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Enhancing Customer Satisfaction at NPCT1 Ports: EDI Application Mediated by User-Perceived Usefulness

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Abstract: The use of Electronic Data Interchange (EDI) has increased the role of technology in business, particularly in complex operations like port management, where it streamlines the exchange of information. Implementing EDI in ports is crucial for enhancing customer satisfaction. This study examines how port users' perceptions of technology mediate the relationship between EDI and customer satisfaction. This study, conducted at NPCT1 port with 120 EDI service users, aims to assess how implementing electronic data interchange affects customer satisfaction and perceived usefulness. The study uses the Partial Least Square (PLS) method and data gathered from a survey questionnaire. The study found that the implementation of EDI, perceived usefulness, and customer satisfaction had a significant and positive impact. However, the EDI implementation variable negatively and insignificantly affected customer satisfaction. Additionally, EDI implementation variables positively and significantly influenced perceived usefulness, while perceived usefulness variables had a positive and significant impact on customer satisfaction.
Keywords: *Electronic Data Interchange, Customer Satisfaction, Perceived Usefullness, Container Terminal, Efficient, Effectiveness*

1. Introduction

Traffic flows in and out of Indonesia have been increasing due to the faster growth of its industrial and trade sectors compared to previous years(Nender et al., n.d.). A port is a geographic area comprising land, sea, and surrounding regions, with delineated boundaries used for government and service functions (Gian Fikri et al., n.d.). The role of a port in servicing ships is supported not only by the existence of port infrastructure but also by the presence of port components that provide reliable port services and satisfy customers. (Tania et al., n.d.). EDI, or Electronic Data Interchange, is a valuable tool for sharing data in electronic commercial transactions. Its implementation can greatly enhance company operations. Although, a drawback of EDI is that it requires a significant investment due to its highly precise and closed installation process. The internet has allowed for the development of EDI over the internet and the introduction of Open EDI, a cost-saving solution utilizing internet technology (Suryani et al., n.d.).

The use of EDI in Indonesian ports is changing the process of information exchange. Port stakeholders such as importers, exporters, cargo agents, and port authorities can exchange data more quickly, securely, and effectively with EDI (Mylonopoulos et al., n.d.). This has improved transaction accuracy, provided more complete information, and shortened the time taken for import and export (Kopczewski et al., 2020). A port plays a vital role in the growth of Indonesian industry as it facilitates the smooth flow of imports and exports in accordance with international standards and regulations (Afandi et al., n.d.). However, it is important to remember that customers at the port are not only large companies; They also include small importers, exporters, cargo agents, and others. Customer satisfaction from these various groups is essential to maintain and enhance the competitiveness of Indonesian ports in an

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increasingly competitive global market (Lim & Palvia, 2001). The perceived usability of port service users is an important factor in the relationship between EDI implementation and customer satisfaction. The role of a port in servicing ships is supported not only by the existence of port infrastructure but also by the presence of port components that provide reliable port services and satisfy customers . Perceived Usability is the user's belief that the adoption of this technology will increase the efficiency and effectiveness of their operations at ports. However, careful research is needed to understand the overall impact of EDI on customer satisfaction. In-depth studies should be conducted to see how the interaction between EDI, Perceived Usefulness, and customer satisfaction affects the needs and preferences of various customers. It is very important to look at other aspects that might affect customer satisfaction at the port (Adi R Tita et al., 2019).

Indonesia has tremendous potential to enhance port services efficiency and quality by utilizing technologies like EDI. In this regard, conducting comprehensive research on the impact of EDI implementation on customer satisfaction, with perceived usefulness as an intermediary, is highly significant and advantageous for the Indonesian port industry. This study aims to comprehend the role of EDI implementation on customer satisfaction, which is affected by perceived usability.

2. Literature review

The main topic of our discussion was the role of EDI implementation in customer satisfaction. The study focuses on the role of EDI implementation in increasing customer satisfaction, with particular analysis of its correlation with perceived usefulness as the mediating variable. The use of technical terms is consistent and explained when necessary to ensure clear and concise text. The section is organized into three subsections, with each presenting the procedures of generating hypotheses based on a particular variable. The initial section involves implementing EDI; the subsequent section investigates perceived usefulness; the final section examines customer satisfaction.

