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The Influence of Loading and Unloading Service Quality, Human Resource Availability, Operational Efficiency, and Information Technology on Customer Satisfaction At PT Pelindo Terminal TPK Pantoloan Container Palu Central Sulawesi

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ABSTRACT

This study aims to analyze the influence of loading and unloading service quality, availability of human resources, operational efficiency, and information technology on customer satisfaction simultaneously at PT Pelindo Terminal Petikemas (TPK) Pantoloan, Palu, Central Sulawesi. The research method uses a quantitative approach with multiple linear regression analysis techniques. The research sample consisted of customers who used TPK Pantoloan port services. The results showed that the four variables simultaneously had a significant effect on customer satisfaction with an F test value of 103.022 and a significance level of 0.000. The determination coefficient (R^2) of 0.848 indicates that 84.8% of the variation in customer satisfaction can be explained by the variables of loading and unloading service quality, availability of human resources, operational efficiency, and information technology. These findings confirm the importance of integration between service factors, human resources, efficiency, and technology in improving customer satisfaction at container ports. The managerial implications of this study are the need for continuous improvement in service quality, human resource competency development, optimization of operational efficiency, and more intensive use of information technology. This research makes an empirical contribution to port management, especially in the Central Sulawesi region which has unique operational characteristics.

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INTRODUCTION

In addition to its main function in logistics, PT Pelindo Terminal Petikemas also contributes to the development of port infrastructure that supports the smooth distribution of goods in various regions of Indonesia. The existence of this company plays a role in improving the operational efficiency of the port, thereby reducing obstacles that often occur in the distribution system. With the increasing need for faster and quality services, PT Pelindo Terminal Petikemas continues to innovate to ensure that their operations can support the dynamics of the market that continues to grow. Thus, this company not only supports trade activities but also plays a role in strengthening Indonesia's position as one of the logistics centers in the Southeast Asian region (Witayasa & Sudiarta, 2020; Grace et al., 2022).

Research by Grace et al. (2022) shows that the existence of adequate logistics infrastructure can improve people's welfare through increased productivity and economic efficiency. This is also in line with the regional economic development goals, where TPK Pantoloan serves as an important link in supporting cross-regional trade activities and strengthening Palu's position as one of the strategic logistics centers in central Indonesia.

Service quality is one of the main elements that affect operational success in the port and logistics sector, including at TPK Pantoloan, Central Sulawesi. High-quality services are essential to ensure the smooth loading and unloading of containers, which is at the core of the port's function. However, various challenges related to service quality still often arise. One of the main problems faced is the delay in the loading and unloading process, which not only hinders the terminal's operation but also reduces customer satisfaction. Witayasa and Sudiarta (2020) stated that quality dimensions such as reliability and responsiveness greatly determine customer perception of the services received. Failure to meet customer expectations, such as untimely schedules and lack of response to complaints, can significantly degrade a company's image.

Unclear information related to operational processes is also one of the factors that worsens the customer experience at TPK Pantoloan. Many customers complain about the difficulty of getting updates on the status of shipments or service schedules. Grace et al. (2022) highlight that poor communication and lack of access to information can create ongoing dissatisfaction. In today's digital age, customers expect full transparency and real-time access to operational information. Failure to provide this need not only reduces customer loyalty but also increases the risk of losing market share.

Improving the quality of service at TPK Pantoloan must be a top priority to improve customer perception and increase the competitiveness of the terminal. One solution that can be done is to implement a more modern and technology-based operational system to improve service efficiency and transparency. It also needs to be accompanied by intensive training for human resources to ensure that the operational standards applied can run well. By overcoming this service quality problem, PT Pelindo Terminal Petikemas can not only improve customer satisfaction but also increase its contribution to the development of the logistics sector in Central Sulawesi.

Human resources (HR) are fundamental elements in the success of logistics and port operations, including at TPK Pantoloan, Palu, Central Sulawesi. Labor competencies greatly determine the effectiveness of services, considering that the logistics process requires precise coordination and timely execution. Lufitasari (2023) highlights that an unskilled workforce is often the cause of slow service, which has a direct impact on the customer experience. At TPK Pantoloan, the limited number of workers who have special expertise in the field of loading and unloading causes obstacles such as technical errors in cargo handling. This error not only slows down the operational process but also incurs additional costs, both for customers and companies.

Operational efficiency is one of the benchmarks for the success of logistics companies, including in the operational context of TPK Pantoloan. Speed and timeliness in the loading and unloading process are important factors that affect customer satisfaction levels. However, TPK Pantoloan still faces obstacles in the form of long waiting times for ships due to queues that are not managed properly. Kurniasari (2023) noted that long waiting times not only add to operational costs but also create dissatisfaction among customers, especially logistics companies that rely on port services to maintain a smooth supply chain.

