Analysis of User Satisfaction Levels For Trans Jatim Bus Services In Malang City Using The Customer Satisfaction Method Index and Structural Equation Modeling

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Abstract.
This study aims to analyze the level of satisfaction of Trans Jatim Bus users in Malang city using the Customer Satisfaction Index (CSI) and Structural Equation Modeling (SEM) methods. A quantitative approach was used through the distribution of questionnaires to active users. CSI measures the level of satisfaction based on the suitability of service performance with user expectations, while SEM analyzes the relationship between service quality, satisfaction, and loyalty. Variables include reliability, responsiveness, assurance, empathy, and physical evidence. The results show that the level of satisfaction is in the satisfied category, and service quality has a significant effect on satisfaction and loyalty. This study provides strategic recommendations for improving the quality of public transportation services in a sustainable manner.
Keywords:*CSI, SEM, satisfaction and service.*

I. INTRODUCTION

Public transportation is a public transportation service with established routes and schedules, aimed at facilitating the movement of people over short and long distances (Cervero, 1998). Transportation is also a crucial element in supporting efficient and sustainable urban mobility (Margaretha and Nugroho, 2023). The existence of a reliable mass transportation system can reduce congestion, reduce pollution levels, and improve the quality of life of the community. Malang City, as one of the developing cities in East Java, has a relatively high level of mobility in line with population growth and economic activity. This condition demands a public transportation system that can optimally meet community needs. The Trans Jatim Bus is present as one public transportation solution that is expected to provide safe, comfortable, and affordable services. However, the success of a transportation service is measured not only by its existence but also by the level of user satisfaction. User satisfaction is an important indicator in assessing the quality of service provided by transportation service providers (Prima, 2020). Research by Purnandika and Septiana (2023) shows that a high level of satisfaction will encourage an increase in the number of users and create customer loyalty. Conversely, low levels of satisfaction can reduce public interest in using public transportation. Therefore, evaluating user satisfaction is crucial. This evaluation not only serves as a performance measurement tool but also as a basis for strategic decision-making. In this context, a scientific approach is needed to obtain objective and measurable results. One approach that can be used is the Customer Satisfaction Index method. This method can provide a quantitative overview of user satisfaction levels based on service attributes (Siahaan and Agustini, 2021). Furthermore, this method allows for comparisons between expectations and service performance. Thus, the results obtained can serve as a basis for determining service improvement priorities. The use of this method is considered relevant in assessing the quality of public transportation services. This is because the CSI can simplify complex data into easily understood indicators. Therefore, this method is widely used in various studies related to customer satisfaction. The application of this method to the Trans Jatim Bus service is expected to provide a comprehensive overview of user satisfaction levels. With clear measurement results, management can conduct more targeted evaluations. Furthermore, the results of this study can also serve as a reference for the development of public transportation services in the future.

In addition to using the Customer Satisfaction Index, this study also utilized the Structural Equation Modeling approach to analyze the relationships between variables that influence user satisfaction. SEM is a multivariate analysis method capable of simultaneously testing causal relationships between latent variables and indicator variables (Hair et al., 1998). The use of SEM in this study aims to gain a deeper understanding of the factors that influence user satisfaction. The variables analyzed include service quality dimensions such

as reliability, responsiveness, assurance, empathy, and tangibles. These dimensions are key components in assessing service quality. By using SEM, researchers can determine the extent to which each dimension contributes to user satisfaction. Furthermore, SEM also allows for analysis of the relationship between user satisfaction and loyalty. This is important because loyalty is one indicator of long-term service success (Widiastuti, 2024). The use of this method offers advantages in terms of accuracy and depth of analysis. Thus, the results obtained are not only descriptive but also analytical. This approach also allows for testing of previously developed theoretical models. In the context of this study, the model used refers to the theory of service quality and customer satisfaction. Therefore, the analysis results are expected to contribute to the development of theory and practice. Furthermore, the use of SEM also strengthens the validity and reliability of the research results. This is because SEM is able to examine relationships between variables in a more complex manner. Thus, the research results are more comprehensive and in-depth. The combination of CSI and SEM in this study is expected to provide a comprehensive picture of user satisfaction. This approach not only measures the level of satisfaction but also analyzes the causal factors. Therefore, this research has added value compared to studies that use only one method. With a comprehensive analysis, the research results can be used as a basis for more effective policy-making. Furthermore, this approach also contributes to the development of customer satisfaction analysis methods in the public transportation sector.

