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Evaluation of the Warehouse Management System Application Using DeLone and McLean Model in North Jakarta Indonesia

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ABSTRACT

Warehouse management in the logistics sector is essential to maintain the smooth functioning of supply chain operations. This study aims to evaluate the success of the Warehouse Management System (WMS) implementation at a logistics company in North Jakarta Indonesia using the DeLone and McLean Information System Success Model. A survey method was used to collect data through questionnaires distributed to 73 employees in the logistics company North Jakarta Indonesia. The data were analyzed using inferential statistics through the Partial Least Squares (PLS) approach. The results showed that out of 9 hypotheses tested, 6 were accepted. Information Quality has a significant positive impact on Use, System Quality has a significant positive impact on both Use and User Satisfaction, Use has a significant positive impact on Net Benefits, and User Satisfaction has a significant positive impact on Net Benefits. These findings suggest that improving the quality of information and systems can enhance the use of WMS and user satisfaction, which ultimately leads to increased net benefits for the company.

1. INTRODUCTION

Efficient warehouse management in the logistics industry is crucial in ensuring a smooth supply chain. Logistics Company, as a warehouse service provider in the logistics industry, is faced with increasingly complex challenges in managing goods in its warehouse. The primary aim of supply chain management is to ensure the alignment and integration of all components and activities throughout the supply chain [1]. An efficient warehouse can allow the company to manage stock items, process orders, and meet customer needs quickly and efficiently. Warehouse management is an important aspect of the logistics and supply chain industry. Warehouses serve as critical locations in the supply chain, facilitating product consolidation aimed at lowering transportation costs, leveraging economies of scale during production or procurement, offering value-added services, and speeding response times [2]. The warehouse acts as a place for storage, distribution, and inventory control of various types of goods and products.

Warehouse efficiency in Indonesia still requires improvement, particularly in terms of optimal warehouse layout design and operations. The study highlights that warehouse attributes, such as a well-designed layout and efficient operations, have a positive impact on supply chain efficiency. A well-planned warehouse layout enhances efficiency by quickly meeting customer needs, while optimal warehouse operations play a crucial role in further improving this efficiency [3].

Many warehouses in Indonesia still use inefficient manual management systems. In fact, modern technology such as WMS can be very helpful in tracking stock, organizing storage, and speeding up the distribution process. The implementation of this technology is still uneven, so many warehouses cannot operate optimally [4].

There are several factors that lead to inefficiencies in warehouse management in Indonesia, such as high rental fees and the inefficient use of warehouse space. Inefficiency also arises from warehouse leases, which are typically arranged on an annual basis, with just 10-20% of the building's total capacity being utilized [5].

In the digital age, WMS have proven to be invaluable tools for improving efficiency and enhancing visibility across warehouse operations. These systems are essential components of modern business infrastructures, as they help streamline various processes, from inventory management to order fulfillment. WMS not only automates routine tasks but also enables businesses to track and monitor their inventory in real time, providing greater accuracy and reducing human error. By optimizing workflow, improving accuracy, and offering real-time insights, WMS significantly contributes to the overall effectiveness of warehouse management and the broader supply chain [6]. By looking at the challenges that exist in traditional warehouse management and the positive potential offered by WMS. Certain advantages of WMS encompass the reduction of inventory and labor expenses, expansion of storage capabilities, enhancement of customer service, and improvement of inventory precision [7].

A logistics company in North Jakarta Indonesia has taken a significant step forward in managing its warehouse operations

by implementing WMS to enhance efficiency and achieve greater accuracy in inventory management and warehouse processes. The WMS is employed to manage inbound, outbound, and inventory activities within the warehouse. Overall, WMS has become a crucial system in the logistics sector, helping companies improve operational efficiency, reduce costs, strengthen supply chain processes, and provide better services to customers. By understanding the usability of WMS, logistics companies can optimize warehouse management to support their growth and maintain competitiveness in an increasingly complex market.

