Article

Singme Music Entertainment Services Marketing Information System with Content-Based Filtering Method and TAM Testing

Ivander Darmawan[1], Benny Daniawan[2],*

[1,2]Buddhi Dharma University, Information System, Banten, Indonesia

ABSTRACT

With the times, the website used as marketing and sales media, which developed into E-Commerce. In 2019, there was 16,277 businesses used the E-Commerce concept, and also the value of Gross Domestic Product (GDP) was about 5.07%. Furthermore, because of the Coronavirus Disease (COVID) pandemic, the GDP decreased to -2.07% In 2020 and even impacted 10 out of 17 business sectors. Music entertainment business was also impacted by the pandemic, because during the pandemic, the government restricted certain public activities. Therefore, this system named Singme will help singers or music groups to market their services and provide related information for the public. Searching the services in Singme will be assisted by using Content-Based Filtering (CBF) method, it will give the recommendations of the services which have correlations with the keywords. Using Technology Acceptance Model (TAM) to test 122 feedback data about Singme with SmartPLS application v3.2.9. As the results, all hypotheses are acceptable because each t-statistic value > t-table value (1.981), and also each p-value < 0.05. Which PEOU influences PU by 34.3%, PU and POEU influence ATU by 50.7%, PU and ATU influence BITU by 56.1%, and BITU influences ASU by 52.3%.

INTRODUCTION

According to the Central Statistics Agency (BPS) [1], the development of business actors in the field of E-Commerce in Indonesia was 16,277 in 2019. This development was also supported by the magnitude of the Gross Domestic Product (GDP) of 5.02%. However, since the outbreak of Coronavirus Disease (COVID) in Indonesia, the GDP figure also experienced a significant change where the GDP figure in 2020 touched the figure of -2.07% as reported by BPS [2]. And based on the comparison of business sector GDP data in the third quarter of 2020 with the third quarter of 2019 as many as 10 of the 17 business categories experienced an economic

1

recession (negative GDP), where one of them is another service category with a GDP of -5.55%.

Based on the 2020 Standard Classification of Business Fields (KLBI), the other service categories include the arts, entertainment, and recreation sectors [3]. In addition to indicators of changes in GDP figures, the ongoing COVID pandemic has also led to the changes or additions to regulations made by the central or regional governments. One of them is the Instruction of the Minister of Home Affairs Number 43 of 2021, which includes the Enforcement of Restrictions on Community Activities (PPKM), which among its contents mentions the restriction of artistic activities or social activities that can cause crowds and crowds [4].

The impact of these restrictions affects the means of promotion as well as the sources of income for artists such as singers and music groups. Thus, a system that can be used by singers and music groups to help market their services is an alternative solution. And with this system, it's also able to assist prospective customers in finding more appropriate services and according to the desired criteria so that in the end they can help both parties in the transaction process.

I. LITERATURES REVIEW

In the previous study about promotion and management photo services system [5], the implemented system helps photo studio managers to photographers in terms of promotions and transaction report management. In addition, the system also makes it easier for the prospective customers to view the service offers and testimonials online. Similar studies by Faadhilla and Kurniadi [6] but in terms of make-up services, the system is applied to assist service providers in Padang city to promoting and organizing transaction data. Service users even can make the ordering process or view testimonials for make-up services more quickly than usual.

Regarding the recommendation system by Wijaya and Alfian [7], the system that uses the Content-Based Filtering (CBF) method is faster in execution time than the Collaborative Filtering method. However, the execution time is also affected by the amount of data used during the process. Another study by Larasati and Februariyanti [8] also explained that the CBF method is appropriate to use to compare products based only on the parameter title or product description. The test results of the method produced 10 recommendations with the highest similarity value (the level of match between product descriptions and keywords based on the CBF method) of 0.7195.