Although the Trans Jatim Bus has been operational as an effort to improve public transportation services, various challenges remain in its implementation. One of the main challenges is ensuring that the service provided meets user expectations. The discrepancy between expectations and reality is often a source of customer dissatisfaction (Adhari, 2021). This can be caused by various factors, such as reliability, responsiveness, assurance, empathy, and tangibles in determining service quality (Parasurama, 1985). Therefore, it is important to comprehensively identify the factors that influence user satisfaction. Without systematic evaluation, it is difficult for managers to determine which aspects need improvement (Muharika, 2019). This study aims to address this need through a measurable and systematic approach. Using the CSI method, user satisfaction levels can be measured quantitatively. Meanwhile, SEM is used to identify relationships between variables that influence satisfaction. This approach allows for a more in-depth analysis compared to conventional methods. Furthermore, this study also considers the local context of Malang City as the study location. User characteristics and regional conditions are important factors in determining the research results. Therefore, the results obtained are expected to be relevant to actual conditions in the field. This study also seeks to provide an objective overview of the quality of Trans Jatim Bus services. Thus, the research results can be used as a basis for decision-making. Furthermore, this research is also expected to contribute to improving the quality of public transportation services. This is crucial considering the role of public transportation in supporting sustainable development. With quality services, people will be more encouraged to switch from private vehicles. This will ultimately have a positive impact on the environment and transportation efficiency. Therefore, this research has high relevance in the context of urban development.

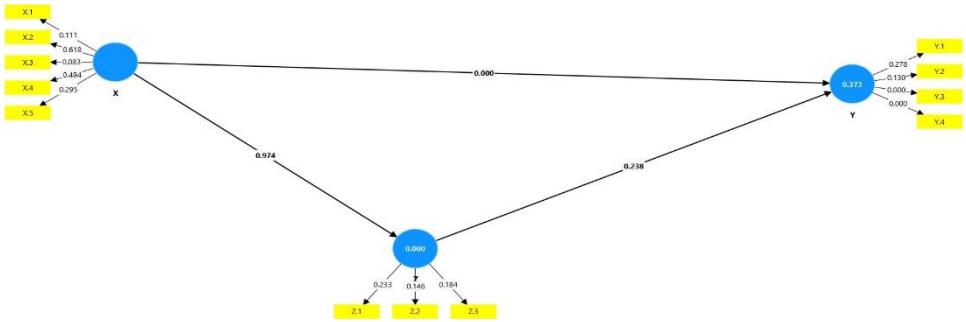
Based on the above description, this research is highly urgent. The level of user satisfaction is a crucial indicator in assessing the success of public transportation services. Therefore, an appropriate method is needed to measure and analyze this satisfaction. The use of the Customer Satisfaction Index provides a quantitative overview of the level of user satisfaction. Meanwhile, Structural Equation Modeling provides a deeper understanding of the factors influencing satisfaction. The combination of these two methods is expected to produce a comprehensive and accurate analysis. This research focuses not only on measuring the level of satisfaction but also on identifying the causal factors. Thus, the research results can be used as a basis for service improvement. Furthermore, this research also makes an academic contribution in the development of customer satisfaction analysis methods. In a practical context, the results of this study are expected to assist Trans Jatim Bus operators in improving service quality. Improved service quality is expected to increase user satisfaction and loyalty. This will ultimately have an impact on increasing public transportation use. With increased public transportation use, it is expected to reduce congestion and pollution in Malang City. Therefore, this research has broad implications, both academically and practically. In addition, this research can also serve as a reference for further research. Thus, this research is expected to

make a significant contribution to the development of science and practice in the field of public transportation. It also reflects the importance of a data-driven approach to decision-making. Therefore, the results of this study are expected to serve as a reference in formulating more effective public transportation policies. With appropriate policies, the quality of public transportation services can be continuously improved. This aligns with the government's efforts to create a sustainable transportation system. Therefore, this research has strategic value in supporting public transportation development in Indonesia.

