

Service Quality Improvement at International Airport In Indonesia Using Service Quality And Theory Of Inventive Problem Solving (TRIZ)

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ABSTRACT

Service quality improvement at I Gusti Ngurah Rai International Airport in Indonesia needs to be done to improve service to passengers. This is done because the I Gusti Ngurah Rai International Airport in Indonesia is an international airport with a large number of passengers compared to other international airports. So it is necessary to improve quality to maintain airport performance and increase satisfaction and loyalty to passengers to visit I Gusti Ngurah Rai International Airport. This study, to improve airport passenger services by conducting initial analysis, namely determining the attributes of the airport passenger service level that need to be improved. The method used in this study uses the Servqual method and the Theory of Inventive Problem Solving (TRIZ) method. In this study, there are 28 service quality attributes based on 5 dimensions of service quality. Based on the service quality calculation, there are 7 positive gap attributes, 4 zero gap attributes, and 17 negative gap attributes. So, 17 service quality attributes indicate passengers are not satisfied with the services provided on these attributes. Based on the results of the method, the initial stage is an analysis using a cause-effect diagram to see the potential contradictions and causes of problems by the 17 attributes. So that 12 attributes cause contradictions in solving problems and 5 attributes that do not cause contradictions in solving problems. Attributes that cause contradictions are then analyzed using the TRIZ method using 39 engineering parameters, a contradiction matrix, and 40 inventive principles. Meanwhile, attributes that do not cause contradictions will be analyzed and solutions will be provided based on 40 inventive principles. Based on the results of the analysis carried out using TRIZ, it was found that the proposed improvements for each attribute were adjusted based on the principles of universality, segmentation, change parameters), taking out, mechanical vibration, preliminary action, and mechanics substitution.

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CCS CONCEPTS

• Service System Engineering; • Quality Improvement; • Service Industry;

KEYWORDS

Service Quality Improvement, International Airport, Service quality, TRIZ

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1 INTRODUCTION

Airport according to the Ministry of Transportation of the Republic of Indonesia [2] is an area on land and or waters with certain boundaries that are used as a place for aircraft to land or take off, board or unload passengers, loading and unload goods and places for intra and inter-agency transfers. a mode of transportation equipped with security and safety facilities for flights as well as basic facilities and other supporting facilities [1]. Indonesia has 351 airports of which more than 200 airports are managed by the Technical Implementation Unit of the Directorate General of Civil Aviation and 77 airports are managed by Regional Governments. There are also 28 airports managed by State-Owned Enterprises (BUMN), namely PT Angkasa Pura I and PT Angkasa Pura II where PT Angkasa Pura I has 13 airports and PT Angkasa Pura II has 15 airports [1]. According to research conducted [17], airports face challenges in serving passengers such as congestion in the terminal area, uneven demand, disturbances that occur in the terminal area, to external events that cannot be controlled. At I Gusti Ngurah Rai International Airport there is an increase in the number of passengers, an increase in March 2022 was recorded by 56% [17] at the departure terminal. The increase in the number of passengers requires managers to continue to improve and improve the quality of their services by taking into account the needs and expectations of service users. The services provided by the manager must be under the expectations of service users at the airport because the

manager is not only required to provide facilities but to improve and pay attention to the needs of the passengers.

The quality improvement carried out by the manager must be under the expectations of passengers so that the level of passenger satisfaction is in line with the increasing quality of services provided by I Gusti Ngurah Rai Airport. According to [22] several gaps have the potential to become obstacles in providing services to customers. One of these gaps is the gap between the manager's perception and customer expectations. Therefore, managers must know customer satisfaction and observe service quality from the consumer's point of view. Research [22] states that there are 5 dimensions of service quality, namely tangible, reliability, responsiveness, assurance, and empathy. These quality dimensions can be used to measure the quality of services provided by I Gusti Ngurah Rai Airport and passenger expectations regarding the quality of services provided. A study conducted [17] used the service quality method with 5 dimensions of service quality which resulted in a negative gap in some of the service quality attributes studied. The negative gap indicates that there is a significant difference between the manager's perspective and the passenger's expectations so this attribute must be improved by the Soekarno-Hatta Airport manager to improve the quality of its services. In addition, the research combines two methods, namely the service quality method and the Theory of Inventive Problem Solving (TRIZ) method to improve the quality of service on airlines. The study [21] identified problems that occur in Airways using the service quality method in the form of flight delays due to bad weather, disturbances in air traffic, and problematic facilities resulting in delays in departure due to the accumulation of passengers. can be solved using the TRIZ method. The solutions given to these problems are in the form of additional services for passengers when delaying departures, increasing air traffic volume capacity, as well as periodic maintenance of the facilities at the airport.