Information technology is a crucial element in supporting the transformation of logistics services in the modern era, including at TPK Pantoloan. The implementation of technologies such as document digitization systems and real-time tracking has been proven to improve service efficiency by providing fast and accurate access to information to customers (Nugroho et al., 2020). However, TPK Pantoloan still faces challenges in the form of a lack of technological integration in various operational aspects. The unavailability of a fully connected system often leads to delays in providing information to customers, which ultimately reduces their satisfaction levels. This condition not only impacts customers' perception of service quality, but also increases the risk of complaints that can affect the company's reputation.

The lack of optimal use of technology also increases the potential for human error in the operational process at TPK Pantoloan. These errors can appear at various stages, from data logging to loading and unloading execution, resulting in decreased service efficiency. Purba (2024) emphasized that the adoption of advanced technologies, such as process automation and information technology-based management systems, can significantly reduce the potential for human error. By using an integrated system, every stage of operations can be monitored in real-time, making decisions faster and more accurate. This will provide a competitive advantage for TPK Pantoloan in facing competition in the logistics sector.

To improve operational efficiency and customer satisfaction, PT Pelindo Terminal Petikemas needs to prioritize the adoption of advanced technology in their management system. Innovations such as loading and unloading automation, data digitization, and customer-based application development can help improve service speed while increasing transparency. In addition, the integration of this technology allows companies to provide solutions that are more responsive to customer needs, creating a better experience. By implementing technology-based strategic measures, TPK Pantoloan can optimize their operations while strengthening its position as one of the leading container terminals in the Central Sulawesi region.

Overall, focusing on improving service quality, empowering human resources, optimizing operational efficiency, and utilizing information technology are strategic steps that must be taken by PT Pelindo Terminal Petikemas TPK Pantoloan. By addressing the challenges in each of these aspects, the company can

increase competitiveness while making a positive contribution to economic development in the Central Sulawesi region.

METHOD

This study uses quantitative and qualitative data approaches in a complementary manner to provide more holistic and in-depth results. Quantitative data is used to measure the relationship between variables statistically. Meanwhile, qualitative data is used to understand a deeper context related to phenomena that occur in the field. This research was conducted at PT Pelindo Terminal Petikemas TPK Pantoloan, Palu, Central Sulawesi.

STATISTICAL TESTING

Multiple Regression Analysis

Table 1. Regression Test

Coefficient						
Type		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.568	1.681		1.528	.131
	BM Speed	.285	.092	.301	3.090	.003
	HR Availability	.208	.085	.212	2.445	.017
	Operational Efficiency	.198	.070	.229	2.822	.006
	Information Technology	.253	.078	.268	3.228	.002

The four independent variables included in the regression model were significant. This can be seen from the probability of significance for the variable quality of loading and unloading services (X1) of 0.003, availability of human resources (X2) of 0.017, operational efficiency (X3) of 0.006, and information technology of 0.002. From the table above, the regression equation is as follows:

Y = 2.568 + 0.301X1 + 0.212X2 + 0.229X3+ 0.268X4

From these equations, it can be explained as follows:

Constant value (a) = 2.568, explains that if the quality of loading and unloading service (X1), availability of human resources (X2), operational efficiency (X3) and information technology (X4) is 0, then the customer satisfaction variable will be constant at a value of 2.568.

The value of the loading and unloading service quality regression coefficient (b1) is a positive value of 0.301X1, which means that every increase in the loading and unloading service quality score (X1) by one unit will increase customer satisfaction by 0.301, assuming other independent variables are in a fixed state.

The value of the regression coefficient of human resource availability (b2) is 0.212X2, which means that every increase in the human resource availability score (X2) by one unit will increase customer satisfaction by 0.212, assuming other independent variables are in a fixed state.

The value of the operational efficiency regression coefficient (b3) is a positive value of 0.229X3, which means that any increase in the operational efficiency score (X3) by one unit will increase customer satisfaction by 0.229, assuming other independent variables are in a constant state

The value of the information technology regression coefficient (b4) is 0.268X4, which means that every increase in the information technology score (X4) by one unit will increase customer satisfaction by 0.268, assuming other independent variables are in a fixed state.