II. RESEARCH METHODS

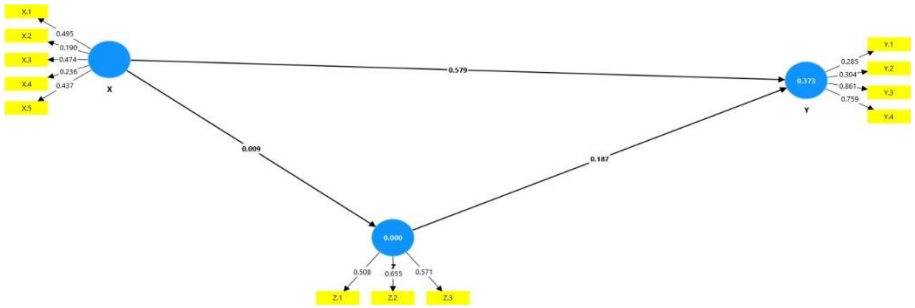
This study uses a quantitative approach with descriptive and causal research types to analyze the level of satisfaction and the relationship between variables among Trans Jatim Bus users in Malang City. The study population was all service users, with a sampling technique using purposive sampling, namely respondents who had used the service at least twice, with a sample size of 100 respondents. Data were collected through a 1–5 Likert scale-based questionnaire that measured service quality, satisfaction, and loyalty variables. Service quality variables were measured through indicators of punctuality, comfort, cleanliness, security, friendliness, bus stop access, schedule information, fares, facilities, and service speed. Data analysis was carried out in two stages, namely using the Customer Satisfaction Index (CSI) to measure the level of satisfaction quantitatively based on a comparison between service importance and performance, and Structural Equation Modeling (SEM) to test the causal relationship between variables. SEM evaluation includes testing the measurement model through validity and reliability, and the structural model through the coefficient of determination and hypothesis testing. This approach allows for comprehensive results in explaining the level of satisfaction as well as the factors that influence it.

III. RESULTS AND DISCUSSION

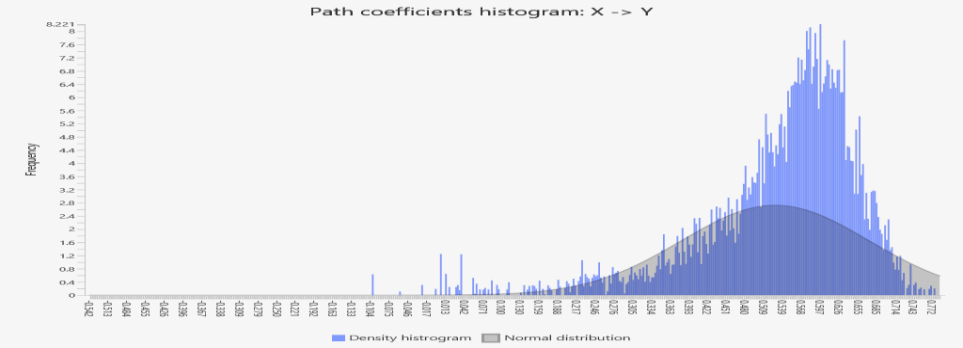


Based on the visual representation of the Partial Least Squares Structural Equation Modeling (PLS-SEM) model presented, the diagram illustrates the structure of the causal relationship between exogenous variable X and endogenous variable Y by involving Z as a mediating variable. Technically, the latent variable X is measured through five manifest indicators (X.1 to X.5) with varying loading factor values, where indicator X.2 shows the highest contribution of 0.618. Meanwhile, the intervening variable Z is supported by three indicators (Z.1, Z.2, Z.3), and the dependent variable Y is measured through four indicators (Y.1 to Y.4) with convergent validity values listed on each reflective path. Path analysis shows that the direct effect from X to Y has a path coefficient of 0.000, which statistically indicates the absence of a significant direct effect in this model. In contrast, the relationship between X to Z shows a very strong path coefficient of 0.974, indicating a dominant positive linear correlation between the two constructs. Furthermore, variable Z contributes to Y with a coefficient of 0.238, implying Z's role in transmitting the influence of the exogenous variables. The value of construct Y is recorded at 0.373, meaning that this model is able to explain 37.3% of the variance of variable Y through the combined contribution of X and Z. Interestingly, the coefficient value of variable Z is recorded at 0.000, which requires further evaluation of its statistical significance or estimation accuracy at a certain significance level. Overall, this model proposes a mediation mechanism where the influence of X on Y is mediated more by Z than through the direct path. The negative imbalance of loading values on indicator X.3 (-0.083) signals the need for more in-depth discriminant validity and composite reliability tests to ensure the quality of the measurement model. This

