

## EVALUATION OF USER SATISFACTION USING THE PIECES FRAMEWORK IN THE TEMAN BUS APPLICATION

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**Abstract**—The TEMAN BUS program employs technology to improve road-based public transportation in urban areas. The Ministry of Transportation of the Republic of Indonesia implements digital transformation by developing the TEMAN BUS application to support TEMAN BUS transportation services. Passengers will find it more straightforward with this application to access the TEMAN BUS travel route, view information about the departure timetable, and observe bus arrivals in real time. To evaluate an application's effectiveness, it is necessary to assess the user's impression when the program is launched. This study uses the PIECES Framework, which has six variables Performance, Information, Economics, Control and Security, Efficiency, and Service, to assess how users perceive the TEMAN BUS application. The findings of this study were derived from the perceptions of respondents, who felt that information and data performance, control and security, service, and user satisfaction were not good, and from the findings of hypothesis testing, which suggested that information and data performance and user satisfaction were unrelated.

**Keywords:** user satisfaction, bus application TEMAN BUS, pieces, sem-pls

**Abstrak**—TEMAN BUS adalah program pengembangan angkutan umum dikawasan perkotaan berbasis jalan yang menggunakan teknologi, Untuk mendukung layanan transportasi TEMAN BUS, Kementerian Perhubungan Republik Indonesia mengimplementasikan transformasi digital dengan menciptakan aplikasi TEMAN BUS. Dengan adanya aplikasi ini akan mempermudah penumpang untuk melihat akses rute perjalanan TEMAN BUS, melihat informasi jadwal keberangkatan dan melihat kedatangan Bus secara real time. Pada dasarnya evaluasi dari persepsi pengguna saat aplikasi diluncurkan sangat dibutuhkan untuk mengukur keefektifannya suatu

*aplikasi. Penelitian ini bertujuan untuk mengevaluasi kepuasan pengguna aplikasi TEMAN BUS menggunakan PIECES Framework dengan enam variabel yaitu Performance, Informaton & Data, Economics, Control & Security, Efficiency, dan Service. Pendekatan penelitian yang digunakan adalah kuantitatif yaitu survey untuk pengumpulan data analisis data menggunakan SEM-PLS. Hasil dari penelitian ini diperoleh dari hasil persepsi responden yang menyatakan kinerja Information & Data, Control & Security, Service, dan User Satisfaction kurang baik dan dari hasil uji hipotesis yang memprediksi Performance dan Information & Data tidak mempengaruhi kepuasan pengguna.*

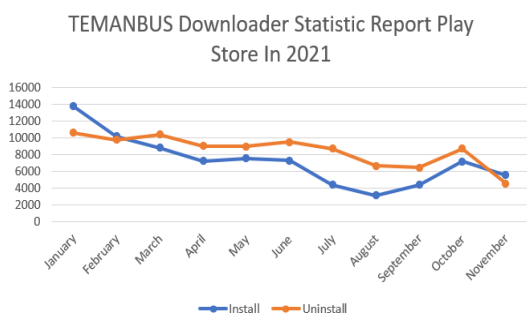
**Kata Kunci:** kepuasan pengguna, aplikasi teman bus, pieces, sem-pls

### INTRODUCTION

TEMAN BUS is the physical embodiment of the Ministry of Communications program in the Republic of Indonesia, namely, *Buy the Service*, to give users economical, easy, reliable, and convenient transportation to users (Teman Bus, 2020). The TEMAN BUS transport service launched on June 2, 2020, in five cities in Indonesia: Solo, Palembang, Denpasar, Yogyakarta, and Medan, which is now already developing into 11 big cities. They are Makassar, Banyumas, Bandung, Banjarmasin, Surabaya, and Bogor. The Ministry of Communications of the Republic of Indonesia implements digital transformation through the TEMAN BUS application to make it easier for passengers to access their TEMAN BUS trip route. Users can look at a timetable or departure and arrival times from the bus in real-time.

Based on data from the TEMAN BUS Downloader Statistics Report from the Play Store and App Store provided by the third-party developer, the number of installs of the TEMAN

BUS application in Figure 1 is not constant because the graph's direction goes up at the beginning of the year and down until the end of the year. In contrast, the total uninstall of the TEMAN BUS application appears to be constant, even though there is a point where the number of installs equals the number of uninstalls, indicating that more users install applications and then uninstall them later. This shows that the implementation of the TEMAN BUS application was not done optimally, leaving the user unsatisfied for the first time using it, and after that, the user uninstalled it.