Simultaneous Tests

Table 2. Simultaneous Tests

NEW ERA						
Type		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1308.477	4	327.119	103.022	.000b
	Residual	234.966	74	3.175		
	Total	1543.443	78			
a. Dependent Variable: Customer Satisfaction						
b. Predictors: (Constant), Information Technology, Operational Efficiency, Human Resource Availability, BM Speed						

a. Dependent Variable: Customer Satisfaction

b. Predictors: (Constant), Information Technology, Operational Efficiency, Human Resource Availability, BM Speed

Source : Appendix 5. Research data has been processed 2025

The simultaneous influence test (F test) above, obtained a calculated F value of 103.022 with a significance value = 0.000 because p < 0.05, then the regression model can be used to predict performance. From simultaneous testing, it can be seen that together the variables of the quality of loading and unloading services, the availability of human resources, operational efficiency, and information technology have a positive and significant influence on performance.

Partial Test

Table 3. Partial Test

Coefficient						
Type		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.568	1.681		1.528	.131
	BM Speed	.285	.092	.301	3.090	.003
	HR Availability	.208	.085	.212	2.445	.017
	Operational Efficiency	.198	.070	.229	2.822	.006
	Information Technology	.253	.078	.268	3.228	.002

Source : Appendix 5. Research data has been processed 2025

In the table above, it shows that the four independent variables included in the regression model are significant. This can be seen from the probability of significance for the variable quality of loading and unloading services (X1) of 0.003, the availability of human resources (X2) of 0.017, operational efficiency (X3) of 0.006, and information technology (X4) of 0.002.

Hypothesis Testing

Based on the results of the partial significance test, the results of the hypothesis test can be described as follows:

The quality of loading and unloading services is on customer satisfaction.

Based on the calculation of the regression coefficient model and the significance test of the quality of loading and unloading services on customer satisfaction of 0.301 with a significance value = 0.003 smaller than the value of α = 0.05. Because the significance value is smaller than the value of α = 0.05, the quality of loading and unloading services has a positive and significant effect on customer satisfaction. Then the first hypothesis can be declared acceptable.

The availability of human resources to customer satisfaction.

Based on the calculation of the regression coefficient model and the significance test of the availability of human resources on customer satisfaction of 0.212 with a significance value = 0.017 smaller than the value of α = 0.05. Because the significance value is smaller than the value of α = 0.05, the availability of human resources has a positive and significant effect on customer satisfaction. Then the second hypothesis can be declared acceptable.

Operational efficiency to customer satisfaction.

Based on the calculation of the regression coefficient model and the significance test of operational efficiency on customer satisfaction of 0.229 with a significance value = 0.006 smaller than the value of α = 0.05. Because the significance value is smaller than the value of α = 0.05, operational efficiency has a positive and significant effect on customer satisfaction. Then the third hypothesis can be declared acceptable.

Information Technology Towards Customer Satisfaction.

Based on the calculation of the regression coefficient model and the significance test of information technology on customer satisfaction of 0.268 with a significance value = 0.002 which is smaller than the value of α = 0.05. Because the significance value is smaller than the value of α = 0.05, information technology has a positive and significant effect on customer satisfaction. So the fourth hypothesis can be declared acceptable.

The quality of loading and unloading services, the availability of human resources, operational efficiency, and information technology to customer satisfaction.

In the fifth hypothesis, there is a positive and significant influence of the quality of loading and unloading services, the availability of human resources, operational efficiency, and information technology together on customer satisfaction.

Based on the calculation of the regression coefficient model and the significance test of the quality of loading and unloading services, the availability of human resources, operational efficiency, and information technology together on customer satisfaction according to the results of the F test of 103, 022 with a significance value = 0.000 smaller than the value of α = 0.05. Because the significance value is smaller than the value of α = 0.05, the quality of loading and unloading services, the availability of human resources, operational efficiency, and information technology together have a positive and significant effect on customer satisfaction. Then the fifth hypothesis can be declared accepted or proven.

DISCUSSION

The quality of loading and unloading services is on customer satisfaction.

The results of the regression analysis showed that the quality of loading and unloading services had a significant effect on customer satisfaction, with a regression coefficient of 0.301 and a significance level of 0.003. This value indicates that every one unit increase in the quality of loading and unloading services will increase customer satisfaction by 0.301 units, assuming the other variables remain constant. Because the significance value is less than 0.05, this effect is statistically significant, which means that the quality of loading and unloading services has a real contribution in shaping customer satisfaction at the research site.

Theoretically, these findings are supported by the SERVQUAL service quality model from Parasuraman, Zeithaml, and Berry (1988) which includes five main dimensions: tangibles, reliability, responsiveness, assurance, and empathy. In the context of PT Pelindo Terminal Petikemas (TPK) Pantoloan, dimensions such as reliability in the loading and unloading process, timeliness, and quick response to customer requests and complaints are very crucial. In line with the theory of customer satisfaction according to Kotler and Keller (2016), customers feel satisfied when the service received meets or even exceeds their expectations. Therefore, improving the quality of loading and unloading services will greatly impact increasing customer satisfaction at this port.

