Quality Function Deployment Analysis on Transportation Services

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Abstract—**Transportation is one of the factors supporting the economic activity of the society. However, the safety factor and the timeliness of transportation services are still a major problem, especially in West Java, Indonesia. The growing number of people and implications for congestion, making transportation service problems need to be addressed immediately. Therefore, it is necessary to evaluate the quality of transportation services through research conducted. The method used is Quality Function Deployment (QFD). With this method, research can generates; suggestions for improvement of service quality because it refers to the voice of the customer, translating customer needs into specific technical specifications in designing new processes, and helps in evaluating the policies that have been set. The data is recapitulated in the form of a house of quality that details the relationship between the voice of the customer and the voice of engineering of the companies. The results shows that QFD is useful for companies that manage transport services, among others, in terms of; focus on customers, because the results of collecting customer inputs are translated into a specific set of customer demands, time efficiency, QFD can reduce development time, as it focuses on specific and clearly identified customer demands.**

Keywords—quality function deployment; transportation services; service quality

I. INTRODUCTION

Quality function deployment (QFD) refers to both; determining what will satisfy the customer, and translating those customer desires into the target design, and implemented by every part of the organization [1]. The idea is to capture a rich understanding of customer wants and to identify alternative process solutions. This information is then integrated into the evolving product design. QFD is used early in the design process to help determine what will satisfy the customer and where to deploy quality efforts.

QFD helps in reducing design costs, development time, improves communication and cohesion in product development teams, and solidifies design decisions early in the development cycle [2]. Initially QFD was developed to analyze customer needs in the context of product development, this method has been adapted and applied in many fields such as quality management, product design, product planning, decision making, management, teamwork, time management, and costing. Basically, there are no definite limits for potential QFD application fields [3]. This method with house of quality can also be used to explore information about the level of importance and level of customer satisfaction by using the voice of the customer and comparing it with competitors as used by Seno Adi Andini [4].

Customer satisfaction in the QFD method is closely related to the quality of service, especially transportation services that are not optimal and are a problem in this study. The quality of service is intangible and more difficult to evaluate compared to the quality of goods. Many companies have difficulty understanding how customer perceptions or expectations regarding service quality. Then the quality of services requires the right tools to measure what consumers feel for the services provided [5].

Previous studies related to transportation services or service quality, show that indicators in measuring service quality are important, and it can be represented and measured in various aspects. As well as improvements that are focused and detailed on aspects or indicators that are still lacking [6]. Khorsidi, et al. using the SERVQUAL approaches, result show that the train service company can find out the needs desired by the customer as the voice of the customer [7]. Situmorang, et al show that the QFD method is very well used to improve the quality of service because it refers to the voice of the customer [8].

Several other QFD studies collaborate with several other methods such as the use of hierarchical analysis methods (AHP) and fuzzy methods [9,10]. Andronikidis, et al. discuss the combination of QFD with the AHP-ANP methodology and DEAHP-DEANP data envelopment analysis (DEA) embedded in the AHP and ANP methodologies and potentially replace the eigenvalue method to prioritize selection criteria in the service context [11]. Compared to previous studies, this research attempts to update service quality research using SERVQUAL and QFD methods, so that the end result is expected to be more comprehensive and actual.

In line with the research of Vinayak and Rambabu [12], this study aims to focus on the indicators that are the priority of service quality improvement, given that QFD is a tool that can help companies to focus on what consumers feel and want from the products or services produced.

II. METHOD

The object of this research is the quality of Jabodetabek commuter line train service with 5 dimensions of service quality through 25 indicators, namely reliability 4 indicators, responsiveness 4 indicators, assurance 6 indicators, empathy 3 indicators, and tangible 8 indicators. SERVQUAL method, factor analysis and Importance Performance Analysis (IPA) method are used to find out the main preferences from the five dimensions of service quality, then the use of the Quality Function Deployment (QFD) method with House of Quality (HoQ) is carried out to produce suggestions for improving service quality.

The population of this study is all passengers or users of Jabodetabek commuter line train services. While the sampling technique is done by using convenience sampling, the determination of the sample is based on the researchers' considerations, the ease of meeting and the willingness to become research respondents. Based on the results of the calculation, the number of samples is 200 people.

III. RESULTS

The analysis was carried out in stages. The first stage is to analyze the gap between expectations and the reality of the quality elements of service. The next stage is carried out Importance Performance Analysis (IPA), and the results are then used to determine the priority elements of service quality that still need improvement. Only then the IPA results are used as one of the inputs in the QFD analysis.

The results show that the highest gap is related to the provision of seats in the station waiting room, safety and comfort when going up and down the train. Both are included in tangible and assurance dimensions. The lowest gap is related to the tidiness of the appearance of officers at the station and on the train. The average expectation has a score of 4.69, while the average level of reality is 3.78. This means that there is still a gap of -0.91 from the quality of service perceived by train passengers.