Therefore, I Gusti Ngurah Rai International Airport needs to know the level of quality of services provided and customer perceptions of the quality of services provided. The service quality method is one tool that can be used to determine the quality gap in service at I Gusti Ngurah Rai International Airport. Service quality is measured based on 5 dimensions of service quality by including several attributes in each measured quality dimension. After knowing the attributes that need to be improved to improve the quality of service, it is necessary to solve problems on these attributes

2 LITERATURE REVIEW.

2.1 Service

Service is any action or performance offered by one party to another, which is essentially intangible and does not cause any transfer of ownership [19]. Service is any action or performance offered by one party to another that is eaten and made at the same time and provides added value and is essentially intangible and does not result in a transfer of ownership [20]. In addition, a service is an economic activity that is offered by one party to another such as employing time-based performance to bring the desired results to the recipient for which the buyer is responsible and the service customer expects to get value from access to goods, labor,

professional skills, facilities, networks, and systems in exchange for time, money, and effort [20].

2.2 Service Quality

Quality according to the American Society for Quality quoted quoting the overall quality of the identity and character of a product or service in terms of its ability to meet predetermined desires in other words the quality of a product or service is the extent to which a product or service can meet its specifications. [17]. However, [6] describes quality as something that is different for different people in terms of duration and fit, or is said to be fit for purpose. Quality also describes quality as a dimension to take into account that an object or service already has a value for what is desired in other words an object or service is considered to have quality if it plays a role or has value for what is desired [7].

2.3 Service Quality Method

The service quality method is a method of an instrument to measure service quality in their research in the service sector. The measurement of service quality in this service quality model is based on a multi-item ratio designed to measure the quality of customer desires and perceptions and the gap between the two on 5 dimensions of service quality, namely tangible, reliability, responsiveness, assurance, and empathy. In the service quality model, there are 5 types of quality gaps that have the potential to become obstacles in providing services to customers [22].

2.4 Validity and Reliability Test

A validity test is testing the level of ability of a research instrument to see whether the information is under the problems studied [13]. A validity test is also referred to as a dimension that proves the validity and validity. The method of validity of an instrument is said to be valid if it can measure something it wants and can convey information from the variables studied appropriately [13]. The level of instrument validity proves the extent to which information is collected from a reflection of the variables studied. A reliability test is a test carried out to identify whether the measurement results remain unchanged even though it is carried out by measuring 2 or more times on similar symptoms with similar measuring instruments [13].

2.5 Theory of Problem Solving

TRIZ or Theory of Inventive Problem Solving comes from the Russian language, namely "Theoriya Resheniya Izobreatatelskikh Zadach" developed by Genrich Altshuller [15]. TRIZ has stages that are used to solve problems by starting with specific problems and identifying contradictions that exist in that problem. [16]. The TRIZ method supports creativity and innovation in the manufacturing industry so that the capabilities of the TRIZ method can be applied to non-technical problems. One example of a non-technical area is the development of service quality and combined with TRIZ

3 METHODOLOGY

The steps of the research methodology carried out in this study began with determining the servqual attribute.

