ISSN 2962 - 2069
JISEM Journal of Industrial System Engineering and Management.

Journal of Industrial System Engineering and Management Vol 4 No 1 June, 2025

Analysis The Effect of Water Quality and Service Quality on Consumer Loyalty

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ARTICLE INFORMATION

Article history:

Received: May 15, 2025
Revised: May 22, 2025
Accepted: june 4, 2025

Keywords:
Consumer Loyalty
Structural Equation Modeling
Water Quality

ABSTRACT

Sustainability of water supply services hold contributes to human well-being with individual preferences. So, there is need to assess for the public from various levels of water services in an effort to ensure water provision with the aim of achieving customer satisfaction in its use so that it can build their own loyalty. So therefore, this study was conducted to determine how water quality and service effect consumer loyalty using the Structural Equation Modeling (SEM) by looking for variables that influence quality and success in achieving user loyalty by forming a diagram of the relationship between variables and indicators, confirmatory analysis factors for exogenous and endogenous variables in the initial model, data normality tests and outlier evaluations. The model fit test in this study uses several criteria, including Chi Square, GFI, TLI, CLI, AGFI and RMSEA. Based on the results of this study, it shows that (1) the variable (CS) Consumer Satisfaction value of 0.768, meaning that the variable (CS) Consumer Satisfaction can be explained by (WQ) Water Quality (SQ) Service Quality with a percentage value of 76.8% while 24.2% can be explained by other variables not examined in this study. (2) not all antecendent variables have a significant influence on the consequent variables. Also, not all hypotheses are accepted. All antecedent variables cannot explain the consequent variables because the R2 value is less than 0.5.

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INTRODUCTION

Water is the most essential need for human life and survival [1], [2]. Because healthy human activities and sustainability depend on clean and quality water resources [3]. However, there is a rapid decline in the provision of water for consumption purposes, especially in developing districts and countries [4] Water resources have been provided in various services and one of them is drinking water which is conventionally processed before it can be consumed by the public as a drinkable supply [5].

Based on research [6] of the 350 PDAMs throughout Indonesia, only around 176 PDAMs (50%) are in the healthy category, 104 PDAMs (30%) are in the unhealthy category and the remaining 70 PDAMs (20%) are PDAMs that are categorized as sick. This is caused by, among other things, the performance of PDAMs as organizers of the Drinking Water Supply System (SPAM) which is considered to be still not optimal.

Currently, PDAM Makassar City has 5 (five) Water Treatment Installations (IPA) including installation I Ratulangi, installation II Panaikang, installation III Antang, installation IV Maccini Sombala, installation V Somba Opu, and as many as 35.53% of Makassar City residents use water from PDAM as water that is ready for consumption [7]. According to research [6] regarding the quality of PDAM Makassar City water, 20% of 40 heads of families said the water was colored, while 10.1% of 20 heads of families said it had a taste and 12.6% of 25 heads of families said it smelled from 199 heads of families who use PDAM Makassar City.

The reason is that the sustainability of water supply services is also significantly influenced by the quality of services that hold economic value and contribute to human welfare according to individual preferences [8] and this is the reason behind the importance of implementing sustainable water resource management that includes economic, social and environmental aspects [9]. Based on the Dublin Principles, managing water as an economic good is very important in achieving efficient and equitable use and ensuring the conservation and protection of water resources [10], [11].

Thus, there is a need to assess for the public the various levels of water services in an effort to ensure the provision of water with the aim of achieving customer satisfaction in its use so that it can build loyalty itself [12]. So that these services can be balanced based on the relationship between the obligations they must fulfill, the quality offered, and the price / value for money [13], [14], [15].

RESEARCH METHODS

To find the variables that influence the quality and success in achieving user loyalty, the Structural Equation Modeling (SEM) model is used, which is a combination of two separate statistical methods, namely factor analysis and simultaneous equation modeling [16], [17]. SEM is used to estimate the strength of the relationship between variables in the model [17]. SEM can provide information about the influence of one variable on another or through an intermediary variable called an intervening or mediating variable that is between the two variables [18]. The steps in modeling the relationship between quality and user loyalty using the SEM model are described as follows:

Fig 1. Proposed model of the influence of various quality variables on user loyalty

The data was processed using AMOS 24.0 software using steps based on the Amos 24.0 User's Guide. The following are the steps in running the SEM model :

1. Form a relationship diagram between variables and indicators The first step taken is to create a relationship diagram between variables and their indicators as in Figure 2. The model has 2 exogenous variables and 2 endogenous variables.