Researchers conducted interviews with the warehouse operational team, asking about their experiences and challenges during the WMS implementation. From these interviews, several obstacles were identified, including mismatches between physical stock and WMS records, slow system performance, and the inflexibility of WMS, which made it unable to meet the specific needs of certain projects within the company.

Researchers hope that the evaluation can find which parts of the WMS system need to be improved so that the WMS system provides the expected benefits and meets business objectives. The researcher hopes to provide a deeper understanding of the extent to which the WMS has been implemented in the company and the extent to which its use has affected operational performance. The findings of this research are anticipated to offer valuable insights to logistics companies, assist in pinpointing areas for improvement, and guide more informed decisions regarding WMS, ultimately leading to enhanced efficiency and long-term success.

2. LITERATURE REVIEW

2.1 Previous studies

The study focuses on the implementation and benefits of WMS within firms, highlighting key techniques such as cross-docking, real-time inventory management, and the automation of shipping and receiving processes. WMS optimizes inventory placement, reduces manpower costs, and enhances warehouse efficiency by tracking product movements in detail, minimizing errors, and ensuring accurate inventory through automated data entry, barcode scanning, and voice picking. Cross-docking practices significantly reduce storage needs by bypassing traditional stock placement, further increasing efficiency. Additionally, WMS improves workforce management by offering an intuitive system that boosts productivity while reducing human errors and labor-intensive tasks. The flexibility provided by WMS allows businesses to respond to fluctuating demand, maintain adequate stock levels, and ensure timely and accurate deliveries through integration with carriers and real-time tracking capabilities. Ultimately, WMS enables companies to streamline warehouse operations, improve customer satisfaction, and adapt to dynamic logistics environments, contributing to better overall supply chain performance [8].

The evaluation of the WMS-Selog system in this study, based on the modified DeLone & McLean IS Success Model, highlights the significant roles of system quality, information quality, and service quality in influencing user satisfaction, system use, and job performance. The descriptive analysis categorized system quality, information quality, and use as "great" (62.50%-81.25%), while service quality and user satisfaction were rated as "very good" (81.25%-100%). Hypothesis testing revealed that system, information, and service quality positively and significantly affect the overall success of WMS-Selog, though system and information quality were not significant predictors of user satisfaction due to mandatory system use, shifting user focus to task completion rather than system features. The model showed strong predictive power, with an R-square of 0.716 for user satisfaction and 0.665 for system use, emphasizing that service quality had the most substantial influence on user satisfaction (path 0.382) and system use (path 0.438). This research underscores the importance of service quality in achieving system success, while also noting the psychological effects of mandatory system use, where users prioritize performance outcomes over informational aspects [9].

2.2 Warehouse management system

A warehouse is a physical facility or storage area designed to store, manage, and arrange goods or products within an organization or business. Warehouses serve multiple functions, such as storing inventory, overseeing supply chain operations, and supporting the distribution of goods. Warehouse activities are crucial for the successful implementation of a warehouse management system. Effective warehouse management ensures that all tasks related to warehousing are performed efficiently and effectively by the personnel working in the warehouse [10]. As shown in Figure 1 WMS is one of the systems used in warehouse management. The system directs warehouse operators to track advance shipping notifications to receive shipments and load those items into appropriate storage locations according to the system. The WMS then triggers a picking instruction to the carrier when a delivery order is placed and then allows the loading of the shipment into the delivery vehicle for delivery.

Inbound goods are the process of receiving goods from suppliers to the warehouse, which includes the activities of goods inspection, goods storage, and goods marking. Figure 2 illustrates the inbound process using WMS. Inbound logistics plays a crucial role in warehouse receiving processes and significantly affects supply chain costs and performance. Inefficiencies during the check-in process can lead to incoming trucks experiencing prolonged wait times between their arrival and the completion of check-in. This may result in avoidable expenses for the company, such as detention fees (penalties for holding the truck and driver beyond the agreed timeframe) and delays in the delivery of future shipments [11].

