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# Logistics digitalization on import document activities: Electronic delivery orders and service quality in maritime ports

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**A B S T R A C T**

Significant changes have occurred in the business world, with one of the most notable being the transformation of technology into digitalization. An example of this digitalization in the logistics sector is the implementation of electronic delivery orders (E-DO), aimed at enhancing convenience and efficiency in logistics activities. The objective of this research was to analyze the extent of influence that electronic delivery orders, logistics digitalization, and logistics service quality exerted on import document activities at Semarang port. Additionally, this study aimed to examine the role of logistics service quality as a mediating variable in the relationship between E-DO and logistics digitalization concerning import document activities. The research employed quantitative research methods, with a sample of 173 individuals selected through random sampling techniques, primarily comprising employees working in the logistics operations division and the export and import documentation division of shipping companies located in Semarang port. Data were collected through a questionnaire utilizing a Likert scale ranging from 1 to 7. Subsequently, the data were analyzed using SmartPLS 4 software to determine the relationships between variables. The findings of this research revealed that Electronic Delivery Orders (E-DO) had a significant influence on the quality of logistics services, although E-DO did not significantly impact import document activities. Furthermore, logistics digitalization was found to significantly enhance the quality of logistics services but did not exert a noteworthy influence on import document activities. The quality of logistics services was identified as having a significant effect on import document activities. Additionally, logistics service quality was recognized as a mediating factor in the relationship between electronic delivery orders and logistics digitalization concerning import document activities, with a substantial influence.



## 1. Introduction

Major changes have swept through the business world, with one of the most significant being the shift towards digitalization from traditional technology (Mugge et al., 2020). One example of digitalization implementation that has received great attention is Electronic Delivery Order or what is often called E-DO in the logistics business in various delivery companies (Lopes et al., 2022). The main aim of implementing E-DO is to bring convenience and efficiency to logistics activities, especially in shipping companies, so that the process becomes more effective and efficient. One important aspect of implementing E-DO is the effort to minimize the time required in the logistics process. In the midst of this revolution, time has become a key factor in business competition. Apart from that, the implementation of E-DO also aims to streamline and

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speed up the process of import document activities in logistics services. This is an important step to remove administrative barriers that often slow down the shipping and delivery of goods (Kayikci, 2018; Jović et al., 2022). With E-DO, import document management can be done more efficiently, reducing the risk of human error, and increasing data integrity. Thus, E-DO is an innovative step in the logistics industry that not only changes the way we operate but also optimizes time and resources. The implementation of this technology has opened the door for shipping companies to move towards greater effectiveness and efficiency in providing logistics services, making modern logistics better prepared to face increasingly stringent business demands (Winkelhaus & Grosse, 2020; Hofmann et al., 2019).

Iman et al. (2022) revealed a significant evidence about the potential impact of digitalization in the shipping industry. These findings provide new insights into how digitalization can change the overall industrial landscape, including potentially major changes in the way business is done. Meanwhile, Jović et al. (2022) underscore the changes occurring in business models in the maritime sector as a result of the impact of digitalization. Organizations in this sector are beginning to identify additional sources of revenue through increased resources, new opportunities in distribution channels, and expanded sales services. This shows that digitalization is not only changing operational processes, but also driving significant changes in the way companies plan and manage business models. The importance of digital transformation in the container shipping industry was emphasized by Yuen et al. (2022), who explain that with growing trade volumes and increasingly stringent regulations, companies must follow new trends in this industry by adopting digital technology. Although digital technology offers many benefits in the maritime transportation rental business, there are still a number of legal obstacles that need to be overcome. This reflects the complexity of the regulatory and legal framework that this industry must face in adopting digital technology (Plomaritou & Jeropoulos, 2022). Ricardianto et al. (2023) highlights the positive contribution of implementing electronic delivery orders in speeding up the flow of imported documents and goods to ports. However, the research also identified barriers faced by delivery companies in adopting these technologies, showing that digital transformation does not always go smoothly.