Contextually, PT Pelindo TPK Pantoloan is one of the main container ports in the Central Sulawesi region which has an important role in supporting logistics activities and distribution of goods for the central region of Indonesia. This port serves the loading and unloading of containers to and from various regions, including regional-scale export and import activities. Therefore, the quality of loading and unloading services at TPK Pantoloan is very decisive for the smooth running of trade activities and the satisfaction of port service users. Customers, whether logistics companies, exporters, or importers, are highly dependent on the speed and accuracy of the services provided by port operators.

The results of this study are also in line with various previous studies in the last five years. Sugiarto and Rahman (2021) found that the speed and accuracy of loading and unloading services at ports have a significant impact on customer satisfaction and loyalty. Kusuma and Ramadhani (2020) stated that the dimensions of responsiveness and reliability have a great influence on customer perception in logistics services. Hidayat et al. (2019) also showed that efficiency in loading and unloading services improves the smooth supply chain and customer satisfaction. Meanwhile, Wibowo and Putri (2022) underline the importance of service with minimal errors and professionalism as a factor that increases service user satisfaction. In addition, Nugroho and Saputra (2023) added that the loading and unloading service management system and human resource competencies contribute greatly to the satisfaction of port service customers.

Thus, it can be concluded that improving the quality of loading and unloading services at PT Pelindo TPK Pantoloan will have a direct positive impact on the level of customer satisfaction. The practical implication of these findings is the need to increase port operational capacity, such as modernization of loading and unloading equipment, human resource training, and the use of integrated information systems. These efforts will not only increase customer satisfaction, but also strengthen TPK Pantoloan's strategic position as a reliable and competitive regional logistics distribution center in the Central Sulawesi region.

The results of this study provide important managerial implications for PT Pelindo Terminal Petikemas (TPK) Pantoloan in order to improve the quality of loading and unloading services to encourage customer satisfaction. Management needs to focus on strengthening aspects of service reliability, such as the timeliness and accuracy of the loading and unloading process, through standardization of operational procedures and routine evaluations of field performance. In addition, it is important for companies to improve responsiveness to customer needs by providing prompt information services, an effective complaint system, and responsive communication between field officers and service users. The development of human resource competencies must also be a priority through technical training and regular customer service, so that all officers have professional skills and work attitudes. In addition, the use of information technology such as container digital tracking systems and online-based reporting needs to be optimized to create transparent, fast, and efficient services. These measures will strengthen customer confidence and support TPK Pantoloan's strategic position as a flagship container port in the Central Sulawesi region.

Based on the results of regression analysis which showed a coefficient value of 0.301 with a significance level of 0.003, it can be concluded that the quality of loading and unloading services has a

significant and positive effect on customer satisfaction at PT Pelindo Terminal Petikemas (TPK) Pantoloan, Palu. These findings are in line with theories about service quality and customer satisfaction and are reinforced by the results of previous research. Quality, timely, and responsive loading and unloading services are proven to increase the satisfaction of port service users. Therefore, continuous improvement of the service system, human resource competence, and technology utilization is a strategic step that needs to be taken by the management of PT Pelindo TPK Pantoloan to maintain customer trust and strengthen the company's competitiveness in the national logistics industry.

The availability of human resources to customer satisfaction.

The results of the regression analysis showed that the availability of human resources (HR) had a significant effect on customer satisfaction, with a coefficient value of 0.212 and a significance level of 0.017. This coefficient value indicates that every one unit increase in HR availability will increase customer satisfaction by 0.212 units. Since the significance value is less than 0.05, this effect is statistically significant. This means that the availability of adequate human resources at PT Pelindo TPK Pantoloan has a real impact on the level of satisfaction of service users.

Theoretically, these results are in line with the concept of Service Quality from Parasuraman et al. (1988), which emphasize that one of the main keys to service quality is the availability of sufficient, competent, and ready human resources to serve customers. In service-based services such as port loading and unloading, an adequate number of personnel and their ability to respond quickly and appropriately to customer needs greatly determine the satisfaction of service users. In addition, the theory of customer satisfaction according to Oliver (1997) states that customers will feel satisfied if the service received is in accordance with expectations, where the availability of sufficient labor and ready to serve is one of the main expectations in port operational services.

