Google+ being in the superior field which means it is feasible to run an online business [15].

3. METHOD

The method used for social research on customer relationship management is the SAW method. The stages of the SAW method are described in the following sub-chapters. The use of data and decision models as problem solving solutions both semi-structured and unstructured was able to be assisted by an interactive decision support system [26]. The stages of the proposed simple additive weighted method are shown in Figure 1.

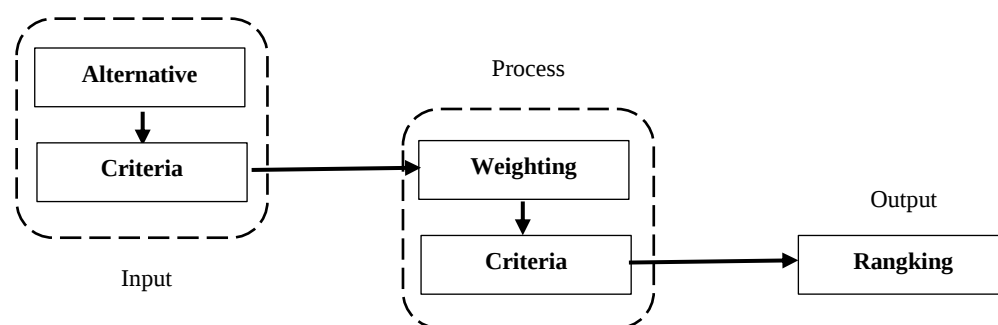


Figure 1. Purpose Model SAW

Simple Additive Weighting as a method of decision making by adding weights based on the performance of each object that was not the same but had the same opportunity to all the criteria [27]. The following equation 1.

$$x_{ij} = \begin{cases} \frac{x_{ij}}{\text{Max}x_{ij}} & \text{if } j \text{ was the profit attribute(benefit)} \\ \frac{\text{Min}x_{ij}}{x_{ij}} & \text{if } j \text{ was an attribute (cost)} \end{cases} \quad (1)$$

Information:

ry = normalized performance rating value
 x_{ij} = attribute value owned by each criterion
 Max_iX_{ij} = the greatest value of each criterion i
 Mini X_{ij} = the smallest value of each criterion i
 Benefit = if the greatest value was the best
 Cost = if the smallest value was the best

Where r_{ij} was the normalized performance appraisal of the alternative A_i on an attribute C_j: i = 1,2,, m and j = 1,2,, n. While the preference value for each alternative (V_i) was given as:

(2)

$$x_i = \sum_{j=1}^n W_j r_{ij}$$

Explanation:

V_i = ranking for each alternative

W_j = weight value of each criterion

R_{ij} = normalized performance rating value

Where the value of V_i acquired a greater result so that it meant that the alternative A_i was preferred.

4. RESULT AND DISCUSSION

This section describes the results of the research that has been carried out starting from the determination of alternatives, calculations using the SAW method, the system developed and the ranking results.

4.1 Analysis Alternative

According to data on the population of active users in Indonesia, there were 272.1 million people in 2020, where the four most accessed or used social media by the people were: youtube (77%), whatsapp (84%), facebook (82%), instagram (79 %), and twitter (56%) (wearesocial.com). This study used a Likert scale that measured opinions, attitudes and perceptions about social phenomena of a person or group of people [28]. Each question in the questionnaire provided five choice answers e.g., Very Good (5), Good (4), Enough (3), Poor (2), and Very Poor (1). There were a matrix to calculate the decision support system for selecting the SCRM model as a university business strategy using the SAW method as follows: The social media alternatives that were assessed were marked by A1 (Youtube), A2 (WhatsApp), A3 (Facebook), A4 (Instagram). The alternatives to be ranked are shown in Table 1.

Table 1. Alternative

Id	A1	A2	A3	A4
Alternative	Youtube	WhatsApp	Facebook	Instagram

- 1) Criteria indicators were marked with C1 (Accessibility), C2 (Interface Design), C3 (Security), C4 (Communicative), C5 (Post), and C6 (Usability).
- 2) The weight of preference or level of importance of each indicator was given a value for each indicator, where the weighting of preference or level of importance was taken from the results of the discussion of interviews that had been conducted on the information section of UniversitasTeknokrat Indonesia

4.2 Criteria Weighting

Giving weight to each criterion is based on the importance of each criterion based on the judgment of the decision maker. The weight of the criteria is shown in Table 2.