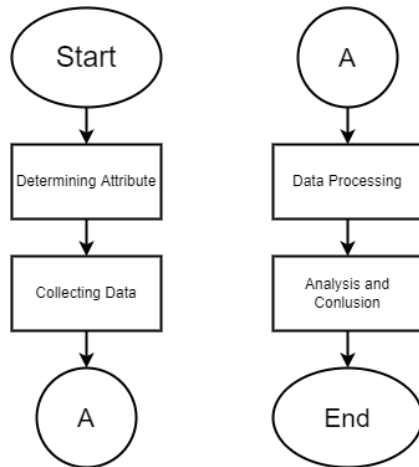


Figure 1: Research Methodology

- Determining the servqual attribute based on 5 dimensions of service quality namely tangible, reliability, responsiveness, assurance, and empathy
- Then determining the number of samples, preparing questionnaires and distributing and collecting questionnaires at the I Gusti Ngurah Rai Airport terminal.
- Then the results of the questionnaire were tested for validity and reliability to find out whether the data obtained were reliable and used as a measuring tool to obtain information in this study. Then do the calculation of the gap servqual type 5 were based on these calculations obtained attributes with a positive gap, zero gap, and negative gap. Servqual gap calculation type 5 is carried out at the item-by-item level where each attribute is calculated based on the servqual calculation
- The results of the negative gap will then be analyzed solved using 40 principles of the TRIZ Method.

4 RESULT AND DISCUSSION

4.1 Deterimination of Servqual Attributes

At the stage of determining the servqual attribute, it is determined based on 5 dimensions of service quality, namely physical evidence (tangible, reliability, responsiveness, assurance), and empathy. The servqual attribute is obtained based on the elaboration of various sources such as Skytrax surveys, Airport service quality, and several other references. Servqual attributes in research based on 5 dimensions of service quality can be seen in Table 1.

4.2 Deterimination of Number Samples

Determination of the number of samples is done by using the Bernoulli formula approach. The following is the Bernoulli formula that will be used to determine the number of samples in this study.

$$N \geq \frac{\left(Z_{\frac{\alpha}{2}}\right)^2 pq}{e^2} \quad (1)$$

In this study, the level of confidence or used is 95% so that the proportion of the number of questionnaires that are considered correct is 0.95 and the proportion of the number of questionnaires that are considered incorrect is 0.05. As for the error tolerance used is 5% where the error that may occur is 5%. So, the calculation of the number of samples as follows:

$$N \geq \frac{(1.96)^2 \times 0.95 \times 0.05}{0.05^2}$$

$$N \geq 72.99$$

So based on the calculation of the minimum number of samples needed in this research is 73 respondents.

4.3 Validity and Reliability Testing

After the questionnaires were distributed and collected, then the validity and reliability of the data were tested. The test is carried out by correlating the statement items with a total value of 77 respondents. The stages in the validity test are as follows:

1. Determining Determine hypothesis on validity testing

H0 : questionnaire is valid

H1 : questionnaire is invalid

- Determine R Table

Determine R Table uses alpha (α) is 0.05 and the number of samples is 77 respondents with degrees of freedom in the validity test of 75. So that the r table is 0.227.

- Determine r Count

Determination of the calculated r using the equation described in the previous section.

- Determine Decision Base on r Count

The respondent's answer is said to be valid if r arithmetic is greater than r table and if r arithmetic is not greater than r arithmetic then the respondent's answer is invalid.

- Decision

The final result can be concluded that H0, so that there is a correlation between each statement item with the total assessment value and the questionnaire can be said to be valid

The reliability test was carried out using the reliability test on the SPSS software. The data is said to be reliable if the Cronbach's alpha value is greater than 0.6. From these results obtained alpha values as follows:

- D Alpha Value Passenger Expectations = 0.963
- Alpha Value Passenger Satisfaction = 0.972

From these two values, it is known that the expression of expectations and passenger satisfaction has a value of more than 0.6 and it can be concluded that the questionnaire is reliable.

4.4 Servqual Counting

After knowing the average passenger expectation score and the average passenger satisfaction, the next step is to calculate the gap servqual type 5 by reducing the average passenger expectation score with the average passenger satisfaction score. The results of the calculation of the type 5 servqual gap can be seen in Figure 6. In Figure 6 it can be seen that the type 5 servqual gap calculation produces 7 positive gaps, 4 zero gaps, and 17 negative gaps. So that there are 7 attributes that indicate passengers are very satisfied