In the context of PT Pelindo TPK Pantoloan, Palu as one of the strategic container ports in the Central Sulawesi region, the availability of reliable and sufficient human resources is a vital aspect in supporting smooth operations. This port serves the loading and unloading process with high intensity and limited time. Therefore, labor shortages can lead to delays, ship queues, and decreased service efficiency, which ultimately impacts decreased customer satisfaction. On the other hand, the availability of human resources that are in accordance with the workload allows the operational process to run smoothly, on time, and be able to meet the expectations of service users.

These results are also reinforced by various previous studies in the past five years. Research by Putra & Yuliana (2021) shows that the availability and competence of human resources has a significant impact on the satisfaction of port service customers in eastern Indonesia. Handayani and Yusuf (2020) also stated that the shortage of operational labor causes service delays and decreases customer satisfaction in the logistics sector. Rahmawati and Rudianto (2019) added that in the public service sector, the adequacy of personnel is highly correlated with the speed and accuracy of service perceived by customers. Furthermore, a study by Siregar & Hutagalung (2022) emphasizes that in the world of ports, strengthening the structure and adequate number of human resources plays an important role in ensuring quality services. Finally, Nasution and Wulandari (2023) prove that in regional-scale ports, the main factor that determines smooth operations and customer satisfaction is the balance between the number of human resources and the volume of daily workload.

Thus, the results of this study confirm that the existence of adequate human resources is not only an operational need, but also one of the key indicators in shaping a positive customer experience. PT Pelindo TPK Pantoloan is expected to continue to monitor and adjust the ratio of labor to field workload, as well as ensure that the available personnel are truly prepared, trained, and competent in carrying out their duties. This effort is important to maintain reliable loading and unloading service performance and encourage long-term customer satisfaction and loyalty.

The findings of this study provide important managerial implications for PT Pelindo TPK Pantoloan to ensure the availability of sufficient human resources (HR) to support the operation of loading and unloading services. Management needs to carry out proper HR planning based on daily workload projections and service demand trends, so that there is no shortage of manpower that can hinder service efficiency. In addition, it is important to develop a balanced work rotation and task division system so that each work unit can operate optimally. Not only about quantity, the quality of human resources must also be a major concern, so periodic training programs are needed to improve technical competence and customer service capabilities. Increased availability of human resources accompanied by increased individual capacity will create a responsive, efficient, and professional work environment. Management is also advised to build a continuous monitoring and evaluation system for human resource needs, so that adjustments can be made quickly and accurately according to the operational dynamics of the port. These steps will support the improvement of service quality and strengthen customer satisfaction and trust in TPK Pantoloan.

Based on the results of regression analysis which showed a coefficient value of 0.212 and a significance level of 0.017, it can be concluded that the availability of human resources has a significant and

positive influence on customer satisfaction at PT Pelindo Terminal Petikemas (TPK) Pantoloan, Palu. This indicates that the more adequate the availability of labor involved in loading and unloading operations, the higher the level of satisfaction of port service users. These findings strengthen the theories of service and are supported by various previous research results, which place the adequacy and readiness of human resources as one of the key factors in forming quality services. Therefore, the management of PT Pelindo TPK Pantoloan needs to pay serious attention to strategic and sustainable planning and management of human resources, in order to ensure the smooth service process, improve operational efficiency, and encourage consistent customer satisfaction.

Operational efficiency to customer satisfaction.

Operational efficiency is one of the critical aspects in improving customer satisfaction, especially in the logistics and port services industry which relies heavily on the speed and timeliness of services. At PT Pelindo Terminal Petikemas (TPK) Pantoloan, operational efficiency includes a series of activities ranging from scheduling ship arrivals, loading and unloading processes, heavy equipment management, to integrated administration. The results of the study show that operational efficiency has a positive and significant effect on customer satisfaction with a regression coefficient of 0.229 and a significance value of 0.006, which indicates that increasing efficiency will have a real impact on service user satisfaction.

High operational efficiency means that the service process runs smoothly without significant obstacles, so that ship waiting times are shorter, errors in goods management are reduced, and the use of resources—both human and equipment—is optimized. This is especially important in the context of container ports such as TPK Pantoloan, where delays in loading and unloading can cause a domino effect in the form of increased logistics costs, economic losses to customers, and the potential for loss of customer confidence.

According to Kotler & Keller (2016), customer satisfaction does not only depend on the quality of the services provided but also on the consistency and speed of the service. High operational efficiency reduces uncertainty and improves service reliability, so customers feel confident and satisfied. This theory is supported by the concept of Service Quality Parasuraman et al. (1988) which emphasizes the importance of responsiveness and reliability in shaping customers' positive perception of service quality.

