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Improvement Quality of Occupational Health and Safety Testing Laboratory Services Using Quality Function Deployment Method

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A B S T R A C T

This research is to assess the quality of OHS laboratory test services, determine items that need to be improved and improve the design of laboratory services. ServQual and QFD methods are used in this study, which is based on 5 dimensions and 19 variables. The results of a poll of 75 respondents to laboratory test services were used in this study. The validity and reliability tests carried out on the findings of the questionnaire were used to assess the reliability of the items and the practicality of the questionnaire. Questionnaire answers are then used to determine the relationship between variables by using correlation and hypothesis testing. Customer satisfaction is influenced by seven factors, according to the study. However, the results are far from expectations. As a result, it needs to become a focal point for improvement. To improve the quality of OHS laboratory test services, it is necessary to improve the design of 8 attributes in the form ofHouse of Quality with 7 elements of technology. As a result, competent management tactics can be used to combat the service industry's intense competition.

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1. INTRODUCTION

The era of globalization which is marked by transparency, democratization, and accountability in every implementation of activities, demands the readiness of supporting facilities and infrastructure so that these demands for change can achieve the expected goals. Testing services are a product quality control instrument, the implementation of which has a very important role in measuring the quality of the products produced. Errors in measurement results, whether caused by non-standard procedures or accuracy levels that are not following with applicable standards, will have fatal consequences that can endanger the safety and health of the soul and the environment. For this

reason, test organizers need to implement applicable standards. The Ministry of Manpower of the Republic of Indonesia 2020, submitted data on achieving the National target for absorption of Non-Tax State Revenue (PNBP) for laboratory services from the National UPTP Offices. Based on PNBP productivity data obtained by the UPTP Jakarta K3 laboratory testing service in the last three years it has continued to be below the target, in 2017 it was realized at 56.7%, in 2018 it was close to the target of 87.7% and in 2019 it was realized 46% of the target in 2019 cannot revise the budget because laboratory services are part of the National Priority Strategy. And in 2020 with an initial target of Rp. 346,086,000 for laboratory services, source: Sesdirjen. Binwasnaker 2020.

Recent testing services carried out by both government and private institutions have found many weaknesses so they have not been able to meet the quality expected by the public. This is indicated by the existence of various public complaints conveyed both through the mass media and individually, which can lead to an unfavorable image. The results of a customer satisfaction survey conducted by the 2019 National Accreditation Committee regarding service show that the quality of service has several results that need to be improved because there are still several indicators and sub-indicators whose indexes show poor performance out of the 20 poor index rating indicators. Including Accreditation service speed with an index of 65.54, cost reasonableness assessment which is set with an index of 65.35, and the response speed of accreditation services by telephone with an index of 64.02. Thus, this is a problem that can affect the low quality of service. One way to increase the company's value perceived by its customers is to build good relationships (Abdul, 2018).

According to Kessel et al., (2014) in Heruye et al., (2020) The World Health Organization states that based on reliable and timely laboratory research results are essential for decision-making in almost all aspects of healthcare: about 60-70% of medical decisions are based on laboratory. Providing high-quality services is a concern of all types of service providers because service quality is very important for customer satisfaction and has an impact on purchase intentions (Meesala & Paul, 2018).

Previous studies have discussed service satisfaction, particularly in laboratory services (Casado et al., 2021; Fernandes et al., 2021; Vianna et al., 2022). However, most research on service quality in laboratory conducted in a clinical laboratory, such as Alejo-Vilchis & Reyes-Lagos (2022); Almatrafi et al. (2108); Hailu et al. (2020); Plebani (2018).

Some studies discussed service satisfaction in non-clinical laboratories. Karthiyayini & Rajendran (2021), study an approach for benchmarking service excellence in accreditation services of calibration and testing laboratories in India. The main objectives are to identify the service gaps, and customer/laboratory needs and to prioritize the technology, quality, cost, and reliability for benchmarking service quality excellence. Similar to Karthiyayini & Rajendran (2021), Huang et al. (2019), studied service quality and brand awareness influence customer satisfaction and loyalty toward calibration laboratory.