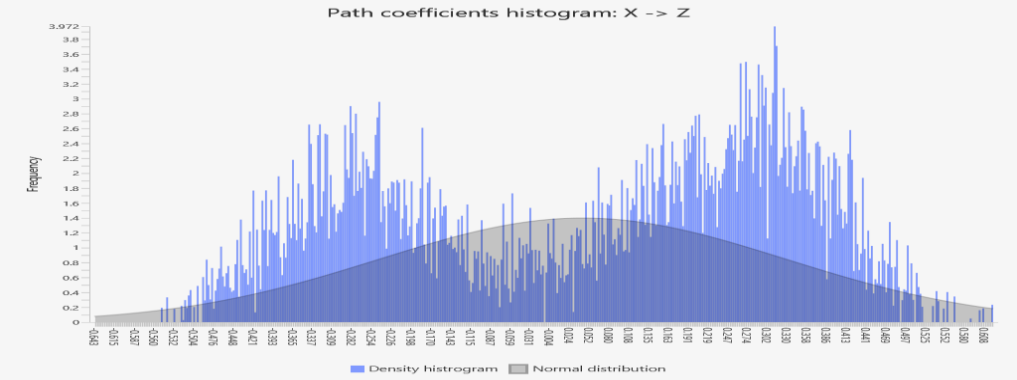
explanation provides a comprehensive picture of the interactions between the latent variables defined in the structural framework. Thus, the interpretation of this model relies heavily on the strength of the indirect relationship through the XZ and Y paths to achieve a complete theoretical understanding. Finally, this diagram serves as an empirical instrument to validate the research hypothesis regarding the structural influence between the variables studied.



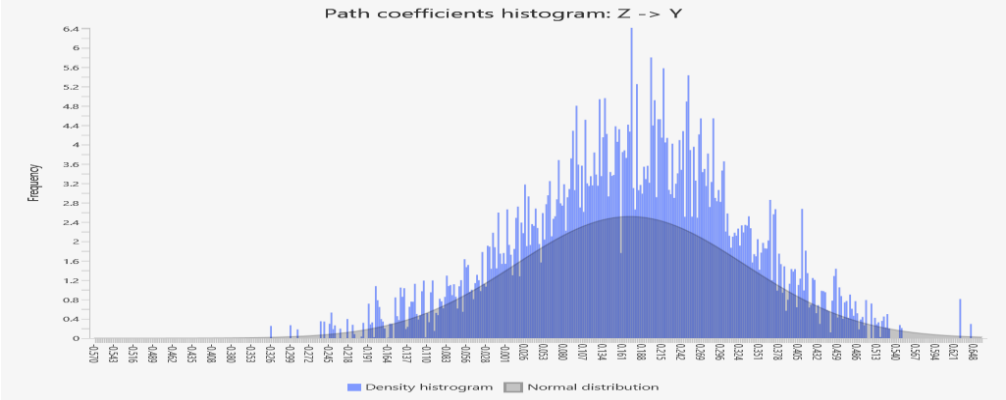
The exogenous variable X is measured through five manifest indicators (X.1 to X.5) with the highest outer loading value being on indicator X.1 at 0.495. The direct relationship between variable X and endogenous variable Y shows a significant path coefficient of 0.579. Meanwhile, the mediating variable Z is measured by three indicators (Z.1, Z.2, Z.3), where Z.2 contributes the largest loading of 0.655. The path analysis from X to the intervening variable Z produces a very low coefficient of 0.009. Furthermore, the influence of variable Z on the dependent variable Y is represented by a path coefficient of 0.187. The construct Y itself is validated by four manifest indicators, with Y.3 showing the highest indicator reliability level of 0.861. Based on the value listed in the Y construct of 0.373, this model is able to explain the variance of the dependent variable by 37.3% through a combination of the influence of X and Z. On the other hand, the R^2 value on the Z variable is recorded at 0.000, which indicates that the variability of Z can hardly be explained by the X variable in this model.