Another study by Muchayan and Kamisutara [9] which also focused on the CBF method, where researchers matched the results of recommendations using the system with survey results, and found the system's accuracy rate of 96.5%. The designed system also needs to be tested by the developer, so there is a study by Ikhlaasahi and Putro [10] make a compare the Equivalence Partitioning (EP) and Boundary Value Analysis (BVA) test method. As a conclusion, EP is used to explore possibilities based on criteria, while BVA is suitable to be applied to systems that focus on user input problems.
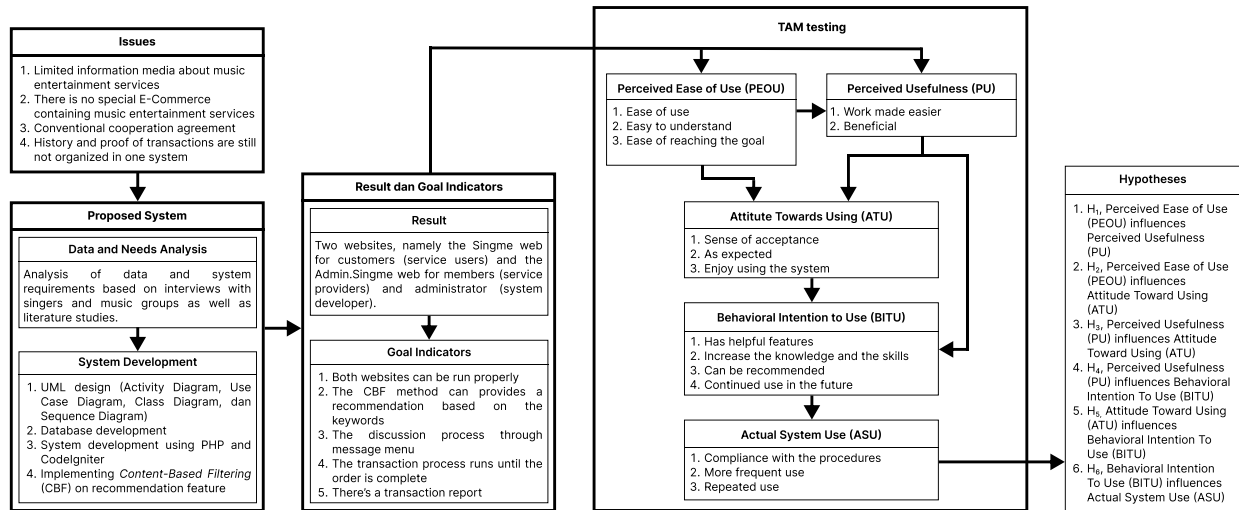
II. FRAMEWORK

Here's the framework:

Figure 1. Framework

III. METHODS

CBF is a category of recommendation system that uses the attributes of a product description and user preferences as parameters in providing an alternative choice. Within CBF there are several techniques or algorithms that can be applied, such as; Terms Frequency Inverse Document Frequency (TF-IDF), Bayesian Classifiers, Cluster Analysis, Decision Trees, and Artificial Neural Networks [8]. In this study, the CBF method will use the TF-IDF algorithm which is divided into several stages, including:

1. Text Preprocessing
   This stage is divided into two processes; Tokenization Process (Changing keywords or product descriptions into arrays) and Stopword Removal Process (Removing words that are repeated or do not provide any important information, as well as symbols and punctuation in the array).
2. Terms Frequency (TF)
   The TF is carried out by assigning a value of 1 to each data that contains the keyword tokens.
3. Inverse Document Frequency (IDF)[11]

$$IDF(T_x) = log\left(\frac{N(D)}{N(D,T_x)}\right) \qquad (1)$$

Where:

(T_x) = The related word
$N(D)$ = The amount of data
$N(D,T_x)$ = The amount of data that contains the related words

4. TF-IDF[11]

$$TF - IDF(T_{x,y}) = TF(T_{x,y}) \times IDF(T_x) \qquad (2)$$

Where:
$TF(T_{x,y})$ = TF value of the related word to y-th data
$IDF(T_x)$ = IDF value of the related word

After finding the TF-IDF value, then the sum of all TF-IDF values is carried out based on the grouping of the data (D).

Technology Acceptance Model (TAM) is one of the modeling concepts with the aim of describing external aspects of the behavior of information system users on system acceptance [12]. TAM basically has two basic perceptions, namely; Perceived Usefulness and Perceived Ease of Use [13] another research was carried out by [14][15][16] TAM can measure the level of acceptance of the system by the user. There are several stages on system acceptance testing using TAM method, including:
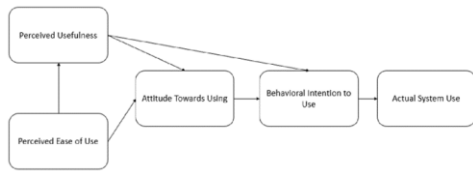
Figure 2. TAM Construct[17]

1. Questionnaire and the distribution
2. Convergent validity testing [18]

$$AVE = \frac{\sum_{i=1}^{n} L_i^2}{n} \qquad (3)$$

Where:
AVE = Average Variance Extracted
n = Number of indicators on the tested variable
L = Factor loadings/outer loading value