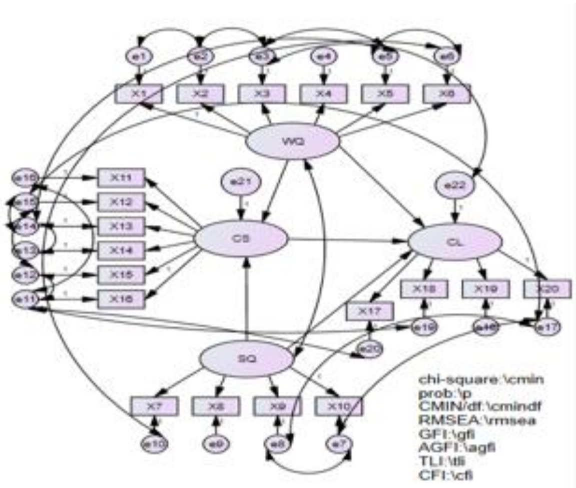

Fig 2. Initial model design of the relationship between various variables and indicators

2. Confirmatory Analysis Factor for Exogenous and Endogenous variables in the initial model To find out whether each indicator is significant for measuring the variable (latent variable), the Confirmatory Analysis Factor test is used.
   a. Confirmatory Analysis Factor pada Variabel Eksogen
   Confirmatory tests are conducted on exogenous variables, namely on the WQ (Water Quality) and SQ (Service Quality) variables. Both variables are covaried, with the results of the diagram output and the estimated output from the confirmatory test given in Figure 3 and tables 1 and 2:

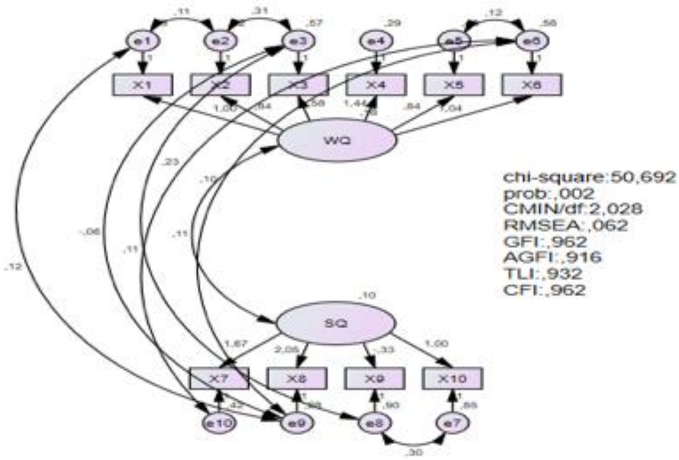

Fig 3. Confirmatory test of Exogenous Variables

Table 1. Regression Weights for Exogenous Variables

			Estimate	S.E.	C.R.	P	Label
X1	<---	WQ	1,000				
X2	<---	WQ	,844	,154	5,468	***	par_1
X3	<---	WQ	,581	,150	3,882	***	par_2
X4	<---	WQ	1,436	,223	6,451	***	par_3
X5	<---	WQ	,836	,159	5,259	***	par_4
X6	<---	WQ	1,036	,188	5,510	***	par_5
X10	<---	SQ	1,000				
X9	<---	SQ	-,329	,248	-1,327	,184	par_6
X8	<---	SQ	2,046	,465	4,403	***	par_7
X7	<---	SQ	1,666	,386	4,321	***	par_8

Table 2. Standardized Regression Weights for Exogenous Variables

			Estimate
X1	<---	WQ	,521
X2	<---	WQ	,413
X3	<---	WQ	,308
X4	<---	WQ	,748
X5	<---	WQ	,454
X6	<---	WQ	,497
X10	<---	SQ	,318
X9	<---	SQ	-,106
X8	<---	SQ	,768
X7	<---	SQ	,622

The results of the Chi Square test show that the model is not fit with a Chi Square value of 50.692 with a probability value of P = 0.002 (less than 0.05). However, when viewed from the GFI criteria with a value of 0.962, AGFI with a value of 0.916, and RMSEA with a value of 0.062, it shows that the model is fit. Thus, all indicators will be used to compile a complete model.

b. Confirmatory Analysis Factor pada Variabel Endogen

Confirmatory tests are conducted on endogenous variables, namely transportation and disaster logistics. Both variables are covaried, with the results of the diagram output and the estimated output from the confirmatory test given in Figure 4 and tables 3 and 4:

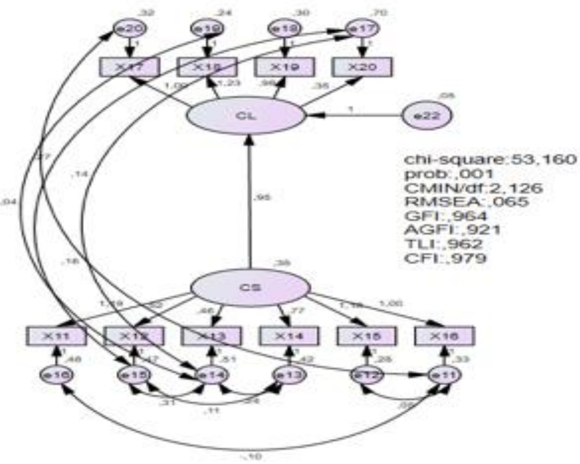

Fig 4. Confirmatory Test of Endogenous Variables

Table 3. Regression Weights for Endogenous Variables

			Estimate	S.E.	C.R.	P	Label
CL	<---	CS	,945	,080	11,833	***	par_9
X17	<---	CL	1,000				
X18	<---	CL	1,227	,099	12,365	***	par_1
X19	<---	CL	,984	,089	11,068	***	par_2
X20	<---	CL	,352	,094	3,755	***	par_3
X16	<---	CS	1,000				
X15	<---	CS	1,184	,095	12,472	***	par_4
X14	<---	CS	,769	,093	8,286	***	par_5
X13	<---	CS	,456	,087	5,212	***	par_6
X12	<---	CS	,519	,085	6,085	***	par_7
X11	<---	CS	1,188	,129	9,212	***	par_8

Table 4. Standardized Regression Weights for Endogenous Variables

			Estimate
CL	<---	CS	,934
X17	<---	CL	,725
X18	<---	CL	,831
X19	<---	CL	,730
X20	<---	CL	,245
X16	<---	CS	,717
X15	<---	CS	,798
X14	<---	CS	,574
X13	<---	CS	,352
X12	<---	CS	,410
X11	<---	CS	,711

The results of the Chi Square test with a value of 53.160, probability with a value of 0.001, GFI with a value of 0.964, AGFI with a value of 0.921, and RMSEA with a value of 0.065 indicate that the model has been fit. Thus all indicators will be used to compile a complete model.

c. Estimation Test on The Complete Model

From the results of the confirmatory test on exogenous and endogenous variables, a complete model is compiled by correlating all variables based on the theoretical framework and the proposed hypothesis. The complete output is given in Figure 5 and 6:

http://dx.doi.org/10.30656/jisem.v4i1.46

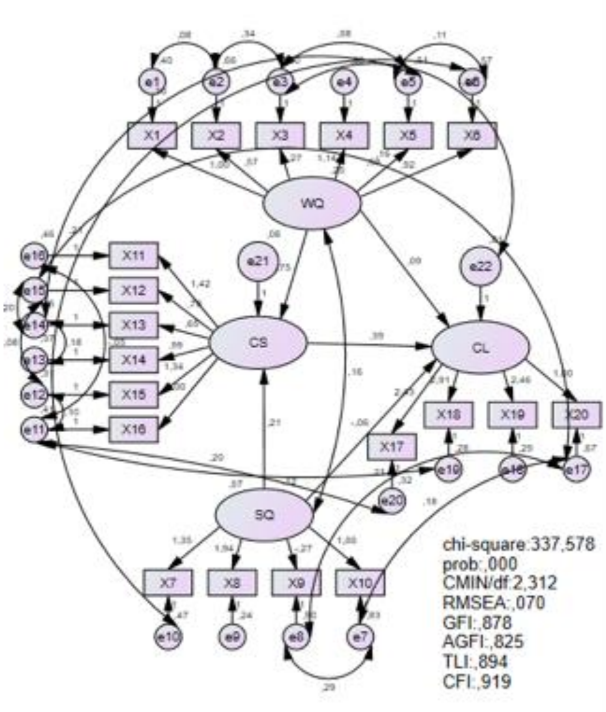

Fig 5. Complete model combining exogenous and endogenous variables

The results of the complete model test obtained that the Chi Square value was 217.665 with a probability value of P = 0.000 (less than 0.05) then it is said that the model is not fit. Then reviewed from the criteria of the Goodness of fit Index (GFI) of 0.878 is stated fit and the Adjusted Goodness Fit of Index (AGFI) of 0.825 is stated fit. Then the value of the Root Mean Square Error of Approximation (RMSEA) of 0.070 is stated fit, then the model can be said to be acceptable or fit based on the values obtained from GFI, AGFI, and RSMEA. The results of the complete model improvement can be seen in the image below. In the model, the Chi Square value was found (272.476) with a probability value (0.000). Then on the other criteria, namely GFI (0.903), AGFI (0.852) and RMSEA (0.060 which indicate that the model is fit and acceptable.