The use of digital technology in the logistics business has become a solution to many problems. Helmke (2022) emphasizes that the technology industry can replace outdated business models. However, in the context of digital innovation such as Electronic Delivery Order (E-DO) to facilitate goods handling at ports, improvements are still needed in the E-DO program through the existing system. Singh et al. (2022) emphasizes the importance of measuring the quality of logistics services and its relationship with performance measurement in this industry. Meanwhile, Jamkhaneh et al. (2022) provides valuable guidance for companies in efforts to improve the quality of their logistics services to overcome challenges in traditional supply chains and logistics. Akıl & Ungan (2022) revealed that certain dimensions of logistics service quality have a positive impact on customer loyalty, which is conveyed through customer satisfaction. Although most customers are considered satisfied with the high level of logistics service, logistics companies must also consider environmental uncertainty when designing strategies to continuously improve the quality of logistics services (Indrasari et al., 2022). Thus, the success of modern logistics businesses increasingly depends on the intelligent use of digital technology and continuous improvement in the quality of logistics services to meet market changes and existing challenges. The aim of this research is to analyze how much influence electronic delivery orders (E-DO), logistics digitalization and logistics service quality have on import document activities. Apart from that, this research will also try to place logistics service quality as a variable that mediates the relationship between E-DO and logistics digitalization on import document activities.

## 2. Literature Review

### *2.1. Electronic Delivery Order (E-DO), Logistics Service Quality and Import Document Activities*

Electronic Delivery Order (E-DO) is an electronic document that replaces the physical version of the Delivery Order (DO) in the logistics and goods delivery process. Carr & Ramezani (2022) Electronic Delivery Order (E-DO) is an order for the delivery of goods or cargo. Sultra et al. (2020) Online Delivery Order (DO) is a form of delivery order from a shipping company made by the expedition company in electronic form. This document is used in the freight forwarding and logistics industry to provide instructions to logistics service providers, related parties, or consignees regarding the delivery of goods that have arrived at a particular port or logistics facility. E-DO contains information such as type of goods, quantity, origin, destination, parties involved, and other special instructions relevant to the delivery of goods (Kuo et al., 2022). The use of E-DO aims to automate and simplify administrative processes in the supply chain, reduce paper use, and speed up the processing of goods delivery. It also allows relevant parties to access shipping information quickly and efficiently via digital platforms, which can improve visibility and coordination in the supply chain (Tijan et al., 2021).

Electronic Delivery Order is one of the innovations that has emerged in the context of digitizing logistics and goods delivery. Implementing E-DO in imported goods delivery services is an important step in efforts to increase the speed and smoothness of the process of sending goods out of the port. E-DO eliminates reliance on physical warrants or paper documents (Plomaritou & Jeropoulos, 2022). By replacing it with an electronic version, the administrative process becomes faster and more efficient. E-DO also allows better coordination between various parties involved in the process of sending imported goods (Yuen et al., 2022). In addition, E-DO can optimize the overall logistics process. The information available through E-DO can be used for better planning and monitoring related to the delivery of imported goods. Speed and smooth delivery of imported goods is

very important in a competitive business environment. By implementing E-DO, ports and shipping companies can speed up processes, reduce administrative costs, and provide more effective services to customers (Raza et al., 2023).

The implementation of E-DO influences the quality of logistics services to become better. The process of sending and receiving imported goods is carried out electronically via E-DO, this can increase efficiency and accuracy in logistics (Selvaduray et al., 2022; Jović et al., 2022). These improvements can include reduced administrative errors, better visibility into shipment status, and reduced time required for processing. In addition, by improving logistics processes through E-DO, companies can stimulate the growth of import document activities more effectively (Fruth & Teuteberg, 2017; Heikkilä et al., 2022). Faster and smoother document import processes as a result of improvements in logistics. Within the framework of this research, it is important to measure and analyze the direct influence of E-DO on logistics service quality and on import document activities. Therefore, this research proposes the following hypothesis:

**Hypothesis 1:** *Implementation of Electronic Delivery Order (E-DO) has a significant influence on logistics service quality.*
**Hypothesis 2:** *Implementation of Electronic Delivery Order (E-DO) has a significant influence on import document activities.*