3. Discriminant validity testing
4. Composite reliability testing [18]

$$CR = \frac{\left(\sum_{i=1}^{n} L_i\right)^2}{\left(\sum_{i=1}^{n} L_i\right)^2 + \left(\sum_{i=1}^{n} e_i\right)} \qquad (4)$$

Where:
CR = Composite Reliability
n = Number of indicators on the tested variable
L = Factor loadings/outer loading value
e = Error value $(1 - L^2)$

5. R Square (R^2) testing
   R^2 is used as a benchmark for the value of the variance of a latent variable that is influenced by other latent variables [19].
6. Hypothesis testing

IV. DISCUSSION AND RESULT

The system was built following the Waterfall Methodology [20] and using the PHP programming language with the CodeIgniter framework. The system is divided into two websites, that is Singme. Provided web for customers (service users) and the Admin. Singme web for members (service provider) and administrators.
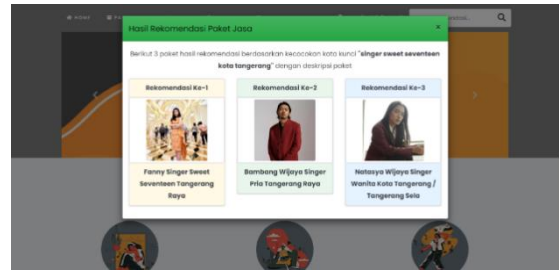

Figure 3. Recommendation results display based on CBF method

Figure 3. is the example of recommendation results displayed by Singme by processing the keywords "singer sweet seventeen kota tangerang" using the CBF method. Where the keywords are processed through the Text Preprocessing stage into an array (singer, sweet, seventeen, kota, tangerang), then sorting is done from 15 service package data, where there are 5 data that has at least 1 word related to the keywords, which is then carried out into the TF calculation stage.

Table 1. TF and IDF calculation

T_x	$TF(T_x)$					N(D)	N (D,T_x)	IDF (T_x)
	1	2	3	4	5			
singer	1	1	1	1	1	5	5	0
sweet	1	1	-	-	-	5	2	0.301
seventeen	1	1	-	1	-	5	3	0.477
kota	1	-	1	-	1	5	3	0.477
tangerang	1	1	1	-	-	5	3	0.477

Table 2. TF-IDF calculation

T_x	1	2	3	4	5
singer	0	0	0	0	0
sweet	0.301	0.301	0	0	0
seventeen	0.477	0.477	0	0.477	0
kota	0.477	0	0.477	0	0.477
tangerang	0.477	0.477	0.477	0	0
TF-IDF($T_{x,y}$)	**1.732**	**1.255**	**0.954**	**0.477**	**0.477**

So based on the TF-IDF value of the five data, sorting is done in descending order and chooses the top 3 values, that is: Data 1, Data 2 and Data 3.
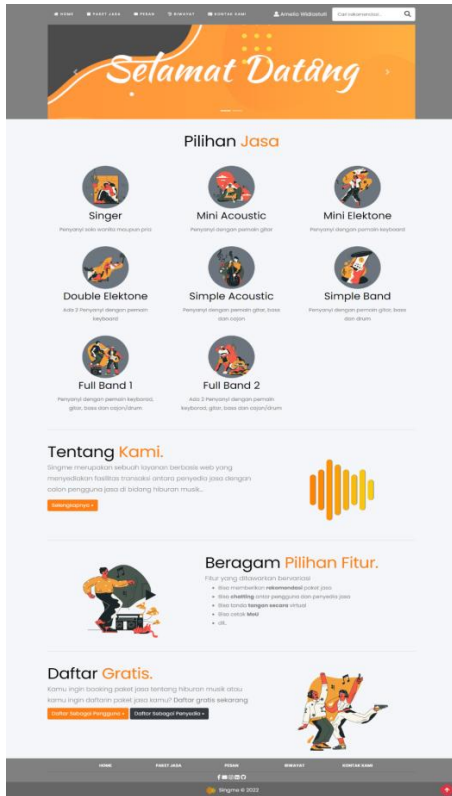
Figure 4. Homepage for the customers

Figure 4. is the homepage of the Singme system for the service users.