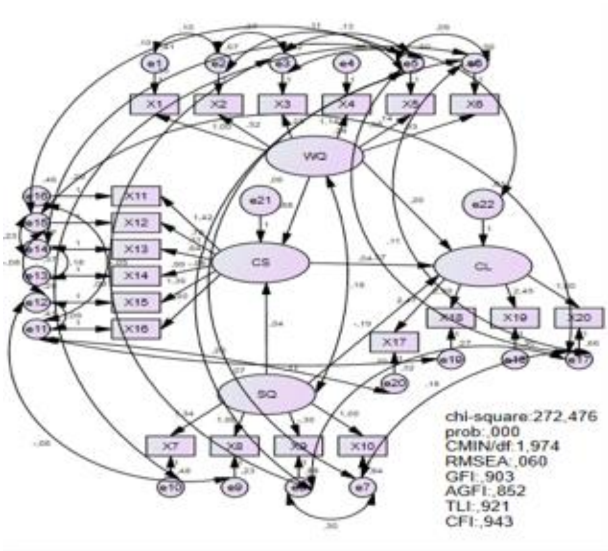

Fig 6. Complete model combining exogenous and endogenous variables.

d. Data Normality Test
Data normality testing is a test that wants to know whether the data used is normally distributed multivariately. Data normality is carried out with the criteria of critical ratio skewness (skewness) of ±2.58 at a significance level of 0.01. Assessment of normality is used as a condition of assumptions that must be met with maximum likelihood. These results indicate that the data used is not normally distributed multivariately with a cr value (34.472)
e. Outlier Evaluation
To find out the outliers, pay attention to the Mahalanobis distance value, which is used to measure the distance of the observation score to the centroid value. with a Mahalanobis distance value of 91.452 indicating that with normal assumptions, the probability of d-square above 91.452 is 0.000. Outlier data is data where p2 is very small or below 0 from the table above shows that the data on p2 as a whole is not greater than 0 or above 0, so it can be used to test the complete model.

RESULTS AND DISCUSSION

From the proposed model using the SEM method, it is known the estimated strength of the relationship between various variables and significant indicators for the poverty alleviation program hypothesized in the proposed model. The estimation method used is Maximum Likelihood (ML), which is by finding the parameter value that is most likely to produce the highest covariance or correlation from the existing data. According to some experts, this approach can be used for data that has problems with normality. However, this ML method is very sensitive to non-normality of data so that other estimation methods such as Weighted least Square (WLS), Generalized Least Squares (GLS) and Asymmetrically Distribution Free (ADF) have emerged [17]

The model fit test in this study uses several criteria, including Chi Square, GFI, TLI, CLI, AGFI and RMSEA. In the final model, the chi square value is (272.476) with a probability of 0.000 which means that the model is declared fit, then several other criteria that support the model are declared fit namely the GFI value (0.903), TLI (0.921), CFI (0.943) AGFI (0.852) nad (RMSEA (0.060) can be accepted.

To meet the requirements of the maximum likehood assumption, this assignment conducted a data normality test. From the results of the data naormality test. It was found that the data used was not normally distributed. However, by conducting outlier data, no data was removed because there was no p2 value below 0 with 269 observations so that it could be used for model estimation.

Based on the model output, it is know that not all antecedent variables have a significant influence on the consequent variables. Also, not all hypotheses are accepted. All antecedent variables cannot explain the consequent variables because the R2 value is less than 0.5.

CONCLUSION

The following are the conclusions of the results of the confirmatory factor analysis test, the estimation method used, the model filtered from the Chi-square criteria and the results of the hypothesis test as follows: :

1. Based on the results of the confirmatory factor analysis test, the construct indicators used to compile the final model are significants for measuring endogenous and exogenous latent variables.
2. The estimation method use is Maximum Likelihood (ML) which is by finding the parameter value that is most likely to produce the highest covariance or correlation from the existing data. The results showed that the data was normally distributed multivariately with a critical ratio value of 34.472
3. Overall, the proposed model is fit ehen viewed from the Chi-square criteria. Then, when viewed from the GFI, AGFI, TLI, CFI and RMSEA criteria model remains fit.
4. From the hypothesis test, it can be concluded that:

a) (H1 is accepted) WQ (*Water Quality)* has a positive effect on CS (*Consumer Satisfaction)* (0,853and based on the p-value test, the effect is not significant.
b) (H2 is accepted) WQ (*Water Quality)* has a positive effect on CL (*Consumer Loyalty)* (0,411), but based on the p-value test, the effect is not significant.
c) (H3 is accepted) SQ (*Service Quality)* has a positive effect on CS (*Consumer Satisfaction)* (0,549), but based on the p-value test, the effect is not significant.
d) (H4 is rejected) SQ (*Service Quality)* has a positive effect on CL (*Consumer Loyalty)* (-0,268), but based on the p-value, the effect is not significant.
e) (H5 is accepted) CS (*Consumer Satisfaction)* has a positive effect on CL (*Consumer Loyalty)* (0,777), but based on the p-value, this effect is not significant

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