However, no research has been found that focuses on identifying customer satisfaction in Occupational Safety and Health (OHS) laboratory services. Therefore, this study aims to identify the satisfaction of testing laboratory services by finding solutions and strategies to improve the quality of OHS laboratory

services. If this problem is not immediately followed up, it will have an impact on reducing the level of customer trust so that it can eliminate the trust of the Occupational Safety and Health testing laboratory institution.

2. LITERATURE REVIEW

Customer satisfaction can be formed if the customer gets something expected from a product or service he uses (Trimarjoko et al., 2019) Industrial world customer satisfaction is the key to success in an increasingly competitive business era. In the service industry, customer satisfaction is closely related to the level of service quality, in the process, there is a direct interaction between the system, the operator, and the customer itself, where the process the customer can feel the quality of the service directly at the same time and can provide an assessment of the quality of service that is currently happening without through other stages of the process. The main process in the service organization/industry that prioritizes the accomplishment of service quality that meets or exceeds customer expectations is service quality (Fathurohman et al., 2021b). So that it can be interpreted that customer satisfaction is one of the important attributes in the industrial world, especially the service industry.

Kano and Servqual's model showed that six of the total 31 service quality attributes as trainee needs were selected for improvement, implying a maximum effect on trainee satisfaction(Altuntas & Kansu, 2020; Singh & Rawani, 2019). Based on the design and weighting of Quality Function Deployment (QFD), the 2 technical responses that have the greatest weight are service procedures improvement of 17.6% and service standard of 16.1%. By improving service procedures and service standards by adhering to excellent service and Excellent Service to improve testing and calibration services to customers. The results of the research using the Servqual method obtained a gap that is all negative between -1.04 to -1.26. This shows that all customers are still not satisfied with the services provided by the agency, and 6 factors become the main priority for improvement including providing services immediately, Notification of when exactly calibration services are provided, Ownership of modern and up-to-date laboratory equipment, Appearance of physical facilities, the appearance of supporting services, and flexible and timely operations/transactions (Ariani et al., 2018).

SERVQUAL method is a deviation from the standard method of employing a perception-based measure as a predictor of customer satisfaction. SERVQUAL recommends utilizing expectation/perception (the service quality gap) as an enduring perception that can predict customer satisfaction with a service provider instead of perception (Altuntas & Kansu, 2020)

The Servqual Model, according to Altuntas & Kansu (2020), is based on the concept that customers compare service performance against ideal/perfect norms for each service attribute. In a few words, quality is a difficult notion to define. Quality has been described as adhering to standards at its most fundamental level. This means that businesses must develop criteria and specifications; once these are in place, the quality purpose of the various functions within an organization is to adhere to these specifications to the letter. Many studies of service quality have attempted to distinguish between objective indicators of quality and those based on consumers' more subjective judgments. Many examples of

SERVQUAL and QFD being combined in different ways and in different industries can be found in the literature. In Singapore, employed SERVQUAL for performance evaluation and used the empirical findings as input for QFD in the process of creating services for hospitals based on consumer expectations.

One of the most widely recognized systematic methodologies for determining which things want improvement is Importance Performance Analysis (IPA). The average values of importance and performance of distinct services/product elements, which are determined in relation to one another, are shown in a two-dimensional coordinate system, primarily in the area divided into four quadrants (Phadermrod et al., 2019). The results of the Sörensson & von Friedrichs (2013) IPA study comparing national and foreign travelers found that national tourists value sustainable tourism more than international tourists. Meanwhile, there are considerable disparities in subsequent tourism between national and international travelers. The IPA results are divided into four quadrants. The high-relevance but low-performance quadrant was included in Quadrant A. The two-dimensional IPA model is divided into four quadrants with performance on the x-axis and importance on the y-axis. As a result, four quadrants namely concentrating here, staying up the Good Work, low priority, and possibly overdoing it was created (Wong et al., 2011).