Figure 5. Dashboard page for the members

Figure 5. is the dashboard page of the Singme system for the service providers.
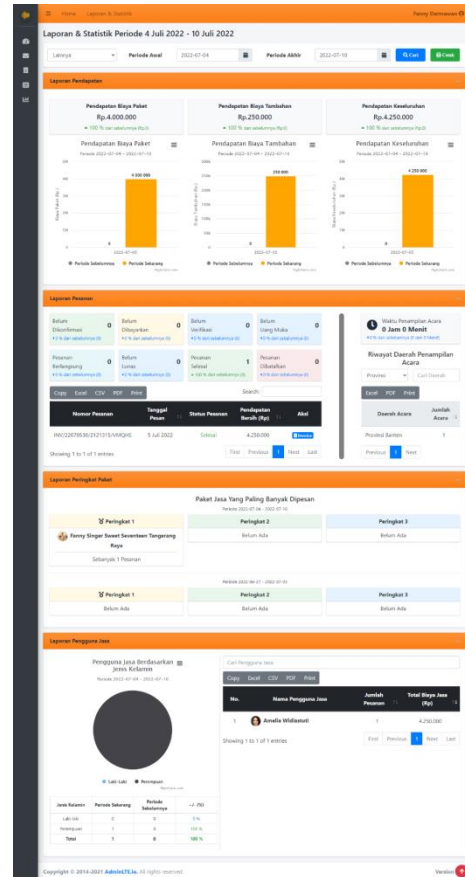

Figure 6. Report and statistics page for the members

Figure 6. is the report and statistics page of the Singme system for the service providers.

System testing using the EP method with a success rate of 100%, while system acceptance testing uses the TAM method with the assistance of the SmartPLS v3.2.9 data processing application.

Figure 7. TAM construct using SmartPLS v3.2.9

At the final phase of TAM testing, hypothesis testing will be conducted which includes several hypotheses such as:

H_1 : Perceived Ease of Use influences Perceived Usefulness,

H_2 : Perceived Ease of Use influences Attitude Toward Using,

H_3 : Perceived Usefulness influences Attitude Toward Using,

H_4 : Perceived Usefulness influences Behavioral Intention To Use,
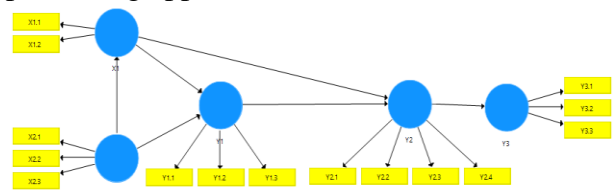
H_5 : Attitude Toward Using influences Behavioral Intention To Use, and

H_6 : Behavioral Intention To Use influences Actual System Use.

The entire testing phase will be described as follows:

1. Questionnaire and the distribution

The weight of the questionnaire assessment uses a Likert scale [21], that is: 1 (strongly disagree), 2 (disagree), 3 (average), 4 (agree), and 5 (strongly agree). The distribution of the questionnaires through social media applications (LinkedIn, Instagram) and messenger applications (WhatsApp, LINE) by utilizing the snowball sampling method, which distributes questionnaires through parties or groups that are most aligned with the target population [22]. As a result, 122 respondents had filled out the questionnaire.

Table 3. Questionnaire

	Statement	Indicator
1	User feel happy with Singme App	ATU-1
2	The Singme App has met the user's expectations	ATU-2
3	The Singme App can be used properly and comfortably	ATU-3
4	With the Singme App, it's easier for the user to find or market music entertainment services	PU-1
5	In general, user think the Singme App has various benefits	PU-2
6	In general, user think the Singme App is easy to use	PEOU-1
7	In general, user think the Singme App is easy to understand	PEOU-2
8	With the Singme App, user's goal to find or market music entertainment services can be fulfilled	PEOU-3
9	The Singme App has features that can help the user	BITU-1
10	With the Singme App, user can add skills and information related to music entertainment services	BITU-2
11	User can share the experiences of using the Singme App with others	BITU-3
12	In the future, user will try to use the Singme App again	BITU-4
13	User can use the Singme App according to the stages	ASU-1
14	User will use the features in the Singme App more often	ASU-2
15	User will repeatedly use the Singme App to search for or market music entertainment services	ASU-3

2. Convergent validity testing

Table 4. The results of AVE

Variable	AVE
Perceived Usefulness (PU)/X1	0.61
Perceived Ease of Use (PEOU)/X2	0.58
AttitudeTowards Using (ATU)/Y1	0.61
Behavioral Intention to Use (BITU)/Y2	0.58
Actual System Use (ASU)/Y3	0.68

A variable can be said to be convergently valid if the AVE value $\geq$ 0.50 [18].