### *2.2. Logistics Digitalization, Logistics Service Quality and Import Document Activities*

Digitalization is the process of changing data, information, or business processes from physical or analog form into digital format. Cherian & Arun (2021) digitalization explains how to work by utilizing information and communication-based tools and practices. It involves the use of computer technology and software to record, store, manage, and access information electronically. Digitalization plays an important role in changing many aspects of modern life. This allows information to be accessed, shared and managed more efficiently. Meanwhile, what is meant by logistics digitalization is the application of digital technology in logistics management, operations and processes to increase efficiency, visibility and effectiveness in the supply chain. Kayikci (2018), the concept of logistics digitalization enables transparency over time from supplier to customer. Shilin et al. (2021) stated that using online digital platforms can be done using web technology in a distributed network. This includes the use of software, hardware, sensors, internet communications, and various other technologies to automate, monitor, and manage logistics processes.

The main goal of logistics digitalization is to optimize logistics operations, reduce costs, improve customer service, and meet challenges in an increasingly connected and rapidly changing business world. Many companies are making strategic changes, such as business consolidation, process integration, and investing in digitalization to overcome their problems (Van Veldhoven & Vanthienen, 2022). Logistics digitalization has a very important role in the context of the logistics and shipping industry. One of the main benefits of this digitalization is supply chain optimization. In addition, digitalization also increases operational efficiency by automating many routine tasks, reducing human errors, and increasing transparency and communication between business units and partners in the supply chain (Heilig et al., 2017). Better security, regulatory compliance and risk management are also important benefits, while digitalization also supports environmental sustainability efforts by reducing environmental impacts resulting from logistics and shipping operations (Lambrou et al., 2017; Muggeet al., 2020).

By automating logistics processes and using digital technology, logistics companies can optimize inventory monitoring, plan more efficient delivery routes, and better communicate with all parties involved in the supply chain. This results in more timely and accurate deliveries and will improve the quality of logistics services (Shilin et al., 2021). Meanwhile, in terms of import document activities, logistics digitalization also plays a key role in improving processes that contribute to increasing productivity and customer satisfaction. Logistics digitalization is changing the way logistics businesses are run by providing greater efficiency, higher accuracy, and better transparency (Sultra et al., 2020; Cherian & Arun, 2021). This creates an environment that supports better delivery, higher quality of service and more efficient import document management in the logistics and shipping industry. Thus, the next hypothesis proposed in this research is as follows:

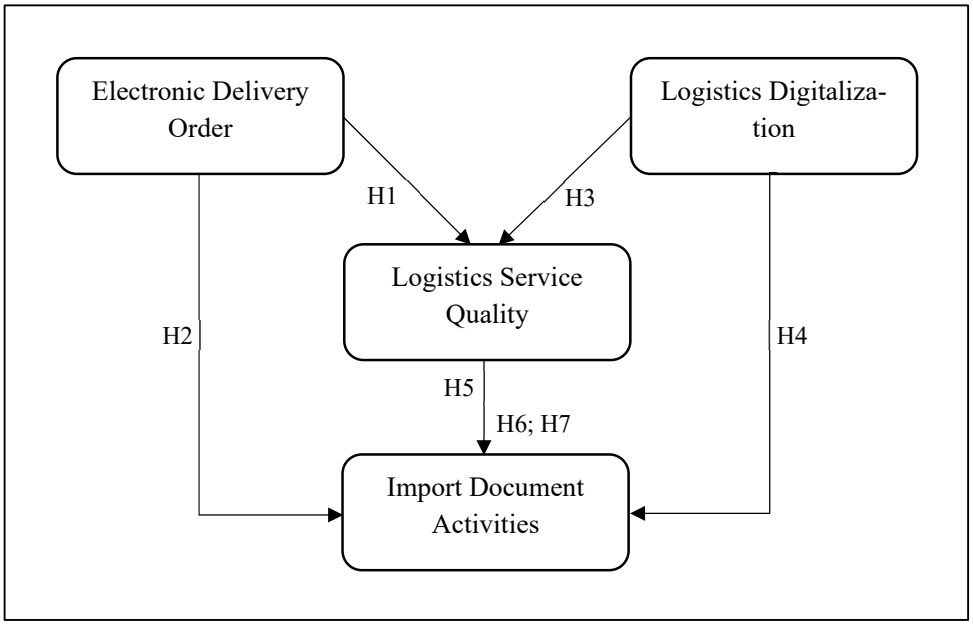
**Hypothesis 3:** *Logistics digitalization has a significant influence on logistics service quality.*
**Hypothesis 4:** *Logistics digitalization has a significant influence on import document activities.*