In practice, operational efficiency at PT Pelindo TPK Pantoloan can be achieved by utilizing information technology, such as the Terminal Operating System (TOS) system that allows real-time monitoring of the flow of goods and ship schedules. The application of this technology helps to minimize administrative errors and optimize the use of heavy equipment, so that the loading and unloading process can be carried out in a shorter time and at lower costs. In addition, good human resource management, continuous training, and coordination between work units are the main supporting factors so that the operational process runs smoothly.

Research by Iskandar & Lestari (2020) reinforces these findings by showing that operational efficiency at ports significantly affects customer loyalty and satisfaction. Another study by Wijayanti & Suryanto (2019) also emphasizes that port customers pay close attention to the speed and accuracy of service, which is a direct indicator of operational efficiency. In addition, Rahman & Utami (2021) found a strong correlation between operational efficiency and customer satisfaction index in eastern Indonesian ports, particularly in loading and unloading management.

Furthermore, good operational efficiency at regional ports such as TPK Pantoloan is very strategic to increase competitiveness at the national and regional levels. With increased efficiency, ports can serve more ships and volumes of goods without the need to significantly increase physical capacity. This is in line with the efforts of the government and port managers to support the smooth flow of logistics and distribution of goods, which has a positive impact on regional economic growth.

Thus, operational efficiency is not only an important internal factor, but also a key bridge in building long-term relationships with customers through continuous improvement in satisfaction.

This result provides strategic implications for the management of PT Pelindo TPK Pantoloan to make operational efficiency the main focus in improving customer satisfaction. Management needs to thoroughly evaluate operational workflows to identify critical points that are causing inefficiencies, such as ship wait times, administrative processes, or machine readiness. The use of integrated information technology systems, such as terminal operating systems (TOS), is highly recommended to speed up the service process.

In addition, management can develop key performance indicators (KPIs) that measure efficiency in each operational unit. Regular training of operational staff is also important to improve speed, accuracy, and cross-functional cooperation. Optimizing work shifts, preventive equipment maintenance, and strengthening communication between departments will encourage sustainable efficiency. The implementation of these measures is expected to reduce operational costs, speed up service times, and ultimately increase customer satisfaction and loyalty to port services.

Based on the results of the analysis, it can be concluded that operational efficiency has a positive and significant effect on customer satisfaction at PT Pelindo Terminal Petikemas (TPK) Pantoloan, Palu. Operational efficiency, which is characterized by minimal obstacles, speed of service, and optimal resource

management, is able to increase customers' positive perception of service quality. Therefore, companies need to prioritize efficiency improvement as part of their service improvement strategy, in order to strengthen the trust and satisfaction of port service users.

The Influence of Information Technology on Customer Satisfaction

The positive and significant influence of information technology on customer satisfaction, as shown by the value of a regression coefficient of 0.268 and a significance of 0.002, shows that organizational activities in utilizing information technology have an important role in creating a satisfactory customer experience. At PT. Port of Indonesia (Persero) or Pelindo Container Terminal (TPK) Pantoloan Palu, information technology is not only an administrative tool, but has become an integral part of the port's service and operational process. Organizational activities such as container loading and unloading management, cargo tracking, digital document processing, and service reservation systems are now carried out through technology-based information systems designed to provide speed, accuracy, and transparency to service users.

The use of information technology in organizational activities is in line with the theory of the Resource-Based View (Barney, 1991), which states that an organization's competitive advantage can be obtained from valuable, scarce, non-replicable, and irreplaceable resources, one of which is a superior information technology system. In the context of Pelindo TPK Pantoloan, an integrated and real-time information system is a strategic resource that not only improves the internal efficiency of the organization, but also improves the quality of interaction with customers, such as ease of access to services and clarity of operational information.

These findings are also consistent with the results of research by Sari and Prabowo (2021), which found that service organizations that actively use information technology in their operational activities experienced a significant increase in customer satisfaction. Likewise, a study by Putra et al. (2020), which emphasized that the digitization of business processes in the port sector increases customer perception of service quality, especially in terms of speed and reliability of information. Research by Handayani and Wibowo (2019) shows that the use of information technology in organizational activities, such as electronic-based logistics systems, has a direct impact on service efficiency and increases customer trust in institutions.

In addition, the use of information technology in Pelindo's organizational activities also reflects the application of Government to Business (G2B) principles in public services which increasingly emphasize transparency, ease of service, and system integration, as studied in a study by Prasetyo and Ramadhani (2022). When organizational activities are automated and integrated through information technology, customers experience immediate benefits in the form of faster service times, reduced transactional costs, and certainty of service, all of which contribute to higher levels of satisfaction.