The histogram of path coefficients for the relationship between X and Y presented in the figure provides an empirical visualization of the distribution of parameter estimates generated through the bootstrapping procedure. The graph shows that the majority of path coefficients accumulate in the positive range, with the highest frequency occurring around 0.568 to 0.626. Statistically, this distribution indicates a consistent and significant positive effect of the exogenous variable X on the endogenous variable Y. The normal distribution curve accompanying the histogram exhibits a rightward skew, confirming the dominance of the positive effect in the model. The relatively wide range of coefficient values, from values close to zero to exceeding 0.772, reflects the variability of the data processed in the simulation. The high density of the histogram bars in the positive region provides strong support for the validity of the hypothesis regarding the causal relationship between the related constructs. Conversely, the frequency of negative or near-zero values appears very minimal, which minimizes the possibility of an absence of influence in the population. This visualization is crucial in PLS-SEM analysis to ensure that the estimated values are not simply single numbers but have measurable distribution stability. The presence of a gray curve as a comparison to the normal distribution helps researchers identify the extent to which sample data follows the theoretical distribution pattern. Overall, this histogram provides a solid statistical basis for concluding that variable X is a reliable predictor of variable Y within this structural model framework.

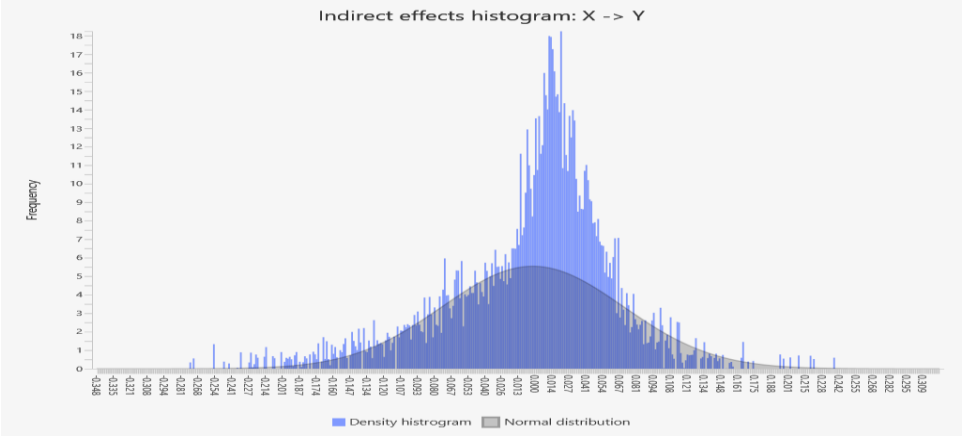


The histogram of path coefficients for the structural relationship between variables X and Z presented in the figure provides an in-depth visualization of the distribution of parameter estimates resulting from the bootstrapping procedure. The data show a fairly widespread distribution of values, ranging from negative to positive areas, with the highest frequency peak around 0.330. Statistically, the dominant concentration of histogram bars (Density histogram) on the right side of the zero axis indicates a tendency for variable X to have a positive influence on Z. However, the presence of bars in the negative area indicates some variability or uncertainty in the relationship between these constructs across several sample iterations. The gray normal distribution curve that shades the histogram shows a data distribution pattern that tends to follow a bell shape, although there are some quite sharp frequency fluctuations. The peak of the theoretical curve is around a value close to zero, which suggests that the significance of this relationship needs further validation through p-values or t-statistics. The range of coefficients that moves from -0.560 to exceed 0.608 reflects the complexity of the interactions between latent variables in this structural model. The density of data at positive values such as 0.274 and 0.302 reinforces the initial indication of a directional relationship between the two variables. This graph serves as a crucial diagnostic tool for assessing the stability of parameter estimates before drawing broader theoretical conclusions. Academically, this distribution visualization helps identify potential outliers or biases that may arise during the data simulation process. The overall appearance of this histogram emphasizes the importance of distributional analysis to ensure that conclusions regarding the effect of X on Z are based on adequate statistical stability.