After doing a gap analysis, the indicators that describe each of the service quality dimensions are then analyzed using Importance Performance Analysis. To determine which indicators are included in quadrants I, II, III and IV, the limits of each axis of Hope and Reality are first determined by dividing the total of each expectation and reality divided by the number of question items. The results are shown in table 1 and the overall score of each indicator is shown in the next figure 1.

TABLE I. RECAPITULATION OF GAP ANALYSIS SCORES

	Reality/ Performance	Expectation/ Importance	Gap
Average of all items	94,53	117,22	
Number of items	25	25	
Axis limit	3,78 (X)	4,69 (Y)	-0,91

Based on data from the level of suitability of each indicator and the axis of importance (Y) and performance (X), the mapping is as follows.
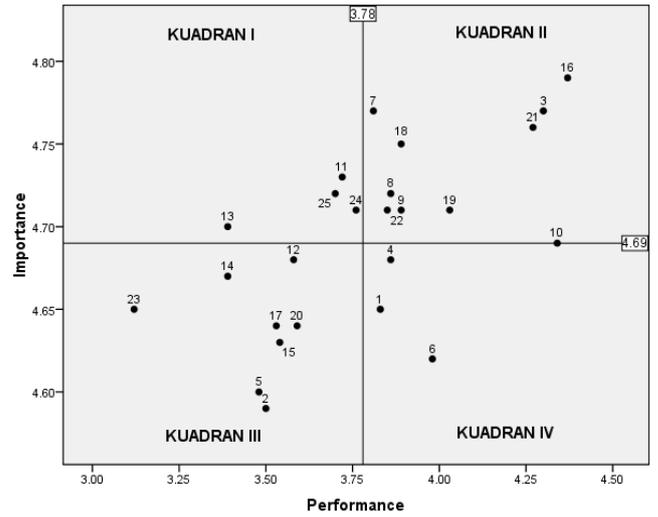

Fig. 1. Mapping of importance/expectation and performance/reality.

From Figure 1 it can be seen that the factors that are in quadrant I show that the high level of importance of the passengers but the low level of performance, so that it becomes a top priority for improvement.

The Factors located in the quadrant I IPA diagram shows that, the indicator is felt by consumers is very important but the condition is still not fulfilling the expectations and desires of consumers and a priority for improvement. The results obtained from the IPA analysis are information about customer needs. The four identified customer needs are then defined as input in conducting QFD analysis. The result of the final analysis, the voice of customer is presented in table 2 below.

TABLE II. VOICE OF CUSTOMER LIST

Voice of Customer
Accuracy of departure schedule and arriving train
Safety and comfort when going up and down the train
Availability of priority seats for people with disabilities, pregnant women, the elderly and mothers with young children
Frequency of train departures (per day)

Further discussion related to customer needs or voice of customers will be presented in the next section.

IV. DISCUSSION

In general, research data shows that the majority of respondents' travel destinations use train services to work, for college / school and recreation. Other data related to the origin station and the destination station of the respondents indicated that the majority came from the capital buffer zones of Jakarta to the Jakarta city area. The description shows that the optimal performance of commuter line mass transit services can encourage economic activity in the region.

The results of the expectations and reality mapping in Figure 1 show that the indicators in quadrant I, among others, are related to the accuracy of train departure schedules, safety and comfort when boarding and alighting, availability of priority seats. Another indicator is that the frequency of train

departures is considered very important for consumers but has not been satisfactory and is a priority for improvement. Some indicators in quadrant I show that the level of importance is high for consumers but the perceived level of performance is still low.

Indicators located in quadrant II are considered as support that can increase consumer satisfaction. Companies need to maintain the performance of these indicators. Some of the indicators are related to; officers who provide information in a language that is easy to understand, readiness of officers directing the use of priority seats, officers able to be friendly and polite in serving passengers, tidiness in the appearance of officers at stations and on trains, suitability of services with ticket prices, better service guarantees than modes of transportation other, station cleanliness, cleanliness in the train, and air conditioning facilities on the train.

From the results of the mapping, the indicators located in quadrant III are not too important to be considered by companies because they are not considered important by consumers and their satisfaction level is also low. These indicators are related to the ease of obtaining updated information, availability of insurance or security guarantees, availability of customer complaints services, and so on.

Meanwhile indicators; availability of information relating to train routes, schedules and rates, and indicators of officers' confidence in serving passengers located in quadrant IV are considered not too important, so that providers of products or services must allocate resources to allocate resources related to indicators to other factors which has a higher handling priority and still needs an increase.

V. Conclusion

The quality of transportation services needs to pay attention to several important aspects. Based on the results of the study, these aspects are the accuracy of the scheduled departure and arrival of the train, safety and comfort when going up and down the train, the availability of priority seats for people with disabilities, pregnant women, the elderly and mothers with young children, as well as the frequency of train departures (per day).

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