Table 2. Criteria and weights

Id	Criteria	Weight	Information
C1	Accessibility	20%	Ease of reaching or accessing social media services
C2	Interface Design	10%	Views from social media
C3	Security	15%	The minimum condition of danger or disturbance either from within the system or outside the social media system
C4	Communicative	30%	Connected to each other between social media account users
C5	Posts	10%	How to present or good quality data in the form of images or videos
C6	Usability	15%	Ease of using social media

- 1) The alternative weighting score of each indicator made a decision matrix

$$R = \begin{pmatrix} 4 & 4 & 5 & 4 & 4 & 5 \\ 3 & 4 & 3 & 5 & 4 & 2 \\ 4 & 4 & 3 & 3 & 3 & 3 \\ 3 & 5 & 3 & 2 & 3 & 4 \end{pmatrix}$$

- 2) The process of normalizing matrix (Rij)

$$\begin{aligned} R_{11} &= \frac{4}{4} = 1 & R_{12} &= \frac{4}{5} = 0,8 & R_{13} &= \frac{5}{5} = 1 & R_{14} &= \frac{4}{5} = 0,8 & R_{15} &= \frac{4}{4} = 1 & R_{16} &= \frac{5}{5} = 1 \\ R_{21} &= \frac{3}{4} = 0,75 & R_{22} &= \frac{4}{5} = 0,8 & R_{23} &= \frac{3}{5} = 0,6 & R_{24} &= \frac{5}{5} = 1 & R_{25} &= \frac{4}{4} = 1 & R_{26} &= \frac{2}{5} = 0,4 \\ R_{31} &= \frac{4}{4} = 1 & R_{32} &= \frac{4}{5} = 0,8 & R_{33} &= \frac{3}{5} = 0,6 & R_{34} &= \frac{3}{5} = 0,6 & R_{35} &= \frac{3}{4} = 0,75 & R_{36} &= \frac{3}{5} = 0,6 \\ R_{41} &= \frac{3}{4} = 0,75 & R_{42} &= \frac{5}{5} = 1 & R_{43} &= \frac{3}{5} = 0,6 & R_{44} &= \frac{2}{5} = 0,4 & R_{45} &= \frac{3}{4} = 0,75 & R_{46} &= \frac{4}{5} = 0,8 \end{aligned}$$

- 3) The formation of a normalized matrix

$$R = \begin{pmatrix} 1 & 0,8 & 1 & 0,8 & 1 & 1 \\ 0,75 & 0,8 & 0,6 & 1 & 1 & 0,4 \\ 1 & 0,8 & 0,6 & 0,6 & 0,75 & 0,6 \\ 0,75 & 1 & 0,6 & 0,4 & 0,75 & 0,8 \end{pmatrix}$$

- 4) The ranking process used the weight determined by the decision maker

$$\begin{aligned} V1 &= (0,2*1)+(0,1*0,8)+(0,15*1)+(0,3*0,8)+(0,1*1)+(0,15*1) \\ &= 0,2 + 0,08 + 0,15 + 0,24 + 0,1 + 0,15 = 0,92 \\ V2 &= (0,2*0,75)+(0,1*0,8)+(0,15*0,6)+(0,3*1)+(0,1*1)+(0,15*0,4) \\ &= 0,15 + 0,08 + 0,09 + 0,3 + 0,1 + 0,06 = 0,78 \\ V3 &= (0,2*1)+(0,1*0,8)+(0,15*0,6)+(0,3*0,6)+(0,1*0,75)+(0,15*0,6) \\ &= 0,2 + 0,08 + 0,09 + 0,18 + 0,075 + 0,09 = 0,715 \\ V4 &= (0,2*0,75)+(0,1*1)+(0,15*0,6)+(0,3*0,4)+(0,1*0,75)+(0,15*0,8) \\ &= 0,15 + 0,1 + 0,09 + 0,12 + 0,075 + 0,12 = 0,655 \end{aligned}$$

e. System Implementation

The system was developed using the PHP programming language, DI Dreamweaver. Data storage using My SQL system management database. The system page is shown in Figure 2-4. Figure 2 is a system page that is used to input the value of each criterion by clicking the "Add" icon. After all the data is entered, then press the Save button.

KPM	NAMA MAHASISWA	JURUSAN	ID KRITERIA	NAMA KRITERIA	ID ALTERNATIF	NAMA ALTERNATIF	NILAI
1	Priesta	SI Sistem Informasi	A-00002	Komunikasi	A-00001	Facebook	5
2	Priesta	SI Sistem Informasi	A-00003	Aksesibilitas	A-00002	Facebook	5
3	Priesta	SI Sistem Informasi	A-00004	Tingkat Pelayanan Data	A-00003	Facebook	5
4	Priesta	SI Sistem Informasi	A-00001	Desain Interface	A-00003	Facebook	5
5	Priesta	SI Sistem Informasi	A-00005	Usability	A-00003	Facebook	5
6	Priesta	SI Sistem Informasi	A-00002	Komunikasi	A-00003	Facebook	5
7	Priesta	SI Sistem Informasi	A-00001	Desain Interface	A-00001	Instagram	5
8	Priesta	SI Sistem Informasi	A-00005	Usability	A-00001	Instagram	5
9	Priesta	SI Sistem Informasi	A-00002	Komunikasi	A-00001	Instagram	5
10	Priesta	SI Sistem Informasi	A-00003	Komunikasi	A-00001	Instagram	5
11	Priesta	SI Sistem Informasi	A-00002	Aksesibilitas	A-00001	Instagram	5
12	Priesta	SI Sistem Informasi	A-00004	Tingkat Pelayanan Data	A-00001	Instagram	5