Source: Internal Developer Data TEMAN BUS application (2021)

Figure 1. TEMAN BUS downloader statistic report Play Store year 2021

Evaluation by the user is one of the most important factors in determining the success level of a system or application. A reaction or reciprocity from an interactive user-related system is called User Satisfaction to a decision based on the user's evaluation. Evaluation is required to determine user satisfaction and analyze problems with the TEMAN BUS application. Evaluation to assess user satisfaction and use system performance levels of support to better any information or features presented. (Kinanti, 2021). The next step assesses user satisfaction with the TEMAN BUS application regarding support methods and applicability to existing problems. The PIECES Framework, which measures the level of satisfaction among loading users in six categories: Performance, Information, Economics, Efficiency, Control and Security, and Services (Febriansah & Abdillah, 2020), is one suitable method used to evaluate user satisfaction in the TEMAN BUS application. Through the PIECES framework, innovative work in product development could be produced as ingredients for future repair systems (Fatoni, 2020).

According to a previous study published by (Arsheyala, 2022), which demonstrated success evaluation and user satisfaction using the PIECES framework on the cloud storage service, the type of research conducted (quantitative via surveys): Used structural equation modeling (SEM) to

collect and process the necessary data (Pengembangan Menggunakan Sem Dan Amos et al., 2021). According to the results, there are six accepted hypotheses and one rejected hypothesis on the establishment, making this the seventh total hypothesis used.

Based on his explanation of the so-called need, he evaluated user satisfaction with the TEMAN BUS application using the PIECES framework to measure the response users had at they inappropriately used the application manner.

## METHODOLOGY

### A. Stages Study

This staged study was carried out through several stages, from literature studies to results research and conclusions, which can be seen in Figure 2 stages of research.

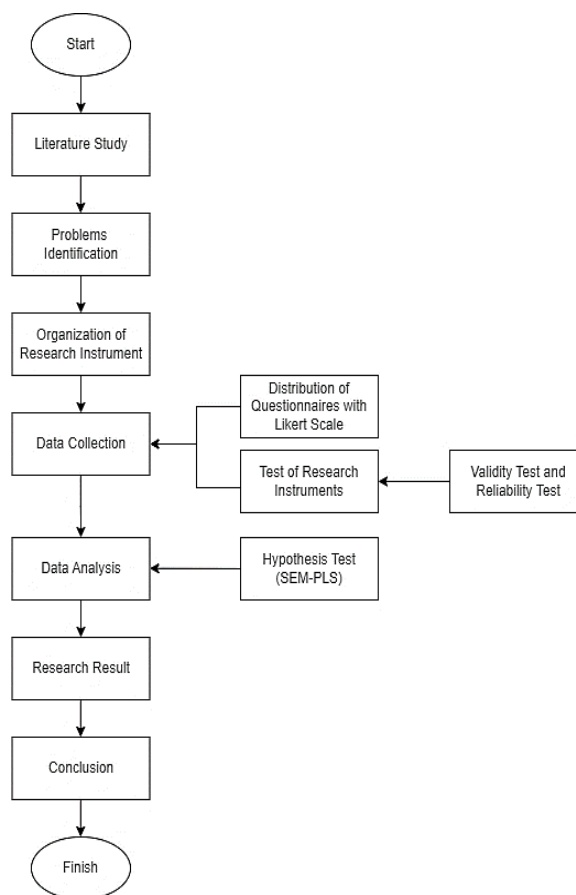


Figure 2. Stages of research

### B. Framework Draft Study

Framework creates a point-to-point connection for each variable, which includes user satisfaction (Satisfaction User), Performance (Constraints), information and data (Data and Information), Economic (Economic Value), Control and Security (Control and Security), Efficiency (Efficiency), and Service (Service). A

draft framework for the study can be seen in Figure 3.