Table 1: Servqual Attributes

Attri	Description	Attri	Description
T1	Coolness and comfort at the terminal	RS1	Security guards respond quickly to requests for help
T2	Cleanliness at the terminal such as waiting rooms, check-in areas, and others.	RS2	Goods inspection time (x-ray) when served is fast (less than 3 minutes)
T3	The capacity at the terminal is sufficient to accommodate passengers	RS3	Check-in process time when served is fast (less than 3 minutes)
T4	There are directions that make it easy to find the needed places such as bathrooms, information rooms, gates, and others.	RS4	Queuing time at check in is fast (Less than 15 minutes)
T5	The physical appearance of the terminal is attractive (such as murals, carvings, etc.).	RS5	Fast baggage reception waiting time (Less than 15 minutes)
T6	The number of trolleys at the terminal is very sufficient	A1	Level of courtesy and friendliness of airport staff
T7	The airport provides comfortable seating	A2	The quality of information provided to passengers at the terminal is adequate
T8	The number of seats in the terminal is sufficient	A3	The officer's fair attitude to every passenger
T9	The number of trash bins at the terminal is sufficient	A4	Skills and knowledge of officers in serving passengers at the terminal
T10	The number of ATMs in the terminal is sufficient	A5	Items in the trunk are not damaged and safe
T11	Cleanliness in the bathroom	E1	Terminal staff give more personal attention to passengers
T12	There is adequate Wifi in the terminal area	E2	Officers at the terminal who are capable and responsive in serving passengers
T13	The number of charging points at the terminal is sufficient	E3	Availability of facilities in providing advice and criticism to airport managers
T14	Crowded changing rooms for babies and breastfeeding in adequate terminals		

with the services provided, 4 attributes that indicate passengers are satisfied with the services provided, and 17 attributes that indicate passengers are not satisfied with the services provided. The 17 attributes that produce the negative gap are then solved using the TRIZ method.

The servqual calculation produces 3 gaps, namely a positive gap, a zero gap, and a negative gap. The gap is obtained from the calculation of the average value of passenger expectations minus the average value of passenger satisfaction on each attribute. The results of the calculation of the average value of passenger expectations can be seen in Figure 4. And the results of the calculation of the average passenger satisfaction can be seen in Figure 2.

4.5 Improvement with TRIZ Attributes

There are 17 attributes that produce negative gaps, namely the attributes T2, T6, T7, T9, T10, T11, T14, RL1, RL2, RS1, RS3, A1, A2, A3, A4, A5, and E2. The following is a proposed improvement on the attributes that result in a negative servqual gap using the TRIZ method.

1. On the attributes of cleanliness in terminals such as waiting rooms, check-in areas, etc. (T2), proposed improvements in the form of implementing standard operating procedures for terminal cleanliness which require cleaning staff to be a reminder to passengers and act quickly on the cleanliness of the terminal and the information board that is available

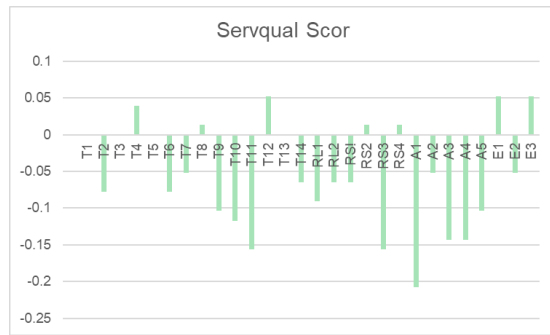


Figure 2: Servqual Scor

at the terminal can be used as a means of information related to passenger sensitivity to cleanliness at the airport in accordance with the principle of universality (6).

2. On the attribute the number of trolleys at the terminal is very sufficient (T6), the proposed improvement is in the form of the airport manager I Gusti Ngurah Rai making separate collection and collection points for trolleys and spread across the terminal area to the parking area at the airport in accordance with the segmentation principle (1).
3. At the airport attribute provides a comfortable seat (T7) the proposed improvement is in the form of changing the seat to be more ergonomic for passengers so that passengers can comfortably use the seat and the material used in the seat is easy to clean and not easy to get dirty so that the cleanliness of the seat is easy to clean. seats will be maintained according to the principle of change parameters (35).
4. On the attribute that the number of trash bins at the terminal is sufficient (T9), the proposed improvement is in the form of adding an information board or a hygiene reminder with the available trash cans so that passengers can easily find trash bins in the terminal area in accordance with the composite material principle (40).
5. On the attribute that the number of ATMs in the terminal is sufficient (T10), the proposed improvement is in the form of adding an ATM machine with an ATM link system where the ATM machine with this system allows passengers to access ATMs with various types of banks owned by each passenger and maximize the available ATM machines in accordance with the principle of Taking out (2).
6. The cleanliness attribute of the airport toilet (T11), the proposed improvement is in the form of using toilet material equipped with sensors that can clean the toilet by itself so as to ensure cleanliness of the toilet at the airport in accordance with the principle of universality (6).
7. The attribute there is a baby and breastfeeding changing room in an adequate terminal (T14) proposed improvements in the form of increasing the frequency of checking in the baby changing room and breastfeeding by officers regarding the completeness and cleanliness of the room so that the atmosphere of the room becomes more comfortable for mothers and children when they are in the room. in the room and add information about the changing room for babies