The previous research that the researchers described was a study conducted by Hicham Amine & Abdelouahab Mesnaoui (2018) in their Journal entitled "Electronic Data Interchange (EDI) in the supply chain: impact on customer satisfaction.", in his journal using the same variable X as the researcher, namely EDI Implementation and Variable Y, namely Customer Satisfaction, but there are differences with the research that the researcher will make, namely on variable Z which does not use variable Perceived Usefulness as Mediator. In his journal concluded that One of the important steps in achieving customer satisfaction is implementing EDI. IT organizations must immediately create an action plan for the transition. However, to ensure smooth implementation and excellent results to achieve high customer satisfaction, this transition requires special attention and guidance throughout the supply chain. We can find every business's EDI needs and push them. We also inform employees about the important role these technologies play in operations (Amine & Mesnaoui, 2018a).

Electronic Data Interchange

By enabling faster, reliable, and efficient data exchange among companies, EDI can improve and improve the results of trading services. This impacts the time it takes for a manufacturer or retailer to receive a product from the moment a customer's order is placed (Sumah et al., 2020). As data is shared electronically, customer satisfaction increases as EDI saves time. Three direct effects of EDI systems on the quality of organizational communication: faster transmission; increased accuracy; and more complete transaction information (Bienstock & Royne, 2010). EDI implementation at ports can be more efficient and fictitious than before EDI, human error can be reduced and processes can run faster. This can increase customer

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satisfaction, especially if they experience delays or errors in the process before using EDI (Amine & Mesnaoui, 2018a). According to Dearing (1990) There are three types of EDI benefits: direct, indirect, and strategic. The immediate benefit comes from the fact that data can be transferred electronically from one application to another without relying on other changes in the company's business practices. For example, the receiving company saves on double-checking costs, the shipping company saves on postage, and both companies benefit from fewer errors and lower human handling costs (Dearing, 1990).

H_1: EDI Implementation variables directly affect Customer Satisfaction

The business of customers or service users will experience changes when companies or customers start using EDI. Perceived Usefulness can be improved through smooth and effective implementation. Users will find that this technology makes work easier, more efficient, and more accurate(L.lacovou et al., 1995).

H_2: EDI Implementation variables directly affect Perceived Usefulness

Perceived Usefulness

Some previous research on electronic data exchange (EDI) suggests that the benefits that can be felt and the associated costs are important factors in the decision to use EDI. Cost-benefit analysis is considered an important step that organizations must take when it comes to choosing innovations. This applies to both structured and unstructured innovations (Chau Patrick Y K &; Jim C.F. Cathy, 2002). According to Alalwan (2016) Perceived Usefulness is defined as a person's belief that using certain technologies or innovations will improve user performance (Alalwan et al., 2016). Chawla & Joshi (2019) also define as the belief that using certain technologies will improve user performance. Perceived usefulness is defined by previous researchers in some of the summaries above as users' perception of the capabilities of the technology they use. (Chawla & Joshi, 2019)The perception of usability is often associated with increased productivity. Customers may be more satisfied if they believe that the use of technology or services will make them more productive (Ivan Naufaldi &; Miharni Tjokrosaputro, 2020). Products or services that shorten their work or save time tend to be perceived as more useful by customers, thus increasing satisfaction (Wilson et al., 2021).

H_3: The variable Perceived Usefulness directly affects Customer Satisfaction.

Customer Satisfaction

Customer satisfaction is the positive feelings, judgments, and emotions that customers have about using a product or service when expectations or expectations can be achieved or even when customers achieve more than they expected. In other words, the customer will feel satisfied if what he gets is greater than he expected, and vice versa if what he gets is equal or less than he expected (Setiawan &; Septiani, 2018). To know if a business has met the needs and preferences of its customers well, customer satisfaction is crucial. Meeting customer needs is the main goal of every company, and it serves as the key to maintaining the survival of the company. Providing services that meet customer expectations can also increase a company's competitiveness in a competitive market (Morkunas &; Rudiene, 2020). EDI implementation has a very crucial role in achieving optimal customer satisfaction. Companies in the field of Information Technology (IT) are required to continuously adapt to the necessary changes, which require an urgent action plan. However, this step must be done with extra care and specific instructions within the supply chain, to ensure successful implementation and positive outcomes. The goal is to achieve a high level of customer satisfaction through successful results from proper EDI implementation (Amine &; Mesnaoui, 2018).