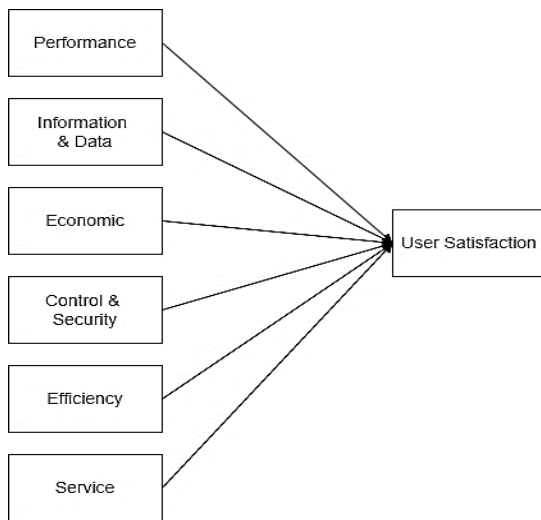


Figure 3. Framework Draft Study

The skeleton draft study produces hypotheses for research to be tested for truth.

- H1: Performance will have a significant impact on *User Satisfaction*
- H2: Information and data will have a significant impact on *User Satisfaction*
- H3: Economic will have a significant impact on *User Satisfaction*
- H4: Control and Security will have a significant impact on *User Satisfaction*
- H5: Efficiency will have a significant impact on *User Satisfaction*
- H6: Service will have a significant impact on *User Satisfaction*

**C. Research Design**

The population under study is the entire user base of the TEMAN BUS application, which is spread across 11 cities. Based on an interview with a party developer of the TEMAN BUS application, the total user count from November 2021 TEMAN BUS application has reached 3,908 users. Sample research is conducted using the probability sampling method (simple random sampling), in which every user of the BUS TEMAN application has the same chance of being chosen for a random sample, regardless of population strata. The amount of sample taken was calculated using the slovin formula with a level of 5% error and a precision of 95% using the following formula (Tullah & Hanafri, 2014):

$$n = \frac{N}{1+Ne^2} \dots\dots\dots (1)$$

Explanation: n = Total sample; N = Total population; Tolerance limit error (5%)

$$n = \frac{3908}{1+3.908 (0,0025)} = 360$$

Considering the total population, time, and cost of 3908 users, the TEMAN BUS application is used by 360 people who will serve as a sample in this study. Users of the BUS TEMAN service who have a smartphone and use the BUS TEMAN application and users located in the 11 cities already served by the FRIEND BUS service participate in the study.

**D. Data Collection**

This is primary data and secondary data in the inner data type study. Primary data are gathered through a distribution questionnaire designed for TEMAN BUS application users, while secondary data are gathered through a literature review and interviews with the party developer. Technical data collection is carried out with a method deployment questionnaire sent to users of the TEMAN BUS application online through a Google Form that contains a statement-related PIECES framework. Spread questionnaires located in 11 cities in Indonesia, namely Solo, Palembang, Denpasar, Yogyakarta, Medan, Makassar, Banyumas, Bandung, Banjarmasin, Surabaya, and Bogor.

**E. Instrument Study**

Instrumental research includes a questionnaire based on the user's demographics, a statement already associated with satisfaction, and variable pieces using a Likert scale. Likert scale, which is a scale used to measure someone's or a group of people's attitudes, opinions, and perceptions about social phenomena (Sugiyono, 2012:93). For each category answer, a Likert scale of 1 to 5 is used, with each component assigned a score or weight between 1 and 5. Score 5 criteria are Strongly Agree (SS), score four criteria are Agree (S), score three criteria are Neutral (N), score two criteria are Not Agree (TS), and Score 1 criterion is a Strong No Agree (STS).

Instruments are studied during trials using a measurement model (the outer model) on variable indicators of factors or latent variables. The outer model is a measurement model for evaluating the validity and reliability of the model (Setiaman, 2023). The validity test consists of two steps: Convergent validity covers the loading Factor and Average Variance Extracted (AVE), and Discriminant Validity covers Fornell-Larcker Criterion and Cross Loading. There are two steps in the reliability test: composite reliability and Cronbach's alpha. The condition could be met after validation and reliability testing, and the next step was structural model testing (inner model).

## F. Data Processing

In the data processing process, method analysis bivariate and univariate use tool SPSS aid and hypothesis testing to test the truth hypothesis to be purpose study use tool help SEM-PLS.