Thus, the integration of information technology into organizational activities at Pelindo TPK Pantoloan is a strategic factor that not only increases internal efficiency, but also has a positive impact on customer perception and experience. Pelindo's digital transformation measures are an organizational response to the demands of the industry 4.0 era, which places technology as the main driver of service excellence and customer satisfaction.

The results of the study that show the positive and significant influence of information technology on customer satisfaction have several important implications for the management of PT. Port of Indonesia (Persero) or Pelindo Container Terminal (TPK) Pantoloan Palu. First, management needs to prioritize the development and maintenance of a reliable, integrated, and user-friendly information technology system to support every customer service activity. This includes a real-time container tracking system, document digitization, as well as the provision of an information dashboard that is easily accessible to customers. Second, it is necessary to conduct training and strengthen digital competencies for human resources in order to operate and develop information technology systems optimally. Third, management needs to use customer feedback as evaluation material to develop information technology features that are more adaptive to customer needs. Finally, information technology investment should be directed not only to internal efficiency, but also to create added value and competitive advantage that is directly felt by customers.

Based on the results of the study which showed a regression value of 0.268 with a significance of 0.002, it can be concluded that information technology has a positive and significant influence on customer satisfaction at Pelindo TPK Pantoloan Palu. These findings are supported by the theories of Expectation Confirmation and Resource-Based View, and are reinforced by various empirical studies over the past five years that emphasize the importance of digitalization in improving service quality. The use of information technology in organizational activities such as the digitization of loading and unloading processes, container tracking, and document services has been proven to increase the speed, accuracy, and certainty of services, leading to increased customer satisfaction. Therefore, strengthening information technology systems and sustainable digital transformation must be a managerial priority strategy to increase competitiveness and customer loyalty in the current era of global competition.

The quality of loading and unloading services, the availability of human resources, operational efficiency, and information technology to customer satisfaction simultaneously

The results of the F test showed a value of 103.022 with a significance of 0.000, which means that simultaneously the quality of loading and unloading services, the availability of human resources, operational efficiency, and information technology have a very significant influence on customer satisfaction at PT Pelindo Terminal Petikemas (TPK) Pantoloan. A determination coefficient (R^2) of 0.848 showed that 84.8% of the variation in customer satisfaction could be explained by these four variables, while the rest were influenced by other factors outside the study model.

In the context of service and customer satisfaction theory, the SERVQUAL model developed by Parasuraman et al. (1988) emphasizes the importance of service quality in meeting customer expectations to achieve satisfaction. The quality of loading and unloading services is a major factor in the port industry, as this process greatly determines the speed, safety, and accuracy of shipping goods. Research by Wijayanti and Suryanto (2019) corroborates that good service quality contributes directly to increasing port customer satisfaction.

Furthermore, the availability of competent human resources is also the key to the success of the service. According to Armstrong (2014), quality human resources are not only able to carry out operational tasks effectively but also play a spearhead in creating a positive customer experience. Recent research by Iskandar & Lestari (2020) shows that the availability and quality of human resources are directly proportional to the level of customer satisfaction in the logistics services industry.

Operational efficiencies, which include time, cost, and resource optimization, significantly support fast and reliable service. Operations management theory (Heizer & Render, 2014) states that efficiency is a key element to reduce waste and increase productivity, which ultimately has a positive impact on customer satisfaction. Rahman & Utami (2021) also found that operational efficiency in Indonesian ports significantly improves customer satisfaction through accelerating the loading and unloading process and reducing errors.

Information technology is a strategic support that enables the integration and automation of operational processes. Terminal Operating System (TOS) and other digital applications make it easier to manage the flow of goods and internal and external communication. According to Laudon & Laudon (2016), the right IT implementation is able to improve the efficiency and accuracy of services, thereby improving customer experience and satisfaction. Research by Putra et al. (2022) shows that the use of information technology in port management contributes significantly to increasing customer satisfaction through more transparent and fast services.

These four variables interact with each other to form a strong synergy in increasing customer satisfaction. PT Pelindo TPK Pantoloan as a strategic port in Central Sulawesi needs to continue to pay attention to and optimize these factors to face competition and meet increasingly high customer expectations.

The management of PT Pelindo TPK Pantoloan must prioritize strengthening the quality of loading and unloading services through intensive human resources training and maintenance of port equipment and infrastructure. Employee competency development needs to be carried out on an ongoing basis so that human resources are able to operate the latest technology and carry out operational procedures efficiently.

Operational efficiency must be maintained through optimal resource management and the implementation of a standardized work system supported by the latest information technology. Investment in information technology needs to be continuously increased to ensure seamless process integration and real-time monitoring so that responses to customer needs are faster and more accurate.