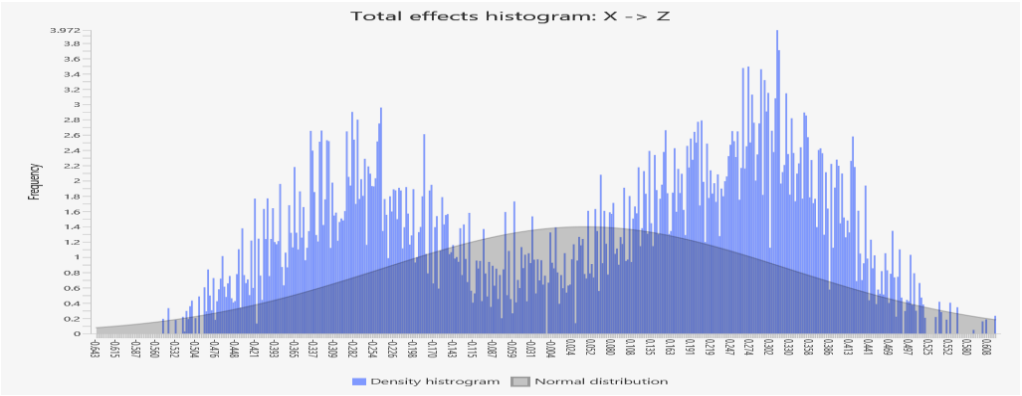


The path coefficient histogram, which presents the structural relationship between the mediating variable Z and the endogenous variable Y, provides a visual representation of the distribution of parameter estimates through the bootstrapping procedure. The graph shows that most path coefficients are predominantly distributed in the positive region, with the highest accumulated frequency occurring around 0.188 to 0.215. Statistically, the concentration of data to the right of the zero value indicates a stable positive influence of variable Z on variable Y within the studied model framework. The gray normal distribution curve that shades the histogram confirms that the parameter estimates tend to follow a bell-shaped distribution pattern with a measurable level of variability. The presence of fairly dense histogram bars in the middle range reflects the consistency of the simulation results in supporting the hypothesis of a relationship between these constructs. Although there are several outliers in the extreme negative region, their very minimal frequency does not significantly undermine the main positive trend of the existing path coefficients.

The range of values moving from -0.326 to 0.648 illustrates the dynamics of the distribution of data processed in the iterations of the research sample. This visualization serves as an essential diagnostic tool to verify the significance and reliability of causal relationships before further theoretical interpretation. The density of the bars in the density histogram provides empirical evidence regarding the effect size produced by the mediating variable on the dependent variable. Overall, this graph confirms that variable Z has a reliable contribution in explaining changes or variance that occur in variable Y systematically.



The presented histogram of indirect effects for the structural relationship between variable X and Y through the mediator provides a comprehensive visualization of the distribution of estimated indirect effects resulting from the bootstrapping procedure. The graph shows a very dense accumulation of frequencies around the zero value, with the highest distribution peak in the range of 0.014 to 0.027. Statistically, the data centering at this very low value indicates that the indirect effect of variable X on Y through the mediator variable has a marginal effect size. The gray normal distribution curve accompanying the histogram shows a distribution pattern that tends to be symmetrical, but with a fairly sharp frequency spike (kurtosis) in the middle area. The presence of estimated values spread across the negative to positive areas, ranging from -0.348 to exceeding 0.309, reflects the high variability in the sample data. The concentration of the histogram bars (Density histogram) very close to the zero line provides an academic signal regarding the potential insignificance of the mediation role in this structural model. Although the frequency distribution is on the positive side, its sloping distribution at larger values indicates that the indirect effect is not strong enough to dominate the causal mechanism. This visualization is crucial as a diagnostic tool to verify the stability of the estimated parameters before conducting formal hypothesis testing. The high density of bars in the zero-value area emphasizes that the measurement model may face challenges in proving the effectiveness of the mediation path X to Z $\rightarrow$ Y. Overall, this histogram provides an empirical basis for researchers to critically evaluate the statistical significance of the resulting indirect effects. Thus, the graph serves to ensure that conclusions regarding the relationship between latent variables are based on a methodologically valid and measurable data distribution.