and breastfeeding in the terminal by adding a logo or information on the direction board in the terminal in accordance with the principle of Mechanical vibration (18).

8. On the attributes of the reliability of facilities and equipment at the terminal (RL1), the proposed improvement is in the form of implementing preventive maintenance on facilities and equipment at the terminal by scheduling regular facility inspections before and after airport operational time in accordance with the principle of mechanical substitution (28).
9. In the attribute of goods inspection time (x-ray) at the time of fast service (RS1), the proposed improvement is in the form of adding a location for passengers to put passenger goods such as bags and suitcases carried by passengers. In addition, adding information boards regarding what items should not be carried when passing through the x-ray machine area such as belts, removing jackets, watches, and others according to the principle of segmentation (1)
10. On the attribute of queuing time during quick check-in (RS3), the proposed improvement is in the form of adding an information board related to file requirements at check-in such as identity cards, boarding passes, etc. as well as adjusting the number of passengers with the number of officers and check-in machines at the airport. terminal and implement a self-check-in system to anticipate long queues in accordance with the preliminary action principle (10).
11. The quality attribute of the information provided to passengers at the terminal is adequate (A2) proposed improvements in the form of adding an information board and equipped with notifications in the form of voice announcements by officers related to flight status, schedule changes, and changes to aircraft gates so that passengers can easily get information regarding flight according to the principle of segmentation (1).
12. On the attributes of the goods in the undamaged and safe baggage (A5), the proposed improvement is in the form of applying an automation-based machine in the transfer of goods to the aircraft baggage in order to reduce the shock of the goods when the process of moving the goods is in accordance with the principle of mechanical substitution (28).
13. At the attributes of the officers at the airport who provide services in accordance with the procedures applied (RL2), the level of politeness and friendliness of the officers at the airport (A1), the fair attitude of the officers to each passenger (A3), the skills and knowledge of the officers in serving passengers at the terminal (A4), and officers who are capable and responsive in serving passengers (E2) proposed improvements in the form of applying standard operating procedures to each officer as well as periodic assessments of officers at the airport in the attitude of officers through feedback given by passengers at the airport and training for officers on a regular basis. periodically so that officers can improve the services provided to passengers in accordance with the principle of preliminary action (10).

5 CONCLUSION AND RECOMMENDATIONS

Based on the results of the study, there were 7 attributes that obtained a positive gap, including T4, T8, T12, RS2, RS4, E1, and E3. So it can be said that passengers are very satisfied with the service on these 7 attributes. In addition, there are 4 attributes that produce a zero gap where the attributes are T1, T3, T5, and T13. And then, it can be said that passengers are satisfied with these 4 attributes. In addition, there are 17 attributes that produce negative gaps, including T2, T6, T7, T9, T10, T11, T14, RL1, RL2, RS1, RS3, A1, A2, A3, A4, A5, and E2. These attributes indicate that passengers are not satisfied with the service on these attributes and it is necessary to make improvements to the attributes that produce the negative gap. Therefore, improvements to these attributes using Theory of Inventive Problem Solving (TRIZ) obtained suggestions for improvements to each attribute are adjusted based on Inventive principles, including universality (6), segmentation (1), change parameters (35), taking out (2), mechanical vibration (18), preliminary action (10), and mechanical substitution (28).

Limitation for this research can be in the next research by making a strategy to improve service at the airport by conducting FGD to a panel of experts and using quantitative methods to get valid results and can be used for industries that have activities in other service sectors to improve service to consumers. Beside that can added respondent to get valid research results by representing the number of airport visitors as research objects..

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