The next researcher employed IPA to compare Hong Kong's corporate competitiveness to that of its primary Asian competitors. They employed IPA to analyze the data because it can serve as a foundation for their corporate development strategy (Enright & Newton, 2004). A QFD tool is a house of quality (House of Quality), and a house of quality is a graphic technique to explain the relationship between customer desires and products or services (Raissi, 2018; Singh & Rawani, 2019). Raissi (2018) defines Quality Function Deployment as a structured method used in the product planning and development process to establish customer needs, specifications, and desires, as well as a systematic evaluation of the ability of a product or service to meet consumer needs and wants. The first of the "quality tables" is usually called the House of Quality or commonly referred to as the House of Quality (HOQ), this is a matrix that is very often used in the QFD method. In the manufacturing sector, a four-phase QFD method is usually used (Putra & Wang, 2020), however, we can make modifications that can then be applied in the service industry or service industry by using the three-phase quality matrix of the four. Many researchers in many service areas employed QFD. Better design and lower service costs, fewer and earlier design changes, decreased product development time, fewer start-up problems, greater corporate performance, enhanced service quality, and, most importantly, increased customer happiness are all advantages of QFD applications (Altuntas & Kansu, 2020). QFD is not the only method that is commonly used in the transformation of consumer desires into every stage of service development. However, QFD is a good design process that can link customer requirements, service specifications, target values, and competitive performance into an overview of the Planning Matrix.

3. RESEARCH METHOD

Customer satisfaction can be formed if the customer gets something expected from a product or service that he uses (Trimarjoko et al., 2019). Customer satisfaction in the

industrial world is the key to success in an increasingly competitive business era. In the service industry, customer satisfaction is very closely related to the level of service quality, in the process, there is a direct