### 1. Bivariate Analysis,

It is intended to determine the impact between the two variables by testing the effect of characteristics on user satisfaction with the TEMAN BUS application using the SPSS tool by looking at the Cross Tabulation and the Chi-Square test. Cross Tabulation to see the relationship between exogenous and endogenous user satisfaction variables. The Chi-Square test determines the influence of respondent characteristics on user satisfaction with the rule that if the contingency table is 2 X 2 but does not meet the requirements in the Chi-square test, the formula used is the Fisher Exact Test. Meanwhile, if the contingency table is more than 2 X 2, for example, 2 X 3, the formula used is Pearson Chi-square (Negara & Prabowo, 2018). Furthermore, to determine the relationship or influence so that it can be accepted, it can be seen from the p-value or significant = 0.05 or 5%. If the p-value > 0.05, then there is no significant effect, and if the p-value < 0.05, then there is a significant effect

### 2. Univariate Analysis,

They were conducted to analyze one variable without relation to another variable to know and identify the respondent's description of the variable with the method and perform a normality test with the tool SPSS to see visuals Kolmogrov-Smirnov Test with a normal condition and a score significance greater than 0.05.

In the PIECES Framework for analyzing characteristics, level satisfaction is measured using the model defined by Kaplan and Norton (Asbar & Saptari, 2017) with level 1-1.79 = Strongly Agree. 1.8-2.59 = Unsatisfied; 2.6-3.39 = Undecided; 3.4-4.91 = Satisfied; 4.92-5.9 = Very Satisfied.

### 3. Hypothesis Test,

They used the inner (*structural*) model to predict connection causality Among latent variables (Ningsi, 2018). *Inner models* are conducted through six steps: coefficient path ( $\beta$ ), coefficient determination ( $R^2$ ), t-test using the bootstrap method, size effect ( $f^2$ ), relevance predictive ( $Q^2$ ), and impact relative ( $q^2$ ) with the use of SEM-PLS (Sudiantini & Saputra, 2022).

## RESULTS AND DISCUSSION

### Research Results

#### A. Characteristics Respondents

Characteristics respondent results from deployment questionnaire on the demographic

instrument that includes address, type, gender, and age user BUS TEMAN application. Analysis bivariate on characteristics respondents to use look the resulting influence from two fruit variable with test influence characteristics respondents which include Address, Type Gender and Age to Satisfaction Users (User Satisfaction) use the TEMAN BUS application tool SPSS help with look Cross Tabulation and perform the Chi-Square test. The result of the characteristic respondent is generally seen in Table 1.

Table 1. Characteristics Respondents

Characteristics Respondents	Amount Respondents	Percentage
Address (Domicile City)		
Solo	27	7%
Palembang	36	10%
Bali	49	14%
Jogja	33	9%
Medan	28	8%
Macassar	29	8%
Banyumas	30	8%
Bandung	33	9%
Banjarmasin	29	8%
Surabaya	32	9%
Bogor	35	10%
Sex		
Man	191	53%
Woman	170	47%
Age		
< 20 Years	62	17%
21-30 Years	229	64%
31-40 Years	65	18%
> 41 Years	5	1%

#### 1. Address

The cross-tabulation shows that most respondents who used the TEMAN BUS application came from Bali, with a total of 49 people and a percentage of 14%. According to the Chi-square test results, there is no connection or strong influence on the address to satisfy the BUS TEMAN application user.

#### 2. Sex

According to the cross-tabulation results, the most common respondent user of the TEMAN BUS application, with a percentage of 53%, is a unique sex man, with as many as 191 people. According to the Chi-square test results, there is no link or strong influence on users' satisfaction with the TEMAN BUS application.

#### 3. Age

The cross-tabulation results show a dominant respondent user for the TEMAN BUS application for those aged 21–30 years, as many as 229 people, with a percentage of 64%. The Chi-square test results show a 4X4 contingency table with the formula used as Pearson Chi-square, which has an expected frequency of less than 5 of 25%, and the Chi-square test requirements are met. These results show a p-value or significant value of 0.009 with an alpha rule of 0.05, so the p-value is <0.05.

Thus, age has a strong relationship or influence on user satisfaction with the TEMAN BUS application.

**B. Instrument Test Results Study**

The instrument test uses the measurement model (Outer Model) through two stages, namely by testing the validity and reliability with the following results:

1. Validity Test

The Convergent Validity results of the 32 indicators get a loading factor value of more than 0.70 so that all indicators are said to be valid, and there is no removal of indicators from the model chart, and the AVE value test results show that all variables have a value of more than 0.5 so that all variables are declared valid.

