

Analysis of Service Quality with Dematel Model

(Case Study in Eltari Kupang International Airport)

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Abstract—The airport is the first and last contact for tourists who are visiting an area, so service quality is an important issue in airport management. The research objective was to describe the quality of service through the indicators used. The lack of using this research method contained bugs to start this research. This research uses quantitative methods through the DEMATEL method. The data collection technique used a questionnaire that was distributed to 10 people from the management of PT Angkasa Pura with the sampling technique using purposive sampling. The results of this study indicate that the reliability indicator (X1) is the indicator that has the greatest influence on the quality of service at Eltari Kupang international airport. The criteria included in the indicator of reliability are the accuracy of officers in serving customers, having clear service standards, the ability of officers/officers to use tools in the service process. While the indicators most influenced in this study are the indicators of tangibles (X1), empathy (X4), and responsiveness (X3).

Keywords—service quality, dematel

I. INTRODUCTION

El Tari International Airport is one of the 13 main airports managed by Angkasa Pura I [1]. Currently, El Tari Kupang international airport is developing and renovating the airport terminal expansion. It was to improve the quality of its services to provide higher satisfaction, especially for tourists visiting Kupang and other areas in the province of East Nusa Tenggara (NTT).

The increase in the use of air transportation every year has led to increased activity at the passenger terminal at El Tari airport. Based on data from PT Angkasa Pura I, the El Tari Kupang branch, the number of passengers in 2017 was 2,099,890 people, in 2018 it was 2,249,986 people and in 2019 it was 1,859,268 people. From this data, it can be seen that there was an increase of 7% in 2018 while in 2019 there was a decrease in passengers of 18% [1]. Along with the increasing number of passengers using airport services, it is necessary to periodically evaluate the quality of services provided.

Service quality is an important issue, including at airport terminals which deal directly with service users. This is closely related to the ability to serve the needs of service users. This is

also in line with the statement by Suska et al., [2] that the development of information encourages service users to be increasingly critical of public services. For this reason, service providers not only focus on providing infrastructure, facilities, and human resources but must also proactively communicate with consumers to find out the dynamics of consumer needs and must be able to anticipate an increase in the number of passengers by providing satisfying services. Therefore, it is necessary to improve public services continuously (continuous improvement). Service quality needs to get great attention from the company because service quality has a direct relationship with the competitiveness and profitability of the company [3].

This study aims to measure the priority of service quality indicators consisting of tangible, reliability, response, assurance, and empathy indicators for improvement and to analyze the relationship between these indicators using the DEMATEL (Decision Making Trial and Evaluation Laboratory) method. Also, DEMATEL can be used to find and analyze the dominant criteria on an indicator [4,5]. The advantage of the DEMATEL method is that it has an approach to identify criteria, criteria, and weight of decision making [6,7]. This needs to be done considering that the Province of East Nusa Tenggara (NTT) is one of the leading tourist destinations in Indonesia [1] and the city of Kupang is the gateway for tourists who want to visit various regions in NTT Province.

The importance of this research is because this topic has never been used before in discussions about the service quality at the airport in NTT province or Indonesia, so it is hoped that the results of this research discussion can provide an alternative in choosing priorities in significantly improving the service quality.

II. LITERATURE REVIEW

Stated that good quality public services must prioritize the quality of services provided to consumers. Service quality is used as a performance measure of the organization [2]. Stated that service quality is related to the fulfillment of customer expectations and needs, where service is said to be quality if it can provide products and services (services) by customer needs