H_4: EDI Implementation variables through perceived usefullness mediation variables affect Customer Satisfaction

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Conceptual Model

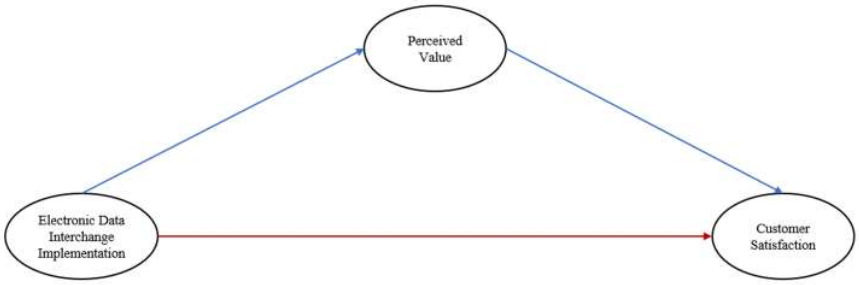

Fig. 1. Research model

The above model can be explained that Customer Satisfaction (Y) is influenced by the Implementation of Electronic Data Interchange (X). The effect of Implementation Electronic Data Interchange (X), does not directly affect Customer Satisfaction (Y), but through *intervening variables*, thus Electronic Data Interchange (X) will first form Perceived Value (Z), then the Perceived Value (Z) variable affects Customer Satisfaction (Y).

3. Research method

This type of research is quantitative research. The data used in this study were primary data obtained from questionnaires distributed to respondents. A target population is a set of observation units or objects that have the information the researcher needs. The population in this study is all users of the ECON platform at New Port Container Terminal 1. This study selected samples by following the Hair formula as a guide in its determination (Hair et al., 2014). Because the population is not yet known and suggested that the sample size is 5 to 10 times the indicator of the variable. In this study, researchers used a sample size of 7 so that the number of indicators was 16 pieces multiplied by 7 (16 x 7 = 112 ➔ 120). So, based on these calculations, the sample to be used is 120 people.

Regarding the profile of respondents in this study which amounted to 120 respondents, as many as 70 were men while 50 were women. The majority of respondents aged 17-25 years were 57 respondents. D3/S1 educational background dominated with 81 respondents. As for the frequency of making TILA/Gatepass, the majority is 1-2 times a month. Researchers then analyzed the data that had been successfully collected using the Structural Equation Model (SEM) approach based on Partial Least Square (PLS). PLS is a structural equation model (SEM) based on components or variants. Structural Equation Model (SEM) is one field of statistical study that can test a series of relationships that are relatively difficult to measure simultaneously. The data will be analyzed using a statistical model, namely *structural equation modeling (SEM*) with a *Partial Least Square (PLS)* approach using *SmartPLS Software* version 3.3.3

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4. Results and discussion

Outer Model

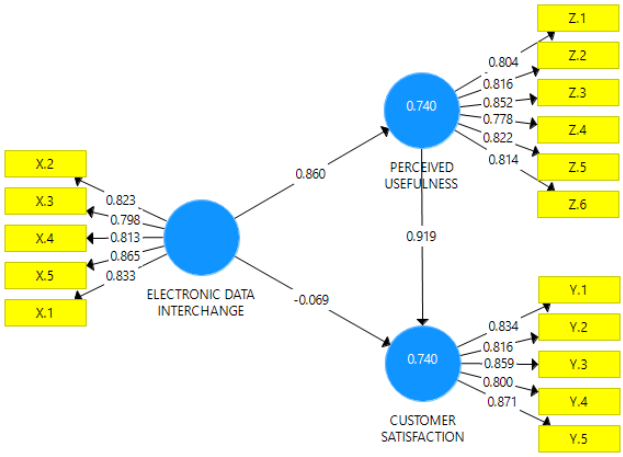

Fig. 2. Outer Model
Source : research data processed using SmartPLS 3.3.3 Software in 2023

Outer loadings and Convergent Validity (AVE) indicators

The validity indicator can be measured using the outer loading score, if the outer loading value is more than 0.70 (>0.70) then the indicator can be used. The Average Variance Extracted (AVE) value that meets the minimum criteria is greater than 0.50 (>0.50). If in the test there is an outer loading value below 0.70, the indicator can still be used provided that the minimum loading value is greater than 0.40 (Loading >40) and the AVE value is more than 0.50 (AVE >0.5) so that the variable can be said to be valid. If it is less than 0.40 then it should be omitted in the model(Joseph F Hair et al., 2017, p. 137).