3. Discriminant validity testing

Table 5. The results of Fornell-larcker Criterion

Variable	X1	X2	Y1	Y2	Y3
X1	0.78				
X2	0.59	0.76			
Y1	0.65	0.62	0.78		
Y2	0.66	0.67	0.70	0.76	
Y3	0.58	0.57	0.68	0.72	0.82

Using the results of the Fornell-Larcker Criterion by comparing the square root value of the AVE of a latent variable with another, where the value must be the largest overall [18], then the variable can be said to be discriminately valid.

4. Composite reliability testing

Table 6. The results of CR

Variable	CR
X1	0.75
X2	0.81
Y1	0.83
Y2	0.85
Y3	0.86
X1	0.75

The value of CR must be in the range 0.70 to 0.95, then the variable can be said to be reliable. In general, reliability testing uses Cronbach's Alpha values, however, CR is better than Cronbach's Alpha because CR can weigh individual indicators into its calculations [18].

5. R Square (R^2) testing

Table 7. The results of R Square

Variable	R^2
X1	0.343
Y1	0.507
Y2	0.561
Y3	0.523

Based on the TAM construct, X2 influences X1 by 34.3%, X1 and X2 influence Y1 by 50.7%, X1 and Y1 influence Y2 by 56.1%, and Y2 influences Y3 by 52.3%. While the rest of the other influence percentage values are the influence of other variables that are not defined.

6. Hypothesis testing

Table 8. The results of t-statistic and p-value

Hypothesis		T-Statistic	P-Value
H_1	X2 ->X1	10.060	0
H_2	X2 ->Y1	5.184	0
H_3	X1 ->Y1	5.815	0
H_4	X1 ->Y2	4.839	0
H_5	Y1 ->Y2	5.882	0
H_6	Y2 ->Y3	12.844	0

Based on the table above, all hypotheses can be accepted because they have met the requirements that the value of t-statistic > t-table, where the value of t-table used in the degree of freedom (df) = 117 with a significance level = 0.05 is 1.981 and p-value < 0.05.

V. CONCLUSION

Based on the results of system acceptance testing, it can be concluded that:

1. All Hypothesis can be accepted because they have met the requirements that the value of t-statistic > t-table (1.981) and the p-value < 0.05, and is supported by the results of the R Square calculation where all the R Square value > 0

2. The system helps service providers in marketing their services which can be interpreted by the PU variable. Where according to the results of hypothesis testing, H_1 can be accepted with a PEOU influence value of 34.3%

3. The system can provide service package information and provide recommendations using the CBF method. This is represented by the BITU variable, which according to the results of hypothesis testing H_4 and H_5, can be accepted with the influence value of PU and ATU of 56.1%.

4. The system can facilitate the transaction process of both parties represented by the ASU variable. Where according to the results of hypothesis testing, H_6 can be accepted with the BITU effect value of 52.3%.

REFERENCES

[1]   BPS, *Statistik E-Commerce*. 2020.

[2]   BPS, "Pertumbuhan Ekonomi Indonesia Triwulan IV-2020," *Www.Bps.Go.Id*, no. 13, p. 12, 2021.

[3]   BKPM, "KLASIFIKASI BAKU LAPANGAN USAHA INDONESIA (KBLI) 2020," *BKPM*, 2020. .

[4]   KEMENDAGRI, "Instruksi Menteri Dalam Negeri Nomor 43 Tahun 2021," *KEMENDAGRI*, Sep-2021. .

[5]   R. Rosdiana, D. Kurniadi, and A. Huda, "Rekayasa Sistem Informasi Promosi Dan Pengelolaan Jasa Studio Foto Berbasis Web," *Voteteknika (Vocational Tek. Elektron. dan Inform.*, vol. 7, no. 2, p. 20, 2019.

[6]   I. H. Faadhilla and D. Kurniadi, "Sistem Informasi Penyedia Jasa Make-Up Berbasis Web," *Voteteknika (Vocational Tek. Elektron. dan Inform.*, vol. 9, no. 1, p. 40, 2021.

[7]   A. E. Wijaya and D. Alfian, "Sistem Rekomendasi Laptop Menggunakan Collaborative Filtering Dan Content-Based Filtering," *J. Comput. Bisnis*, vol. 12, no. 1, pp. 11–27, 2018.

[8]   F. B. A. Larasati and H. Februariyanti, "Sistem Rekomendasi Product Emina Cosmetics Dengan Menggunakan Metode Content - Based Filtering," *J. Manaj. Inform. dan Sist. Inf.*, vol. 4, no. 1, p. 45, 2021.