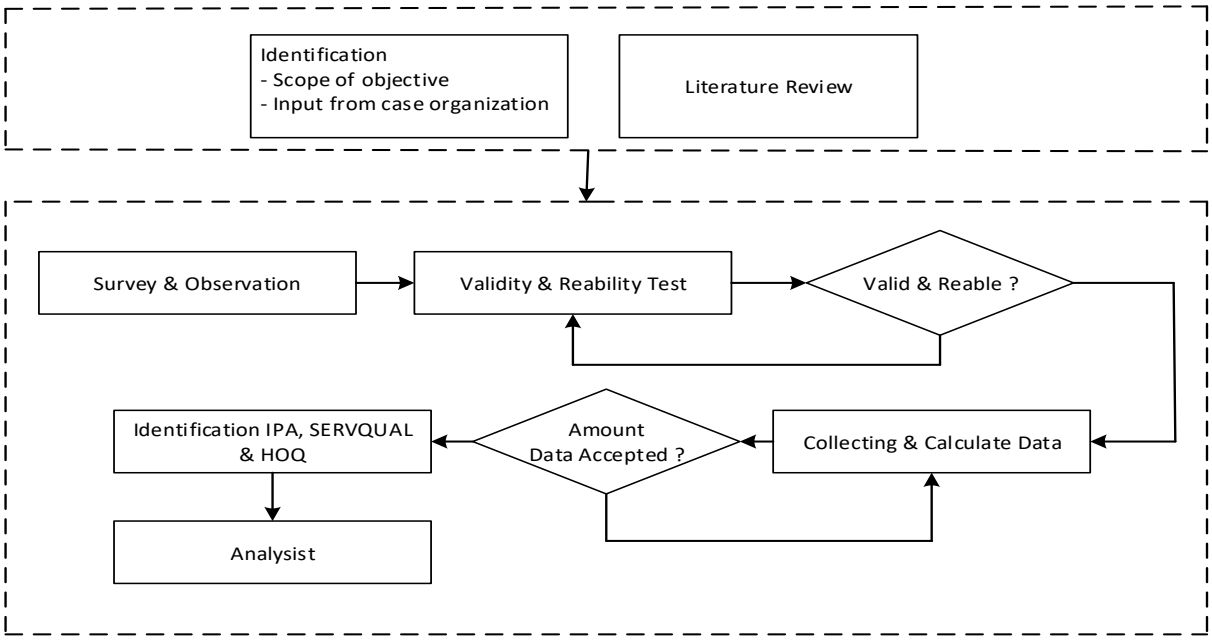


Fig. 1. Study framework

interaction between the system, the operator, and the customer himself, where in the process the customer can feel the quality of service directly. at the same time and can provide an assessment of the quality of service that is happening without going through other stages of the process. The main process in service organizations/industries that prioritize achieving service quality that meets or exceeds customer expectations is service quality (Fathurohman et al., 2021a). So that it can be interpreted that customer satisfaction is one of the important attributes in the industrial world, especially the service industry.

The Kano and Servqual models show that six out of a total of 31 service quality attributes as participant needs are selected for improvement, implying a maximum effect on trainee satisfaction (Rahmana et al., 2014). Based on the design and Quality Function Deployment (QFD) weighting, the 2 technical responses that have the greatest weight are service procedure improvements at 17.6% and service standards at 16.1%. By improving service procedures and service standards by adhering to excellent service and excellent service to improve testing and calibration services to customers. The results of the study using the Servqual method obtained gaps which were all negative between -1.04 to -1.26. This shows that all customers are still not satisfied with the services provided by the agent. Quality has been described as adhering to standards at the most fundamental level. This means that businesses must develop criteria and specifications; Once this is in place, the quality objective of various functions within an organization is to comply with these specifications in writing. However, QFD is a good design process that can link customer requirements, service specifications, target values, and competitive performance into a Planning Matrix overview.

4. RESULT AND DISCUSSION

According to the results of the questionnaire, 36 percent, or 27 who became respondents by gender in this study were female, while the remaining 64 percent, or 48 respondents were male. Meanwhile, 32 percent of respondents were between the ages of 20 and 30, 60 percent, or 45 respondents, were between the ages of 31 and 40, and 9 percent, or 7 respondents, were between the ages of 41 and 50. In this study, the validity test is performed with SPSS by comparing the estimated r value to the r table for the degree of freedom (df) = n-2, where n is the number of samples and n = 75. The sample consists of 75 respondents who were chosen from the sample of respondents for the SERVQUAL test to assess this validity with df 28 and alpha 0.05, the value of r table can be calculated as r table = 0.227. The item, query, or indicator is then compared to r count, and if r count > r table and the value is positive, it is pronounced valid. The following are the results of the validity and reliability tests of the questionnaire results from 75 respondents involved in this study.

For 75 surveys, The results of the SPSS computation overall value of "r" count, which is greater than the r table value of 0.227. As a result, the entire questionnaire's question items might be inferred to be valid. The dependability of respondents' responses to the general items of the questions was then measured using a reliability test. According to Santoso (2010), a questionnaire is considered reliable if the Cronbach Alpha value is more than 0.60. The reliability test of the questionnaire's 19 question items yielded the following results.

Table 1. Expected reliability test

Cronbach's Alpha	No Of Item	Result
0,974	19	Reliable

Table 2. Perceptual Reliability Test

Cronbach's Alpha	No Of Item	Result
0,960	19	Reliable

After all, indicators were deemed valid in SPSS, the reliability test was conducted. If a construct or variable has a Cronbach Alpha value greater than 0.60, it is said to be dependable. The reliability test results are reported in Tables 4.3 and 4.4. The anticipated reliability test has a Cronbach Alpha score of 0.974 > 0.6, indicating that it is reliable. The Cronbach Alpha rating for the perceptual reliability test is 0.974 > 0.6, which means it is also considered trustworthy. A gap score is used to assess the OHS Testing Laboratory's performance in terms of service attribute quality. The answers to the questionnaire are compared to expectations and perceptions in a gap analysis. If the perception falls short of the expectation, the customer is dissatisfied, and the question item should be revisited in the HOQ stage for improvement. The gap analysis shows that the distance between all question items is negative, indicating that expectations are bigger than perceptions. This indicates that the buyer is unhappy with all of the items that have been submitted. Customer expectations for the Admissions and Promotions Department's services were not satisfied. As a result, in the next stage, all of these elements will be employed as consumer voices in the HOQ approach.