Latent Variables	Indicators	Loading (>0.70)	AVE(>0.5)
Electronic Data Interchange	X.1	0.833	0.684
	X.2	0.823	
	X.3	0.798	
	X.4	0.813	
	X.5	0.865	
Customer Satisfaction	Y.1	0.834	0.700
	Y.2	0.816	
	Y.3	0.859	
	Y.4	0.800	
	Y.5	0.871	

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Perceived Usefulness	Z.1	0.804	0.663
	Z.2	0.816	
	Z.3	0.852	
	Z.4	0.778	
	Z.5	0.822	
	Z.6	0.814	

Table 1. Outer loadings and Convergent Validity (AVE) indicators
Source : Research data processed using SmartPLS 3.3.3 software in 2023

Based on the table above, the following information can be known:

- The entire loading factor value is above 0.60.
- The Average Variance Extracted (AVE) value of all variables is greater than 0.50.
- Based on the calculation of the loading factor value and Average Variance Extracted (AVE), all variables and indicators have met the validity criteria and can proceed to further testing.

Discriminant Validity

Discriminant validity occurs when two different instruments that measure two constructs that are predicted to be uncorrelated produce a score that is indeed uncorrelated. The discriminant validity of the reflective model is evaluated through cross loading and then compared the AVE value with the square of the correlation value between constructs / comparing the square root of AVE with the correlation between constructs. The measure of cross loading is to compare the correlation of the indicator with other block constructs. If the correlation between an indicator and its construct is higher than the correlation with other blocks, it shows that the construct predicts the size of their block better than other blocks. Another measure of discriminant validity is that the root value of AVE must be higher than the correlation between constructs and other constructs or the value of AVE higher than the square of the correlation between constructs (Joseph F Hair et al., 2017, p. 253).

Cross loading

Cross-loading is another method to find out discriminant validity, namely by looking at the value of cross loading. If the loading value of each item against its construct is greater than the value of cross loading.

Construct Variables	Latent Variables		
	Customer Satisfaction	Electronic Data Interchange	Perceived Usefulness
X.1	0.535	**0.833**	0.721
X.2	0.587	**0.823**	0.693
X.3	0.595	**0.798**	0.711
X.4	0.659	**0.813**	0.717

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X.5	0.600	**0.865**	0.712
Y.1	**0.834**	0.577	0.729
Y.2	**0.816**	0.617	0.697
Y.3	**0.859**	0.604	0.718
Y.4	**0.800**	0.574	0.684
Y.5	**0.871**	0.644	0.764
Z.1	0.661	0.667	**0.804**
Z.2	0.699	0.678	**0.816**
Z.3	0.798	0.767	**0.852**
Z.4	0.672	0.643	**0.778**
Z.5	0.709	0.736	**0.822**
Z.6	0.649	0.704	**0.814**

Table 2. Cross loading table Construct variables
Source : Research data processed using SmartPLS 3.3.3 software in 2022

Based on the Cross loading table of the construct variables above, the following information can be known:

- The loading value of each construct variable against the late variable as a whole is higher when compared to the loading value of the other latent variables marked with numbers with bold characters.

Based on these results, it can be decided that all research construct variables have met the criteria for discriminant validity and there are no symptoms of multicholeniaritity

Inner Model

Coefficient of determination (R^2)

The coefficient of determination is used to measure the accuracy of predictions (estimations). In general, an R2 value of 0.75 is considered to have a large estimation accuracy, an R2 of 0.50 has a medium accuracy estimation, and an R2 value of 0.25 has a low estimating accuracy. The result of the value of the coefficient of determination can be found in the following table(Joseph F Hair et al., 2017, p. 211).

Latent Variables	R Square	R Square Adjusted
Customer Satisfaction	0.740	0.736
Perceived Usefulness	0.740	0.738

Table 3. Coefficient of Determination (R2)
Source : Research data processed using SmartPLS 3.3.3 software in 2023

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Based on the table above, the following information can be known:

- R 2 Customer Satisfaction model estimation accuracy 0.740. Based on this value has a high accuracy estimation. In other words, Electronic Data Interchange and Perceived Usefulness affect 74.0% while the remaining 26.0% is influenced by other factors outside the research model.
- estimation accuracy of model R^2 Perceived Usefulness 0.740. Based on this value has a high accuracy estimation. In other words, Electronic Data Interchange affects 74.0% while the remaining 26.0% is influenced by other factors outside the research model.