The histogram of total effects for the structural relationship between variables X and Z presented in the figure provides an in-depth visualization of the distribution of parameter estimates resulting from the bootstrapping procedure. The data show a fairly widespread distribution of values, ranging from negative to

positive areas, with the highest frequency peak around 0.330. Statistically, the dominant concentration of histogram bars (Density histogram) on the right side of the zero axis indicates a tendency for a positive total effect of variable X on Z. However, the presence of bars in the negative area indicates some variability or uncertainty in the relationship between these constructs across several sample iterations. The gray normal distribution curve that shades the histogram shows a data distribution pattern that tends to follow a bell shape, although there are some quite sharp frequency fluctuations. The peak of the theoretical curve is around a value close to zero, which suggests that the significance of this relationship needs further validation through p-values or t-statistics. The range of coefficients that moves from -0.643 to exceed 0.608 reflects the complexity of the interactions between the latent variables in this structural model. The density of data at positive values such as 0.274 and 0.302 reinforces the initial indication of a directional relationship between the two variables in their total effect. This graph serves as a crucial diagnostic tool for assessing the stability of parameter estimates before drawing broader theoretical conclusions.

IV. DISCUSSION

The analysis results show that the initial variable (X) influences the final variable (Y), both directly and through the intermediary variable (Z). Variable X is measured using five indicators with different contributions in each model. In one model, indicator X.2 has the greatest influence, while in the other model, indicator X.1 is the indicator that best represents the variable. Variable Z is formed by three relatively consistent indicators, with indicator Z.2 being the most dominant indicator. Meanwhile, variable Y is measured using four indicators, and indicator Y.3 shows the highest level of reliability. The relationship between variables shows that the direct influence of X on Y varies, ranging from very weak to very strong. Similarly, the relationship of X to Z shows differences in the strength of influence, while Z still makes a positive contribution to Y. The research model is able to explain 37.3% of the variation in variable Y, thus having sufficient predictive ability. However, the low certainty value for variable Z indicates the need for further evaluation to ensure that variable X is truly able to explain changes in the intermediary variable. In addition, the presence of several indicators with negative values indicates that validity and reliability testing needs to be carried out more carefully to maintain the quality of the model.

In general, the research results show that the strength of the relationship between variables is significantly influenced by the characteristics of the data used. Therefore, the accuracy of the indicators in representing each variable is a crucial aspect in determining the quality of the measurement model. The analysis also shows that intermediary variables play a role in strengthening or weakening the influence of the initial variables on the final variables, so their presence requires careful consideration in developing the research model. Information regarding the magnitude of each indicator's contribution provides researchers with an overview of the most influential aspects and worthy of being the focus of service development or further research. On the other hand, the weak relationships in several pathways indicate that the model structure can still be refined by considering other, more relevant variables. The results of this analysis not only provide an understanding of the relationships between variables in the study but also serve as a basis for refining the conceptual model and developing future research.

V. CONCLUSION AND SUGGESTIONS

CONCLUSION

Based on the results of the model analysis, it can be concluded that the initial variable (X) has a more dominant influence on the final variable (Y) compared to the influence through the intermediary variable (Z). This indicates that an increase in variable X will have a more direct impact on changes in variable Y, while the role of variable Z as a mediator is still not optimal. The research model is able to explain 37.3% of the variation in variable Y, so there are still other factors outside the model that also influence the research results. In addition, differences in values in several indicators indicate that the research instrument still needs to be refined to have a better level of validity and reliability. Improvement efforts should be focused on strengthening variable X as a factor that has the greatest influence on Y, accompanied

by an evaluation of variable Z so that it can function more effectively in strengthening the relationship between variables in future research.

VI. SUGGESTION

Researchers are also advised to explore additional factors in the future to gain a more comprehensive understanding of this phenomenon. Overall, improvements in the key elements that are most influential will be crucial in ensuring the success of this program or research.

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