### *2.3. Logistics Service Quality on Import Document Activities*

Service quality is a measure or assessment of the extent to which a service or experience meets or exceeds customer expectations, needs and expectations. Service quality includes various aspects such as reliability, responsiveness, ability to meet customer needs, effective communication, and conformity to certain standards or specifications (Huma et al., 2020). Service quality is often seen from the customer's perspective. In business and the service industry, achieving a high level of service quality is a key goal for achieving long-term success. In the logistics industry, service quality is an important parameter that measures the extent to which logistics companies can meet and exceed customer expectations in various aspects of the logistics services offered (Chen et al., 2023). High service quality in logistics has a very significant impact, including increasing customer satisfaction, building a positive reputation, and increasing operational efficiency. Customer trust gained through good service quality helps logistics companies retain customers and compete in a competitive market (Heikkilä et al., 2022; Ricardianto et al., 2023). In an industry often governed by detail and timeliness, a focus on service quality is a key

element in achieving competitive advantage and long-term success. In an integrated supply chain, good logistics services can streamline import document activities. This helps companies and parties involved in imports to save time, resources and reduce the risk of errors (Gupta et al., 2021). Thus, logistics service quality is an important element in supporting smooth and efficient import document activities in the logistics industry. Therefore, the following hypothesis is proposed in this research:

**Hypothesis 5:** *Logistics service quality has a significant influence on import document activities.*
**Hypothesis 6:** *Logistics service quality mediates the relationship between E-DO and import document activities.*
**Hypothesis 7:** *Logistics service quality mediates the relationship between logistics digitalization and import document activities.*




Source: Ricardianto et al., 2023

**Fig. 1.** Conceptual Framework

## 3. Research Methodology

The research method used in this research uses quantitative methods. The sample used was selected using random sampling techniques and focused on employees who worked in the logistics operations division and export and import documentation division at shipping companies located in Semarang port. In collecting data, this study used a questionnaire with a Likert scale, which has a rating range from 1 to 7 points, describing the respondent's level of agreement or disagreement with the statements in the questionnaire. A total of 240 questionnaires were distributed to respondents, but after the data filtering process, the number of questionnaires that could be analyzed further was 173 questionnaires. This research uses Structural Equation Modeling (SEM) by adopting the conceptual framework from previous research conducted by Ricardianto et al. (2023). This model includes three main independent variables, namely electronic delivery order (E-DO), logistics digitalization, and logistics service quality. Interestingly, logistics service quality is also used as a mediating variable in this research. The dependent variable in this research is import document activities. The data that has been collected is then analyzed using SmartPLS 4 software. This analysis was carried out to identify and measure the influence between variables. This research is expected to provide deeper insight into how the implementation of electronic delivery orders, digitalization of logistics, and the quality of logistics services influence import document activities in the context of shipping companies.

## 4. Result

This research adopts structural equation modeling (SEM) with SmartPLS 4 software as a tool for analyzing data. In the initial stage of analysis, obtaining standard factor loading values is focused because it is the basis for measuring the construct or questions in the questionnaire used to measure latent variables. This research follows general recommendations which suggest a minimum limit of standard factor loading values of 0.6 as a sign of adequate quality. This means that if there is a certain construct that has a standard factor loading value below this limit, the recommended step is to remove the construct from the analysis or consider replacing the construct with other more adequate questions or variables in the questionnaire. This approach allows research to focus on constructs that have a stronger contribution to the analytical model and produces more credible and reliable results. Furthermore, data validity and reliability testing was carried out with the aim of finding out whether the research data met the requirements in terms of validity and reliability. The validity test is used to measure the validity of the questionnaire, namely the extent to which the questionnaire or questions in the questionnaire can measure or