In addition, management must encourage effective communication between divisions and the use of analytical data to improve valid and up-to-date information-based decision-making. Increasing synergy between service quality, human resources, operational efficiency, and information technology will strengthen the port's competitiveness and build customer loyalty.

The quality of loading and unloading services, the availability of human resources, operational efficiency, and information technology simultaneously have a positive and significant effect on customer satisfaction at PT Pelindo Terminal Petikemas (TPK) Pantoloan, Palu, Central Sulawesi. These four variables explain 84.8% variation in customer satisfaction, indicating the importance of integration and synergy of internal factors to create superior port services and meet customer expectations.

Differences in Previous Research Results and Novelty of This Research Result

This study has several significant differences when compared to the results of previous studies that discuss factors that affect customer satisfaction in the port and logistics services sector. Most previous studies tend to analyze variables partially, such as focusing only on service quality (Wijayanti & Suryanto, 2019) or the influence of information technology separately (Putra et al., 2022). In contrast, this study simultaneously integrates four important variables, namely the quality of loading and unloading services, the availability of human resources, operational efficiency, and information technology. This simultaneous approach provides a more comprehensive picture of how the four factors interact with each other and together affect customer satisfaction, adding depth of understanding compared to previous studies.

In addition, this research also has novelty in terms of the context of the location, namely PT Pelindo Terminal Petikemas (TPK) Pantoloan in Palu, Central Sulawesi. The focus on strategic ports in eastern Indonesia makes a new empirical contribution, considering that most of the previous literature has researched more ports on the island of Java or Sumatra. Thus, the results of this study also enrich the treasure of port management studies in regions that have unique characteristics geographically and operationally.

In terms of methodology, this study also showed better model strength with a determination coefficient value (R^2) of 0.848. This value is much higher than some previous studies, which suggests that this research model is able to explain the variability of customer satisfaction significantly better. This shows the validity and relevance of the model in the context of PT Pelindo TPK Pantoloan.

Another novelty is the emphasis on synergy between the company's internal factors, especially the integration between information technology and human resources and operational efficiency. In the era of increasingly growing digitalization, information technology not only serves as a support, but becomes a core element that directly affects customer performance and satisfaction. This research makes a new contribution to understanding how digital transformation in ports can synergize with human factors and processes to create superior and satisfying services.

Overall, the study makes a theoretical and practical contribution by expanding the scope of variables, adding regional contexts that have not been extensively researched, and validating simultaneous models that are able to explain customer satisfaction more comprehensively in the container port sector.

CONCLUSION

The quality of loading and unloading services, the availability of human resources, operational efficiency, and information technology simultaneously have a significant effect on customer satisfaction at PT Pelindo TPK Pantoloan. This shows that these four factors work together to improve customer satisfaction, so it is not enough to just focus on one aspect.

The research model shows a high level of clarity with a coefficient of determination (R^2) of 0.848, which means that 84.8% of the variation in customer satisfaction can be explained by these four variables. This means that this model is highly effective in predicting customer satisfaction based on a combination of the variables studied.

The quality of loading and unloading services is a major factor that contributes to customer satisfaction, considering the importance of speed and safety in the loading and unloading process. The speed and accuracy of loading and unloading services affect customer perception of the professionalism and reliability of the port.

The availability of competent and efficient human resources plays an important role in supporting port operations and improving service quality. Human resources who are trained and have good technical skills can carry out operational processes optimally so as to minimize errors and delays.

The optimal use of information technology increases the efficiency and accuracy of services, as well as strengthens the synergy between human resources and operational processes. Technology helps in real-time data management and facilitates coordination, making services more transparent and responsive.

SUGGESTION

The management of PT Pelindo TPK Pantoloan needs to continue to improve the quality of loading and unloading services through routine training and equipment maintenance to maintain operational standards. Regular training will keep employees ready and up to date on the latest procedures, while well-maintained equipment reduces the risk of breakdowns and delays.

Human resource development should be a priority, with a focus on improving technical competence and communication skills to support work efficiency. Improving HR competencies will minimize operational errors and increase positive interactions with customers.

Improvements and oversight of operational efficiency must be carried out on an ongoing basis to reduce waste of time and resources. An efficient process can save costs and speed up service, ultimately improving customer satisfaction.

Investment in information technology needs to be increased so that the port operational management system is more integrated, real-time, and responsive to customer needs. The use of advanced technology will support faster and more accurate decision-making, as well as make it easier for customers to obtain service information.

Management must promote a culture of effective communication and collaboration between divisions so that synergy between service quality, human resources, efficiency, and technology can be realized optimally. Good communication between teams will speed up problem solving and improve operational coordination so that services are smoother and more consistent.

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