Predictive relevance (Q2)

In addition to evaluating the magnitude of the R2 value as a criterion for prediction accuracy, researchers can use the Stone-Geisser Q2 value. Q2 values are obtained using the blidfolding procedure. As a relative measurement of predictive relevance, a value of 0.02 is considered to have little predictive relevance, 0.15 has moderate predictive relevance, and 0.35 has great predictive relevance(Joseph F Hair et al., 2017, p. 212).

Latent Variables	SSO	SSE	Q^2 (=1-SSE/SSO)
Customer Satisfaction	600	322.294	0.463
Electronic Data Interchange	600	600	
Perceived Usefulness	720	431.17	0.401

Table 4. Predictive relevance (Q2)
Source : Research data processed using SmartPLS 3.3.3 software in 2023

Based on the test results in the table above, information can be obtained as follows:

- The Q2 value of predictive relevance for the constructive model of the Customer Satisfaction variable is influenced by Electronic Data Interchange and Perceived Usefulness of 0.463 and is classified as having great predictive relevance.
- The Q2 value of predictive relevance for constructive models of the Perceived Usefulness variable is influenced by Electronic Data Interchange by 0.401 and is classified as having great predictive relevance.

Efect size (f2)

As to evaluate the R2 value of all endogenous variables using f^2. The difference between f2 and R2 is that f2 is more specific to each exogenous variable. In general, a value of 0.02 is considered to have a small affect size, 0.15 has a medium affect size and 0.35 has a large affect size (Joseph F Hair et al., 2017, p. 211). Here is a table of f^2

Latent Variables	Customer Satisfaction	Perceived Usefulness
Electronic Data Interchange	0.005	2.847
Perceived Usefulness	0.845	

Table 5. Affect Size F2 Value
Source : Research data processed using SmartPLS 3.3.3 software in 2023

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Based on the test results in the table above, information can be obtained as follows:

- The value of F2 affect size for the constructive model The Electronic Data Interchange variable affects the Customer Satisfaction variable by 0.005 and is classified as having a Small estimation value.
- F value ^{2} affect size for constructive model Electronic Data Interchange variable affects the Perceived Usefulness variable by 2.847 and is classified as having a large estimation value.
- The value of F2 affect size for the constructive model The variable Perceived Usefulness affects the variable Customer Satisfaction by 0.845 and is classified as having a large estimation value.

Test the hypothesis

Coefficient analysis of structural models is used to test hyposis by knowing which relationships have a significant effect. If the p-value < a (0.05) then the relationship is significant, otherwise if the p-value > a (0.05) then the relationship is not significant(Joseph F Hair et al., 2017, p. 216).

Hypothesis	Path Coefficient	Original Sample (O)	T Statistics (|O/STDEV|)	P Values	Information
H1	Electronic Data Interchange -> Customer Satisfaction	-0.069	0.563	0.573	rejected
H2	Electronic Data Interchange -> Perceived Usefulness	0.860	24.510	0.000	Accepted
H3	Perceived Usefulness -> Customer Satisfaction	0.919	8.555	0.000	Accepted

Table 6. Test the hypothesis of direct influence of the Research model
Source : Research data processed using SmartPLS 3.3.3 software in 2023

Based on the table above, the following information can be known:

- Electronic Data Interchange -> Customer Satisfaction has an Original Sample (O) value of -0.069 and P Values of 0.573 greater than 0.05. Based on this value, it can be known that there is an insignificant negative influence. Then **H1 is rejected** and H0 is accepted.
- Electronic Data Interchange -> Perceived Usefulness has an Original Sample (O) value of 0.860 and a P Value of 0.000 smaller than 0.05. Based on this value, it can be known that there is a significant positive influence. Then **H2 is accepted** and H0 is rejected.
- Perceived Usefulness -> Customer Satisfaction has an Original Sample (O) value of 0.919 and P Values of 0.000 less than 0.05. Based on this value, it can be known that there is a significant positive influence. Then **H3 is accepted** and H0 is rejected.