Importance of Performance Analysis on Expectation Congruence and Service Quality Reality In making a diagram it is necessary to point (X, Y) "X" is the average score for reality, and "Y" is the average score for expectations to determine the position of the statement items, whether they are in quadrant A, B, C, or D, where the position of the question items in quadrant A are the points that must be corrected immediately using the QFD

method.

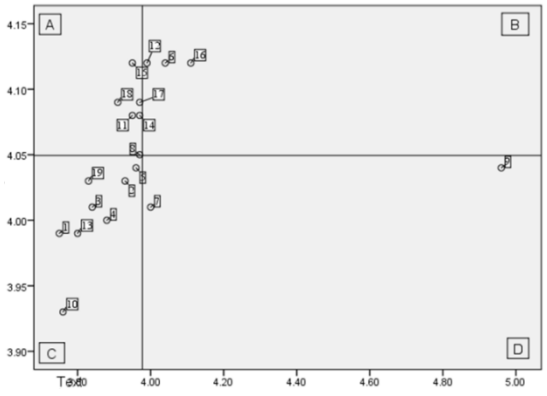


Fig. 2. Importance of performance analysis

The ability of personnel to provide information regarding OHS test services (Q2), Quality assurance of OHS testing services (Q6), Guarantee the confidentiality of the test result data (Q5), The suitability of service products between those listed in the service standards and the results provided (Q8), Facilities and infrastructure of testing institutions (Q11), Completeness of the use of Personal Protective Equipment (PPE) for the officer conducting the test (Q12), Ease of getting information on OHS test services (Q14), Ease of registering OHS test services (Q15), Assistance of personnel to customers in selecting the required test services (Q17) and Ability to solve problems faced by customers (Q18). Lin et al. (2009) presented the Importance of Performance Gap Analysis (IPGA), which combines IPA with gap analysis and uses fixed values for the coordinates cross section derived by changing functions of two axes and using relative importance (RI) and relative performance (RP). The RP has a value of 0 at intersection sites, while the RI has a value of 1, and the vertical axis denotes the "best performance axis. The improvement Gap Analysis (IGA) model is proposed by Tontini et al., (2014). "According to the IPGA model, the magnitude of the priorities for potential corrective action is defined by the element's distance from the intersecting coordinates. A distinctive feature of this model is the shaded area surrounding the coordinates, which represents a 90% likelihood of axis position. Managers must assess if a certain aspect in the shaded region warrants corrective action.

The matrix of consumer demands or Voice of Customer, which was a list of items that were significant to customers, was the first phase in producing HOQ. The results of the Importance Performance Analysis (IPA) were utilized in this study to determine the Voice of Customers by placing the items in the quadrant “A” like the improvement focus.

The performance of service quality qualities is essentially service quality, or how well-existing services meet the needs of service users or consumers. The service quality method, or SERVQUAL, is a method for assessing expectations or expectancies and perceptions or reality felt by customers in the laboratory of Balai K3 Jakarta on these service attributes to determine the performance of the quality of educational service characteristics. SOP must be written to high standards if they are to be implemented. Furthermore, there were repercussions if the SOP was not followed to the letter. The severe requirement was to hold associated parties, such as customer service and examiner staff, accountable for following the regulations in the applicable SOP. The ability of the examiner staff to act as a good competence in responding to customer needs, the ability of customer service to resolve the problem quickly, the ability of personnel with the services provided of an internal problem, and interacting directly with the users are all covered by the SOP on customer service. Meanwhile, the vendor is expected by the SOP to give accurate, reliable, current, and thorough information.