Figure 2. Page criteria of data assessment

The assessment page is used to input assessment data from students. The alternative assessment data was seen in the following figure.

KPM	NAMA MAHASISWA	JURUSAN	NAMA ALTERNATIF	TOTAL
101	Ali	SI Sistem Informasi	Youtube	1
101	Ali	SI Sistem Informasi	Instagram	1
101	Ali	SI Sistem Informasi	Twitter	1
101	Ali	SI Sistem Informasi	Facebook	1
1	Priesta	SI Sistem Informasi	Twitter	1
2	Priesta	SI Sistem Informasi	Facebook	1
3	Priesta	SI Sistem Informasi	Youtube	1
4	Priesta	SI Sistem Informasi	Instagram	1

Figure 3. Page Alternative assessment

Based on the criteria data that has been inputted in Figure 3, then the calculation process is carried out using the SAW method. The result of this calculation is a ranking of the values of each alternative. From the results of the calculations using the SAW method above. The biggest results were in alternative A1 so that the recommendation for an alternative SCRM model was Youtube. The ranking results are shown in Figure 4.

DASHBOARD DATA MASTER DATA TRANSAKSI REPORT LOGOUT STATUS LOGIN : ADMIN				
LIST DATA RANGKING SAW				HAZEL PENILAIAN PERINGKAT SAW
PERINGKAT SAW	ID ALTERNATIF	NAMA ALTERNATIF	NILAI	
1	A-00002	Facebook	0.808000000000000067	1 Facebook 0.808000000000000067
2	A-00000	Whatsapp	0.808000000000000067	2 Whatsapp 0.808000000000000067
3	A-00003	Instagram	0.87	3 Instagram 0.87
4	A-00001	Youtube	0.8833333333333333	4 Youtube 0.8833333333333333

Figure 4. Page the rank of data assessment

Based on the ranking results in Figure 4, it was presented in the form of a graphic in Figure 5.

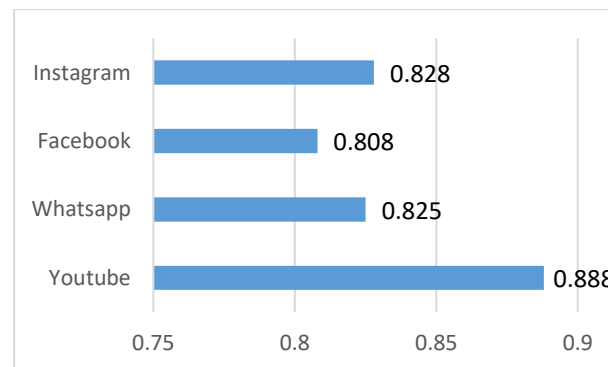


Figure 5. Ranking graph

f. Evaluations

This study used Blackbox testing conducted by marketing team and students with the aim of obtaining information on the number of system functions that were able to run well or functions that experienced problems or errors.

Table 3. Black box testing

No	Input Data	Expected Data	Observation	Conclusion
1	Selecting the criteria rating menu	It displayed a menu of results of the overall assessment criteria	The criteria assessment menu appears	[√] Accepted
2	Choose an alternative assessment menu	It displayed the overall result menu of alternative assessments	An alternative assessment menu appears	[√] Accepted
3	Selecting the SAW ranking menu	It displayed the overall result menu of the SAW ranking	The SAW ranking menu appears	[√] Accepted
				[] Rejected

Table 4. Result of testing

Conclusions	Count
Accepted	100%
Rejected	0

Based on the results of the test calculations that has been carried out, the results showed that the system was *Good or Fit* for Use.

2. CONCLUSION

The conclusions of this research were:

- The decision support system for selecting the SCRM model as business strategy for higher education institution used the SAW method according to the results of the black box test.
- The implementation of the results of the assessment of alternative social media with the provisions of the predetermined criteria and the student assessor population of the information system study program class of 2017, 2018 and 2019 showed that the social media YouTube with a score of 0.888 and was the recommended social media to be used business strategy for higher education institution.

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