The results of Discriminant Validity on the Fornell-Lacker Criterion show that the correlation between the variable and the variable itself is more significant than the other variables. The correlation value is more than 0.70, so it is said to be valid, and the Cross Loading value shows that

the correlation between the variable and the indicator itself is more significant in value than indicators with other variables and have a value of more than 0.70 so that it is said to be valid.

2. Reliability Test

Based on the results of Composite reliability shows that the value of each variable has a value of more than 0.70, so it is said to be reliable, and the results of Cronbach Alpha show that of the seven variables, there are six variables with a value of more than 0.7 and one variable with a value of 0.6 so it is said to be reliable

The results of the instrument test model can be seen in Figure 4. The final results of this study's outer model instrument test have met the prerequisites of good validity and reliability so that they can proceed to the next stage, namely the internal model analysis stage, to test the research hypothesis. All indicators in the instrument outer model test were successfully maintained so that there was no removal of indicators.

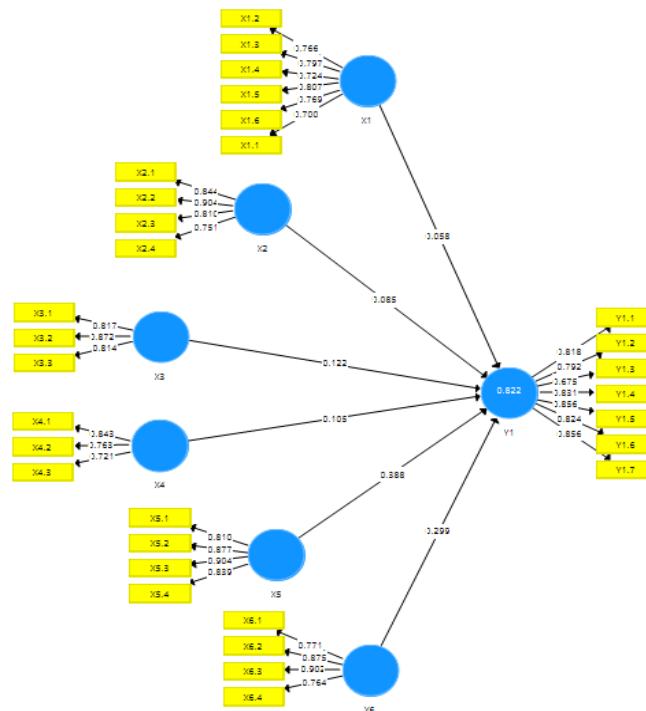


Figure 4. Instrument Test Model

**C. Analysis Results Univariate**

Responses to the PIECES variable were analyzed univariately with a normality test. If the variable is normally distributed, use the mean value as the score divisor; otherwise, use the median value as the score divider. The results will divide the respondents' perceptions into Good and Not Good. The recap results of respondents' perceptions of PIECES performance can be seen in Table 2.

Table 2. Recap Results Perception Respondents on PIECES Performance

Variable	Min	Max	Sum	Means	Median
Performance	8	30	7578	20.99	21
Information & Data	5	20	4569	12.66	12
economics	3	15	4056	11.24	11
Control & Security	3	15	3275	9.07	9
Efficiency	7	20	5214	14.45	14
Service	7	25	6024	16.69	16
User Satisfaction	12	35	8236	22,81	23

#### **D. Hypothesis Test Results Study**

In the Hypothesis Analysis Testing the sixth test hypothesis using a structural model (Inner Model) for look indication, connection, and causality among latent variables with six type steps, namely:

1. Path coefficient: There are two hypotheses, H1 and H2, that do not meet the threshold limit of 0.1, implying that the second hypothesis has no significant influence.
2. The coefficient of determination obtained from an R-square test with a score of endogenous variables ranging from 0.745 percent to 74.5 percent indicates that the influence obtained from exogenous variables on endogenous variables is strong.
3. T-test, from the sixth hypothesis, four paths have values greater than 1.96 and are considered acceptable, while two tracks, H1 and H2, have scored less than 1.96 and are considered rejected.
4. Effect size: from the sixth hypothesis, two hypotheses accept influence small with score threshold limits below 0.02; three, H3, H5, and H6, accept influence medium with score threshold limits below 0.15; and one, H4, accepts influence big with a score threshold limit of 0.35.
5. Predictive Relevance: Based on the sixth hypothesis, a value of 0.473 already exceeds the score threshold limit of 0, indicating predictive relevance.
6. Relative impact, derived from the sixth hypothesis: influential Big with a score threshold limits greater than 0.35.