and expectations. In this case, quality is associated with good service, namely the attitude or way of employees in serving customers or the community satisfactorily. Quality of service can be said to be quality or not based on the assessment of the services provided [3]. stated that there are 4 (four) service variables that are important for knowing the quality of terminal airport services they are the ease of passengers in obtaining information, the reliability of airport facilities and equipment, the coolness and comfort of airport terminals, and clean airport terminal rooms [8]. In line with the results of other studies, stated that the quality of service can have a positive effect on the field of staff skills, ease of getting information, and speed in security inspection services as well as check-in and clarity regarding service procedures [9]. Negative assessment in the form of airport use as a means of promotion and advertisement, reliability of facilities and infrastructure supporting public service facilities such as toilets, parking, and traffic flow do not meet service standards, politeness and friendliness of officers in handling problems faced by passengers, ease of getting information, airport bus services and non-formal services namely brokers and illegal transportation at the airport [8]. The results of the research showed that the quality of service of Ngurah Rai Bali International Airport has a positive effect on tourist satisfaction and the image of Bali tourism [10].

Based on the description above explains that the measurement of service quality has five dimensions, namely [3]:

- Tangibles (physical form), consisting of physical facilities, equipment, personnel, and communication.
- Reliability, consisting of the service unit's ability to create the promised service appropriately.
- Responsiveness (responsiveness), willingness to help consumers, is responsible for the quality of services provided.
- Assurance includes ability, courtesy, free from the danger of risk or doubt.
- Empathy (Empathy) which includes ease in making good communication relationships and understanding the needs of customers.

III. METHODS

This research is located at Eltari Airport with the code KOE or WATT Airport located in Kupang City, East Nusa Tenggara Province. This research uses quantitative methods. To achieve the research objectives, the sample used in this study, 10 people from the management of PT Angkasa Pura I based on purposive sampling. Data collection is done through distributing questionnaires is a pairwise comparison that will be used to go at the next stage which is collected and collected again. After the data is calculated using the DEMATEL method.

A. Decision Making Trial and Evaluation Laboratory (DEMATEL)

DEMATEL method was used to assist in research and analysis of complex problems aims to fragment antagonistic phenomena in the social field and integrated decision making. [11]. Dematel is an appropriate method used to design and analyze complex problems by making structured models of the causal relationships between factors in the system. Solving complex problems using the DEMATEL method will be presented graphically to make it easier for researchers to do problem-solving and system planning. Therefore, to make an overall improvement in a business unit it is necessary to identify the relationship of influence of each criterion so that what criteria will have the greatest influence [12].

The use of the DEMATEL method has several advantages, namely:

- Obtain a group of data that can describe interactions between sub-systems.
- Get a form of a structured model to evaluate in the decision-making process.
- Obtain a visualization of causal relations from subsystems by offering causal diagrams based on understanding the character of the problem and expert opinion.

The results of the DEMATEL method showed a reciprocal relationship between several components and can be used to find out which factors affect each other or affect each of them.

Table 1 below is the scale used in DEMATEL:

TABLE I. SCALE OF THE DEMATEL ASSESSMENT

Level of Importance	Definition
0	There is no influence
1	Low influence
2	Medium influences
3	Influence heights
4	Very high influence

The DEMATEL method has five main stages including the following [13]:

- The first step is the calculation of the average matrix (A) is done using a scale of integers ranging from 0 to 4, which represent no influence (0), less influence (1), enough to influence (2), influence (3) and greatly influence (4). The average matrix is obtained from the results of the questionnaire averaged for each relationship.
- The second step is to calculate the normalized direct influence matrix (X) to normalize.
- The third step, the total relation matrix (T).

- For the last stage is to make structural correlations impact diagrams. Before making this diagram, it is necessary to calculate the threshold value which is the average of all values in the T matrix.

IV. RESULTS AND DISCUSSION

The indicators used in the questionnaire are indicators of service quality indicators consisting of Tangibels (X1), Reliability (X2), Responsiveness (X3), Assurance (X4), and Empathy (X5).

A. Direct Link Matrix

At this stage, a recapitulation of the assessment results of each service quality indicator is performed by the rating scale. This matrix is then called the X matrix. The main matrix diagonal is set to the value 0. We can see in table 2 below.