[9]   M. W. Putri, A. Muchayan, and M. Kamisutara, "Sistem Rekomendasi Produk Pena Eksklusif Menggunakan Metode Content-Based Filtering dan TF-IDF," *JOINTECS (Journal Inf. Technol. Comput. Sci.*, vol. 5, no. 3, p. 229, 2020.

[10]   S. Ikhlaasahi and H. P. Putro, "Komparasi Dua Teknik Black Box Testing: Equivalence Partitioning dan Boundary Value Analysis (Studi Kasus: Aplikasi Postcrossing)," *Pros. Annu. Res. Semin. 2019*, vol. 5, no. 1, pp. 213–220, 2019.

[11]   Y. Afoudi, M. Lazaar, and M. Al Achhab, "Hybrid recommendation system combined content-based filtering and collaborative prediction using artificial neural network," *Simul. Model. Pract. Theory*, vol. 113, Dec. 2021.

[12]   A. Mahardhika, "AKUNTAN DI ERA DIGITAL: PENDEKATAN TAM (TECHNOLOGY ACCEPTANCE MODEL) PADA SOFTWARE BERBASIS AKUNTANSI," *J. Ilm. Akunt. dan Keuang.*, vol. 8, no. 1, pp. 12–16, Jan. 2019.

[13]   I. V. Kusuma, Suwitno, A. Wijaya, and A. R. K. Maranto, "PERANCANGAN SISTEM INFORMASI B2B BERBASIS WEB PADA INDUSTRI KAROSERI DENGAN PENDEKATAN TAM (TECHNOLOGY ACCEPTANCE MODEL)," *AKSELERATOR J. SAINS Terap. DAN Teknol.*, vol. 2, no. 2, pp. 25–40, Oct. 2021.

[14]   Riki, "ACCEPTANCE OF WEB-BASED TECHNOLOGY AS A HARMONIOUS COMMUNITY OF CITIZEN WITH THE CONCEPT OF TECHNOLOGY MODEL ACCEPTANCE," vol. 10, pp. 8–11, 2019.

[15]   M. R. Julianto and B. Daniawan, "E-COMMERCE INFORMATION SYSTEM USING TECHNOLOGY ACCEPTANCE MODEL APPROACH," *J. TAM (Technol. Accept. Model)*, vol. 13, pp. 1–8, 2022.

[16]   R. D. Susilo, B. Daniawan, A. Wijaya, and Suwitno, "The Acceptance Study of e-commerce Customers Based on," *bit-Tech*, vol. 3, no. 3, 2021.

[17]   A. Rahmawati, D. Novita, and I. Pradesa, "Perancangan Kuesioner Analisis Penerimaan E-Tax Menggunakan Technology Acceptance Model (TAM) ," *MDP STUDENT Conf. 2022*, pp. 512–517, 2022.

[18]   J. F. Hair, B. J. Babin, R. E. Anderson, and W. C. Black, *MULTIVARIATE DATA ANALYSIS*, 8th ed. Cengage Learning, 2019.

[19] S. Aprilisa, Samsuryadi, and Sukemi, "Pengujian Validitas dan Reliabilitas Model UTAUT 2 dan EUCS Pada Sistem Informasi Akademik," *J. MEDIA Inform. BUDIDARMA*, vol. 5, no. 3, pp. 1124–1132, Jul. 2021.

[20] K. C. Laudon and J. P. Laudon, *Management Information Systems Managing the Digital Firm*, 13th ed. England: Pearson Education, 2014.

[21] R. LIKERT, S. ROSLOW, and G. MURPHY, "a Simple and Reliable Method of Scoring the Thurstone Attitude Scales," *Pers. Psychol.*, vol. 46, no. 3, pp. 689–690, 1993.

[22] K. Leighton, S. Kardong-Edgren, T. Schneidereith, and C. Foisy-Doll, "Using Social Media and Snowball Sampling as an Alternative Recruitment Strategy for Research," *Clin. Simul. Nurs.*, vol. 55, pp. 37–42, Jun. 2021.

BIOGRAPHY

Ivander Darmawan, currently working as a Programmer at PT. KlipPlastik Indonesia and has completed his Bachelor studiesin the field of Information System with a GPA of 3.91 at Buddhi Dharma University in 2022.

Benny Daniawan, graduated in the Information Technology Study Program (S1) in 2011, continued his Masters in Information Systems in 2014, and graduated in 2016. He is currently a Lecturer Information Systems Study Program at Buddhi Dharma University.