#### **Discussion**

According to the findings of the bivariate test research, there are two characteristics: type, gender, and address, indicating that there is no relationship you have or a strong influence on satisfaction user, whereas characteristics of age and relationships have a strong influence on satisfaction user with dominant respondents who are in the age range of 21-30 years and have 20 satisfied people and 210 less satisfied people.

From the results, the perception respondent to each variable uses analysis univariate with performing a normality test. All variables show scores significantly smaller from 0.05, using the median value as divider category good and not good enough. The variable performance has a median value of 21 as a divider, so the variable performance results are categorized as good with a percentage of 53%. There is a median value of 12 as a divider in information and data variables, so the results of variable information and data are

categorized as not good with a percentage of 53%. On economic variables, the median value is 11 as a divider, so the economic variable results are categorized as good with a percentage of 61%. There is a median value of 9 as a divider in control and security variables, so the variable control and security results are categorized as not good enough with a percentage of 58%. The variable efficiency has a median value of 14 as a divider, so the variable efficiency results are categorized as good with a percentage of 60%. The variable service has a median value of 16 as a divider, so the variable service results are categorized as good with a percentage of 55%. The variable user satisfaction has a median value of 23 as a divider, so the results of the variable user satisfaction are categorized as not good enough with a percentage of 90%.

The hypothesis test was done on the sixth hypothesis, and the results on H1 show that X1 (Performance) is not influential in a manner significant to Y1 (User Satisfaction), so H1 was rejected in the study. The results of the H2 hypothesis test shows that X2 (Information and Data) does not influence in a manner significant to Y1 (User Satisfaction), so H2 was rejected in this study. The hypothesis test results on H3 show that X3 (Economic) is influential in a manner significant to Y1 (User Satisfaction), so H3 is accepted in this study. The hypothesis test results on H4 show that X4 (Control and Security) has an effect in a manner significant to Y1 (User Satisfaction), so H1 was rejected in the study. The hypothesis test results on H5 show that X5 (Efficiency) significantly affects Y1 (User Satisfaction), so H5 is accepted in this study. The hypothesis test results on H6 show that X6 (Service) has an effect in a manner significant to Y1 (User Satisfaction), so H6 is accepted in this study.

#### **Implications Research**

To determine the study's implications, a SWOT analysis was created to analyze the Strengths, Weaknesses, Opportunities, and Threats. SWOT analysis is based on univariate, bivariate, and hypothesis testing results. Following the following SWOT analysis, strategize about every element that can assist the party developer in developing the future TEMAN BUS application. The SO (Strengths and Opportunities) strategy analysis results cover how-to videos to use the TEMAN BUS application, disseminate TEMAN BUS information through social media to make it easily accessible, and present a challenge to TEMAN BUS users via social media. The WO (Weaknesses and Opportunities) strategy analysis results include Improvements to simple and

appealing interface design and improvements to accuracy and timely information updates. The findings of the ST strategy analysis (Strengths and Threats) include maximizing the function of the TEMAN BUS application so that users believe the TEMAN BUS application is genuinely needed and approaching TEMAN BUS users aged 21-30 years for assistance with deployment information. The WT strategy (Weaknesses and Threats) approaches users who have not adapted to digital change, improves security and system improvements to the TEMAN BUS application to reduce errors, and updates the plan track bus stop with the location.

### CONCLUSION

Based on the evaluation of users' satisfaction with using the TEMAN BUS application, it is possible to conclude that, based on the characteristics of respondents' age, the dominant age exists at 21-30 years. Four categorized variables are from the results perception respondent to the seventh variable: good (variable performance), economic, efficient, and service, and three categorized variables not so good (information and data), control and security, and user satisfaction. From the hypothesis test that was carried out, the hypothesis that has been accepted is H3: Economics is influentially significant to satisfaction users. H4: Control and Security are influentially significant to satisfaction users. H5: Efficiency is influentially significant to satisfaction users, and H6: Services is influentially significant to satisfaction users, based on the results of hypothesis testing that has been conducted to date. Two track hypotheses, namely H1: Performance, are not significant enough to influence satisfaction users, and H2: Information and Data are not significant enough to influence satisfaction users, both of which are rejected. The research results obtained can be used as a reference for future TEMAN BUS application developers, especially in terms of performance and information, by considering the application's interests and user satisfaction.