TABLE II. DIRECT RELATION MATRIX

	X1	X2	X3	X4	X5
X1	0	3	3	2,9	2,5
X2	2,4	0	3,5	3,3	3,5
X3	2,6	2,9	0	3,1	3
X4	2,4	2,8	2,5	0	3
X5	2,2	3,1	3,1	3,2	0

In Table 1, it can be seen that X2 and x3 which have an average value of 3.5 means that the X2 indicator has a high level of influence on the X3 indicator. Indicators X1 and X5 with an average value of 2.5 have a moderate level of influence on indicator X5. Meanwhile, the value of 0 means that the indicator does not have a level of influence.

B. Normalization of Direct Relation Matrix

The direct relationship matrix (X) is then normalized direct influence matrix (X) performed to normalize the direct-relation matrix. The main diagonal in the matrix remains 0.

TABLE III. NORMALIZED DIRECT RELATION MATRIX

	X1	X2	X3	X4	X5
X1	0	0,23622	0,23622	0,22835	0,19685
X2	0,18898	0	0,27559	0,25984	0,27559
X3	0,20472	0,22835	0	0,24409	0,23622
X4	0,18898	0,22047	0,19685	0	0,23622
X5	0,17323	0,24409	0,24409	0,25197	0

C. Direct Indirect Relation Matrix Inverse Identity - Normalized Direct Relations Matrix

The normalization matrix (Z matrix) is then constructed in the relationship between direct and indirect matrices (T) can be seen in Table 4 below.

TABLE IV. DIRECT-INDIRECT RELATION MATRIX INVERSE IDENTITY

	X1	X2	X3	X4	X5
X1	2,64962	2,14518	2,18463	2,2394	2,15782
X2	1,95799	3,13171	2,391	2,44702	2,39134
X3	1,84069	2,16589	3,0195	2,2771	2,21041
X4	1,72486	2,03666	2,05825	2,95059	2,08402
X5	1,82084	2,1779	2,21773	2,28452	3,02216

D. Count the Total Number of Rows and Columns

After making the T matrix, then calculate the total row (Ri) and the total column (Ci). Vector R is obtained through the sum of each row in the total relationship matrix, while Vector C is the sum of each column. The R and C vector calculations are used to obtain prominence (R + C) and relation (R-C) for the calculation results (R + C) and (R-C).

TABLE V. TOTAL RELATION MATRIX

	X1	X2	X3	X4	X5
X1	1,64962	2,14518	2,18463	2,2394	2,15782
X2	1,95799	2,13171	2,391	2,44702	2,39134
X3	1,84069	2,16589	2,0195	2,2771	2,21041
X4	1,72486	2,03666	2,05825	1,95059	2,08402
X5	1,82084	2,1779	2,21773	2,28452	2,02216

Table 6 is a calculation of R minus C (Ri-Ci) and R added by C (Ri + Ci) see in table 5.

TABLE VI. CALCULATION RESULT (R + C) AND (R-C)

	Ri	Ci	Ri + Ci	Ri - Ci
X1	10,376653	8,9940027	19,370656	1,3826503
X2	11,319054	10,657337	21,976391	0,6617166
X3	10,513588	10,871107	21,384695	-0,3575194
X4	9,8543862	11,198632	21,053018	-1,3442456
X5	10,523139	10,865741	21,388879	-0,3426018

The calculation of total rows (R) and total columns (C) is carried out to obtain the importance and relationships of the indicators. The determination of the Threshold Value (α) is determined by calculating the average value of the T matrix element. In the total relation matrix table, it can be seen that each indicator has a major influence on other indicators. From this explanation, if it is connected with a cause and effect diagram, it will be obtained as shown in Figure 1 below.

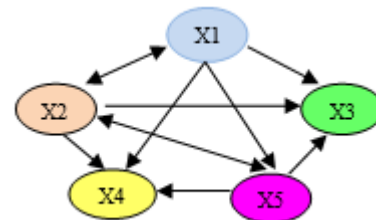


Fig. 1. Cause and effect diagram.