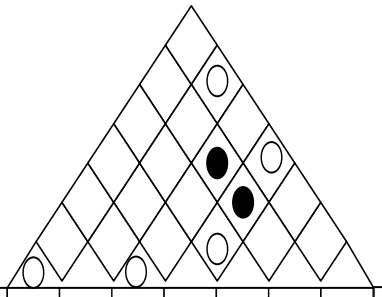
The technical characteristic with the second-highest weighting was the fulfillment of customer satisfaction with integrated program development to improve the quality of OHS laboratory testing services through collaborative efforts such as integrating the Customer Service division with quality assurance testing.

Responding to complaints/complaints testing took about 5 days. As an exceptional service, integrating the test contract area with the payment department. Improve organizational performance by providing training to the administrative, technical, technological, financial, and policy sections (risk management, Six Sigma, financial reporting, and quality management deepening), as well as investing in computerized facilities and infrastructure. Make the most promotion's potential with a focus on marketing, but it is still tied to the existing test requirements.

The third highest weighted technical characteristic was market penetration and product development (service differentiation), expansion and development of test techniques based on parameters and other types of matrices/samples, making complete test parameters for the SNI and test markets as requested by customers, particularly in research and development, maintain accreditation and expand the scope of testing 100 test parameters every time the National Accreditation Committee performs an assessment/reaccreditation and equipment investment.

5. CONCLUSION

The results of the SERVQUAL and QFD methods for these ten traits have a considerable impact on customer satisfaction, but not in the way that one might assume. The information is effective, Personnel's capacity to provide information on OHS testing services, Assurance of the quality of OHS laboratory testing services, the confidentiality of test findings data assurance, between those mentioned in the service standard and the outcomes produced, the suitability of service products, Institutional testing facilities and infrastructure, officers who conduct testing must wear full Personal Protective Equipment, obtaining information on laboratory OHS services is simple, registration of laboratory OHS services is simple, customers are assisted by employees in selecting the appropriate test services, ability to help clients with their difficulties. The 8 attributes that do not meet customer expectations are then evaluated with QFD, resulting in a technical analysis that needs to be improved, which includes a variety of laboratory quality services, information completeness standards, consistency of SOP implementation, refund policy, workforce qualifications, and assurance availability. Future studies with a bigger sample size can benefit from the merging of the SERVQUAL and QFD methods. Additional research should also be capable of analyzing two or more related laboratory test services.



Technical Requirement / Customer	Customer Importance Rate	Renovation for facilities and laboratory test	Designation supplier for equipment and special reagents test	Increasing intecity communication to customer	Training motivation and enhacement work culture	Desimination quisionaire and discuss with customer	Integrity program development	Conduct comparative studies with foreign laboratory	Our Product	Competitor A's Product	Competitor B's Product	Target Value	Importance Factor	Sales Point	Overall Weigthing	Percentage Total
Competence enhacement OHS officer	4				9			9	5	4	5	5	1,7	1,5	12,75	17,49
Calibrated and validated of laboratory equipment	5	9	9					3	5	5	4	5	1,7	1,3	11,05	15,17
Comitment organization to impplemen ISO 17025	4	3		3	9		9		5	4	5	5	1,7	1,3	11,05	15,17
Promotion and socialitation laboratory service test	5			9		9		9	4	4	4	4	1,3	1,0	5,2	7,14
Enhacement facilities and infrastructures laboratory	4	9	3						5	5	5	5	1,7	1,3	11,05	15,17
Making call center and complaint service	4			9					5	4	4	5	1,3	1,5	9,75	13,38
Increased of number accreditation parameters	4						9	9	4	4	5	4	1,3	1,0	5,2	7,14
Provide facility tracking of process position	4			3			9		4	4	4	4	1,3	1,3	6,8	9,33
Technical Priority		99	85,5	127,2	97,2	54	133,2	112,2								
Percentage of Total		14,0	12,1	18,0	13,7	7,6	18,8	15,8								
Technical Difficulties (Lowest 1 – Highest 5)		4	6	2	5	7	1	3								

Fig. 3. House of quality

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