reveal exactly what is meant by the latent variable. Validity is an important aspect in scientific research, because it ensures that the measurement tool (questionnaire) actually measures what it is supposed to measure. The validity of the questionnaire can be seen from the Average variance extracted (AVE) value obtained which is more than 0.6. Meanwhile, the reliability test is used to measure questionnaires which are indicators of latent variables. A questionnaire is said to be reliable if the respondent's answers to the questionnaire statements are consistent or stable. This can be proven by looking at the Cronbach Alpha value obtained which is more than 0.6 or it can also be seen from the Composite Reliability value which is more than 0.7. The Research Framework in this research data analysis test can be seen in Fig. 2 below:

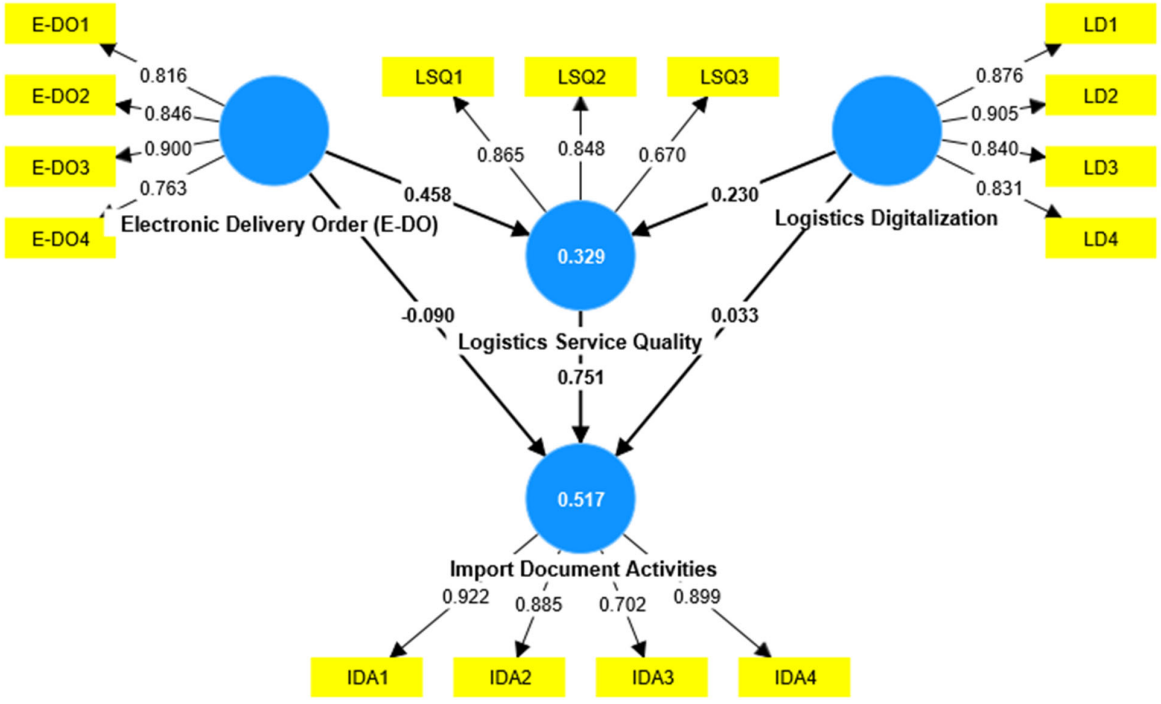



**Fig. 2.** Research Framework

The results of the first analysis test show that the construct representing the electronic delivery order variable obtained a standard factor loading value of 0.816; 0.846; 0.900; 0.763. None of the values obtained are less than 0.6, which means that the construction used is reliable. Furthermore, measuring the construct on the logistics digitalization variable obtained a standard factor loading value of 0.876; 0.905; 0.840; 0.831. The constructs that measure the logistics digitalization variable are also reliable with none of the values obtained being below 0.6. The construct used to measure the logistics service quality variable is also reliable with the value obtained being 0.865; 0.848; 0.670. Furthermore, the construct representing the import document activities variable obtained a standard factor loading value of 0.922; 0.885; 0.702; 0.899 which can be interpreted as meaning that the construct in the import document activities variable is reliable. More detailed standard loading factor analysis test results can be seen in Table 1 below:

**Table 1**
Standard Loading Factor

| Latent Variables | Construct | Std. Loading Factor |
|---|---|---|
| Electronic Delivery Order | E-DO1 | 0.816 |
| | E-DO2 | 0.846 |
| | E-DO3 | 0.900 |
| | E-DO4 | 0.763 |
| Logistics Digitalization | LD1 | 0.876 |
| | LD2 | 0.905 |
| | LD3 | 0.840 |
| | LD4 | 0.831 |
| Logistics Service Quality | LSQ1 | 0.865 |
| | LSQ2 | 0.848 |
| | LSQ3 | 0.670 |
| Import Document Activities | IDA1 | 0.922 |
| | IDA2 | 0.885 |
| | IDA3 | 0.702 |
| | IDA4 | 0.899 |

The validity test in measuring the level of validity of the questionnaire used in measuring the electronic delivery order variable obtained an Average variance extracted (AVE) value of 0.693. Furthermore, the logistics digitalization variable obtained an AVE value of 0.745, logistics service quality of 0.639 and import document activities of 0.734. The AVE value obtained from all latent variables in this research is above 0.6, which means that all the constructs used are valid. Furthermore, the reliability test on the electronic delivery order variable obtained a Cronbach's alpha value of 0.854 and a Composite Reliability value of 0.900. Furthermore, the Cronbach's alpha and Composite Reliability values obtained for the logistics digitalization variable were 0.886; 0.895, logistics service quality of 0.709; 0.705, import document activities of 0.876; 0.895. The Cronbach's alpha value obtained from all variables is above 0.6 and the Composite Reliability value obtained from all variables is above 0.7. This shows that the questionnaire used to measure the latent variables in this research is reliable and reliable. The results of the research validity and reliability tests can be seen in Table 2 below:

**Table 2**
Validity and reliability tests

| Latent Variables | Cronbach's alpha | Composite Reliability | Average Variance Extracted (AVE) |
|---|---|---|---|
| Electronic Delivery Order | 0.854 | 0.894 | 0.693 |
| Logistics Digitalization | 0.886 | 0.895 | 0.745 |
| Logistics Service Quality | 0.709 | 0.705 | 0.639 |
| Import Document Activities | 0.876 | 0.895 | 0.734 |

Therefore, to find out how high the level of fit/goodness of the model used in this research is to test the influence between variables, it can be seen from the NFI value obtained from the model fit test. The closer the NFI value is to 1, it means that the model used in the research has high suitability. The model fit test results of this research obtained an NFI value of 0.733, which means the model used has a high level of suitability/goodness.

**Table 3**
Model Fit

| Index | Saturated Model | Estimated Model |
|---|---|---|
| SRMR | 0.110 | 0.110 |
| d_ULS | 1.439 | 1.439 |
| d_G | 0.519 | 0.519 |
| Chi-square | 266.813 | 266.813 |
| NFI | 0.733 | 0.733 |

A further analytical test used to determine the significance of the influence or relationship between variables is to carry out hypothesis testing. In this research there are a total of 7 (seven) hypotheses, of which there are 5 (five) direct influence hypotheses and 2 (two) mediation hypotheses. The hypothesis can be accepted and said to be significant by obtaining a T statistic value of more than 1.96 or it can also be seen from the P value obtained which is less than 0.05.