From Table 6, it can be seen that the X2 indicator has the largest value (Ri + Ci), X2, which is 21.9764, so that it has a greater influence than other indicators and is assumed to be the

main priority, called a dispatcher, thus making this indicator the most dominant among other indicators. X2 is a reliability indicator consisting of the service unit's ability to create the promised services appropriately. While the receiver group is a group that receives more influence than other indicators, which is assumed to be the last priority. The grouping of indicators into receiver groups based on the largest negative (Ri-Ci) value are indicators that are included in the receiver group, including X3, X4, and X5. From this receiver group the indicator that received the most influence was the X4 indicator of -1.3442, then the X3 indicator of -0.3575, and the X5 indicator of -0.3426.

E. DEMATEL Causal Relationships

The DEMATEL causal relationship is made in the form of a diagram. Value (Ri + Ci) is defined as importance or advantage while (Ri-Ci) is defined as a relationship or relation and shows the priority. This is in line with the statement that by applying the DEMATEL method it is possible to determine a cause and effect relationship between criteria that can be built [8]. The mapping in the diagram uses (Ri + Ci) as a horizontal line and (Ri-Ci) as a vertical line. (Di + Ri) shows all levels of service quality indicators that influence each other so that the greater the Ri + Ci value, the stronger the relationship between these indicators and (Ri-Ci) Tangibles shows the largest positive value, namely 1.38265. This makes tangibles the dominant indicator of causal groups on service quality. Based on the value (Ri-Ci) the indicator most influenced by the largest negative value is the Assurance indicator with a value of -1.3442. The causal diagram can be seen in Figure 2 below.

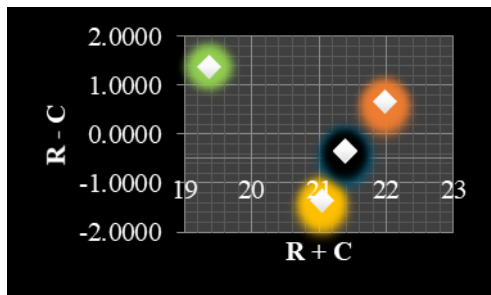


Fig. 2. Causal diagram.

Figure 2 shows the distribution of all service quality indicators. The results (Ri + Ci) on all indicators have a positive value on the X-axis (horizontal) so that all indicators can be said to have importance. The results of this study are consistent with those expressed in research at Ngurah Rai International Airport in Bali [10]. In the causal matrix, it can be seen that Indicator X2 is called a dispatcher and is an indicator with the highest level of interaction influence and a driving force for other indicators. In general, people who use aviation services at airports have a positive perception of the skills or abilities possessed by airport officers in providing services. Another thing that makes this possible is because in general the officers are equipped with adequate skills and knowledge qualifications under their field of function and duty [5,14]. The X3, X4, and X5 toughness indicators are called receivers

because they have a negative level of influence. The indicator of service quality in the receiver category is the main indicator that is influenced by other conditions.

V. CONCLUSION

In this study, based on the results of the questionnaire data processing using the DEMATEL method, the casual relationship between indicators can be identified. The analysis was conducted on service quality indicators, among others: tangibles (X1), reliability (X2), responsiveness (X3), assurance (X4), and empathy (X5). The result of this research shows that the indicator that gives the biggest influence on the service quality indicator is the reliability indicator (X2). The criteria included in the reliability indicator are the accuracy of the officers in serving customers, having clear service standards, the ability of officers/officers to use tools in the service process. While the indicators most influenced in this study are the tangibles indicator (X1) which consists of physical facilities, equipment, personnel, and communication, the Empathy Indicator (X4) which includes the ease of making good communication relationships and understanding the needs of customers and the responsiveness indicator (X3) which includes a willingness to help consumers, is responsible for the quality of services provided.

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