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Hypothesis	Path Coefficient	Original Sample (O)	T Statistics (|O/STDEV|)	P Values	Information
H4	Electronic Data Interchange -> Perceived Usefulness-> Customer Satisfaction	0.790	7.504	0.000	Accepted

Table 7. Test the Hypothesis of Indirect Influence Research Model
Source : Research data processed using SmartPLS 3.3.3 software in 2023

Based on the table above, the following information can be known:

- Electronic Data Interchange -> Perceived usefulness -> Customer Satisfaction has an Original Sample (O) value of 0.790 and P Values of 0.000 smaller than 0.05. Based on this value, it can be known that there is a significant positive influence. Then **H4 is accepted** and H0 is rejected.

5. Conclusion

The study found many important things about the effect of Electronic Data Interchange (EDI) on customer satisfaction and the role of perceived usefulness as a mediation variable. Here are the main results of the study:
Effect of EDI on Customer Satisfaction: The results showed that the effect of direct EDI on customer satisfaction was not significant. That is, the level of customer satisfaction is not directly influenced by the application of EDI in the process of exchanging business information at NPCT1 port.
Effect of EDI on Perceived Usefulness: This study shows that there is a significant and positive effect of EDI on Perceived Usefulness. This suggests that users will see the benefits of EDI in terms of speed and efficiency of business information exchange at NPCT1 ports.
The Effect of Perceived Usefulness on Customer Satisfaction: The results also show that Perceived Usefulness has a good and significant effect on customer satisfaction. In other words, when the use of EDI is considered beneficial, the level of user satisfaction increases.
This study emphasizes the importance of user perception of the benefits of EDI (Perceived Usefulness) as a mediating factor that links EDI with customer satisfaction. There is a significant positive effect on customer satisfaction if a combination of these three components EDI, Usability Viewed, and Customer Satisfaction is performed.
The research found that implementing EDI at NPCT1 ports can significantly improve customer satisfaction, mainly due to the role of Perceived Usefulness as an intermediary. Therefore, business practitioners and port managers must consider how important it is to inform users about the benefits of this technology if they want to continuously improve customer satisfaction.

6. Implications

Indonesian ports can improve the efficiency of their operations by implementing effective EDI. This can result in faster, more efficient, and more accurate service to customers. Customers will feel more satisfied because using EDI can speed up processes such as shipping, handling cargo, and administering documents. It is important to ensure that customers feel significant benefits from using EDI, as this may include more than they expected. If port services are deemed beneficial, customers are likely to be satisfied and prefer to use them. Ports can increase customer loyalty by providing a better experience through the implementation of EDI. Customers who are satisfied and see the benefits of this technology

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will be more likely to use the port service again. This will help the port retain its customers and reduce churn, meaning customers switch to competing services. Ports that can implement EDI well can achieve a competitive advantage in the market by offering more efficient and quality services to their customers, which can attract new customers and keep old customers. This will help the port win the competition in the industry. In addition, there are technical issues associated with implementing EDI. The port must ensure that the EDI system is secure and operating properly. Training of customers and port staff on the use of this technology is also very important. The port must be ready to address technical issues and support customers. It's important to constantly track and evaluate how effective EDI is and how it impacts customer satisfaction. Corrective action should be taken proactively when there is a problem or opportunity for improvement. Governments and regulatory agencies may need to create regulations that support EDI at ports. This could include interoperability rules, data security standards, and incentives to encourage ports to use these technologies. Indonesian ports must have a mature EDI implementation strategy to address these implications. This strategy should include sound planning, investment in technology infrastructure, training, and a commitment to providing superior customer service. In this way, ports can increase customer satisfaction and become more competitive in an increasingly global market.

7. Research limitations

Limited Research Time: The study collected data in two weeks. In this short span of time, users may not notice any change or difference in their views over time. Other Variables Not Discussed: This study only addresses how EDI, Perceived Usefulness, and Customer Satisfaction impact customers. Price, product quality, and customer service are some additional factors that can affect customer satisfaction, which were not addressed in this study. Subjective Measurement: The assessment of customer satisfaction, perceived usability, and other elements in the study is based on user opinions. This can cause the data to contain subjective bias. Other Aspects of EDI Implementation: This study does not examine the technical aspects of EDI implementation thoroughly, but rather focuses on the effect of EDI on customer satisfaction. When interpreting research findings and applying the results to the wider world of business or management, it is important to consider these limits. These boundaries can also serve as the basis for more in-depth research on the topic.

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