**Table 4**
Hypothesis testing

| Hypothesis | | T Statistics | P Values | Information |
|---|---|---|---|---|
| H1 | Electronic Delivery Order → Logistics Service Quality | 6.481 | 0.000 | Significant |
| H2 | Electronic Delivery Order → Import Document Activities | 1.132 | 0.259 | Not Significant |
| H3 | Logistics Digitalization → Logistics Service Quality | 3.403 | 0.001 | Significant |
| H4 | Logistics Digitalization → Import Document Activities | 0.394 | 0.694 | Not Significant |
| H5 | Logistics Service Quality → Import Document Activities | 13.798 | 0.000 | Significant |
| H6 | Electronic Delivery Order → Logistics Service Quality → Import Document Activities | 5.891 | 0.000 | Significant |
| H7 | Logistics Digitalization → Logistics Service Quality → Import Document Activities | 3.37 | 0.001 | Significant |

The first hypothesis of this research obtained a T statistical value of 6.481 (> 1.96) and a p-value of 0.000 (< 0.05) which indicates that there is a significant influence from the relationship between electronic delivery orders on logistics service quality. The results of this study support previous research by Jamkhaneh et al. (2022). However, in testing the second hypothesis of this research, the direct influence of electronic delivery orders on import document activities does not have a significant effect. This is indicated by the T statistic value obtained which is 1.132 (should be > 1.96) and the p-value obtained is 0.259 (should be < 0.05). Thus, these results reject the research of Ricardianto et al. (2023) which found a positive contribution from the implementation of electronic delivery orders in speeding up the flow of documents and imported goods to ports. However, testing the third hypothesis on the influence of logistics digitalization on logistics service quality obtained a T statistic value of 3.403 and a p-value of 0.001. The values obtained indicate that the third hypothesis in this study has a significant influence. Meanwhile, the fourth hypothesis which measures the influence of logistics digitalization on import document activities obtains a T statistic value of 0.394 and a p-value of 0.694. With this value, it means that logistics digitalization on import document activities does not have a significant influence. The results of this research support Akıl & Ungan (2022) who revealed that certain dimensions of logistics service quality have a positive impact on customer loyalty and are in line with research by Indrasari et al. (2022) who revealed that logistics companies must also consider many things when designing strategies to continuously improve service quality.

The results of the fifth hypothesis test show that the relationship between logistics service quality and import document activities has a significant influence. This is proven by the T statistics value obtained at 13,798 with a p-value of 0.000. The results of testing the fifth hypothesis in this study are in line with the research of Singh et al. (2022) which emphasizes the importance of measuring the quality of logistics services and its relationship with performance measurement. Furthermore, the sixth and seventh hypotheses of this research which use the logistics service quality variable as a mediating variable both have a significant influence. Whereas in the sixth hypothesis, logistics service quality mediates the relationship between electronic delivery orders and import document activities, proven by a T statistic value of 5.891 and a p-value of 0.000. Meanwhile, the seventh hypothesis states that there is a significant influence of the logistics service quality variable in mediating the relationship between logistics digitalization and import document activities, proven by the T statistic value obtained which is 3.37 and p-value 0.001. This shows that logistics service quality is a suitable variable when used as a mediating variable that bridges these variables.

## 5. Conclusion

The results of this research produce a number of very important conclusions in the context of document import activities in logistics services. First, Electronic Delivery Order (E-DO) is proven to have a significant influence on the quality of logistics services. This shows that the implementation of E-DO in the logistics process can contribute positively to increasing the quality of logistics services. However, interestingly, the test in this study E-DO did not have a significant influence on import document activity. Furthermore, logistics digitalization also has a significant influence on the quality of logistics services. This shows that the level of digitalization in logistics operations is positively related to the quality of logistics services. However, logistics digitalization in this research did not have a significant influence on import document activity. Furthermore, the quality of logistics services turns out to have a significant influence on import document activities, indicating that increasing the quality of logistics services can contribute positively to the smoothness and efficiency of import document activities, which is an important aspect in logistics operations. Apart from that, the placement of the logistics service quality variable as a mediating variable in mediating the relationship between electronic delivery orders and logistics digitalization on import document activities has a significant influence. This identifies that there is a strong and integrated relationship between Electronic Delivery Order (E-DO), logistics digitalization, quality of logistics services and import document activities. This conclusion has important implications for logistics companies, as it can help in understanding how digital technology and the quality of logistics services can influence document import activities. This can help improve the efficiency and quality of logistics services. In addition, these results also provide an important contribution to further understanding of the dynamics in the increasingly digitized logistics industry.

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