### REFERENCE

- Asbar, Y., & Saptari, M. A. (2017). Analisa Dalam Mengukur Kualitas Pelayanan Terhadap Kepuasan Konsumen Menggunakan Metode PIECES. *Jurnal Visioner & Strategis*, 6(2), 39-47. <https://www.journal.unimal.ac.id/visi/article/view/301>
- Fatoni, A., Adi, K., & Widodo, A. P. (2020). PIECES Framework and Importance Performance Analysis Method to Evaluate the Implementation of Information Systems. *E3S Web of Conferences*, 202, 1-11. <https://doi.org/10.1051/e3sconf/202020215007>
- Febriansah, B., & Abdillah, L. A. (2020). Web-based Computerized Land Activities Analysis. *Journal of Information Systems and Informatics*, 2(1), 178-191. <https://doi.org/10.33557/JOURNALISI.V2I1.60>
- Kinanti, N., Putri1, A., & Dwi, A. (2021). Penerapan PIECES Framework sebagai Evaluasi Tingkat Kepuasan Mahasiswa terhadap Penggunaan Sistem Informasi Akademik Terpadu (SIKADU) pada Universitas Negeri Surabaya. *Journal of Emerging Information System and Business Intelligence (JEISBI)*, 2(2), 78-84. <https://ejournal.unesa.ac.id/index.php/JEISBI/article/view/39730%0Ahttps://ejournal.unesa.ac.id>
- Negara, I. C., & Prabowo, A. (2018). Penggunaan Uji Chi-Square untuk Mengetahui Pengaruh Tingkat Pendidikan dan Umur terhadap Pengetahuan Penasun Mengenai HIV-AIDS di Provinsi DKI Jakarta. *Prosiding Seminar Nasional Matematika Dan Terapannya 2018*, 1(1), 1-8. <http://matematika.fmipa.unsoed.ac.id/wp-content/uploads/3.-igo-dkk.pdf>
- Ningsi, B. A. (2018). Analisis Kepuasan Pelanggan Atas Kualitas Produk dan Pelayanan Dengan Metode SEM-PLS. *Jurnal Statistika Dan Aplikasinya*, 2(2), 8-16. <https://doi.org/10.21009/jsa.02202>
- Pengembangan Menggunakan Sem Dan Amos, D., Sevi Andriasari Akademi Manajemen Informatika Dan Komputer Lampung Jl Pagar Alam No, O. Z., & Rajabasa Bandar Lampung, A. (2021). Kajian Sistem Informasi Akademik Untuk Efektivitas Dan Pengembangan Menggunakan Sem Dan Amos Studi Kasus Amik Lampung Bandar Lampung. *Journal of Innovation Research and Knowledge*, 1(7), 327-334. <https://bajangjournal.com/index.php/JIRK/article/view/804>
- Setiawan, S. (2023). Tutorial Analisa Parsial Model Persamaan Struktural Dengan Software Smart-Pls Versi 3 Untuk Tenaga Kesehatan. *Tutorial*, 3, 100.
- Sudiantini, D., & Saputra, F. (2022). Pengaruh Gaya Kepemimpinan: Kepuasan Kerja, Loyalitas Pegawai dan Komitmen di PT Lensa Potret Mandiri. *Formosa Journal of Sustainable Research*, 1(3), 467-478. <https://doi.org/10.55927/fjsr.v1i3.873>
- Sugiyono, M. (2012). *Penelitian Bisnis: Pendekatan Kuantitatif, Kualitatif, R&D*. Alfabeta.

- Teman Bus. (2020). *TEMAN BUS Transportasi Ekonomis Mudah Andal dan Nyaman*. Kementerian Perhubungan Republik Indonesia. <https://temanbus.com/>
- Tullah, R., & Hanafri, M. I. (2014). Evaluasi Penerapan Sistem Informasi Pada Politeknik LP3I Jakarta Dengan Metode Pieces. *Jurnal Sisfotek Global*, 4(1), 22–28. <http://journal.global.ac.id/index.php/sisfotek/article/view/36>
- Wulandari, R. A. I., & Tambotoh, J. J. C. (2022). Evaluation of Cloud Storage Services Using PIECES Method. *Sistemasi*, 11(1), 239. <https://doi.org/10.32520/stmsi.v11i1.1700>