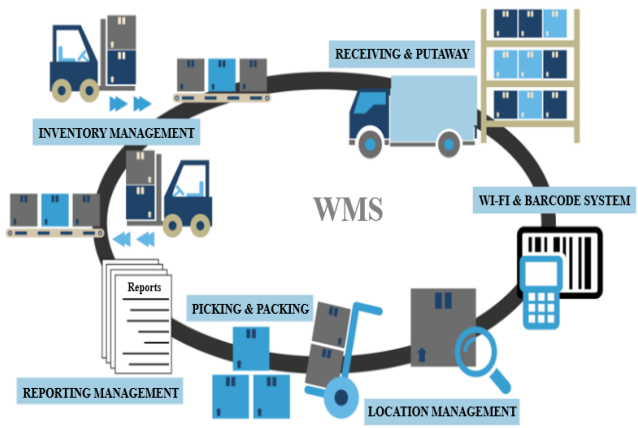

Figure 1. Warehouse management system

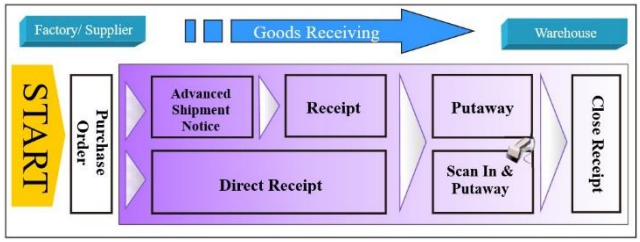

Figure 2. WMS inbound process

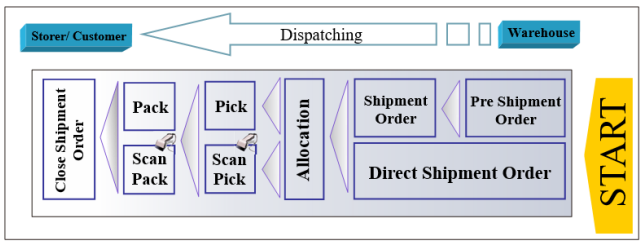

Figure 3. WMS outbound process

Outbound logistics has placed significant emphasis on the customer relationship management process, particularly in terms of last-mile delivery. Participants within the manufacturing, retail, purchasing, and marketing departments in the supply chain prioritize consumer needs, leading to an enhanced focus on outbound logistics [12]. Based on Figure 3 outbound goods are the process of sending goods from the warehouse to the customer, which includes the activities of picking, packing and marking goods.

2.3 DeLone and McLean is success model

Evaluating the system implemented in a company is a very important thing to do. From this evaluation, we can find out which parts of the company system need to be repaired, need to be upgraded, or need to be maintained. We can also find out whether the system we use significantly impacts users and the company. William H. DeLone and Ephraim R. McLean stated that 6 dimensions influence the success of an Information System (see Figure 4), namely, Information Quality, System Quality, Service Quality, Usage Intentions, User Satisfaction, and System Benefit [13].

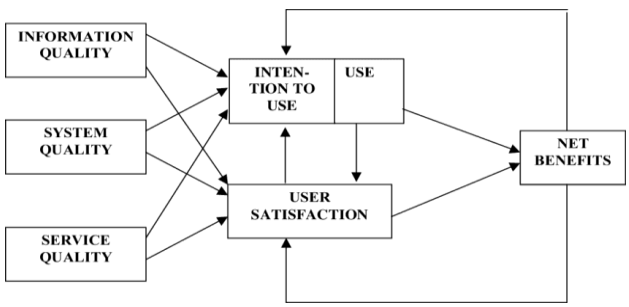

Figure 4. Updated DeLone and McLean is success model

In a study conducted on Fast-Moving Consumer Goods (FMCG) companies in Germany, effective stock management, driven by high Information Quality, leads to a smooth flow in upstream and downstream activities, reducing stock delays and improving overall supply chain performance [14]. In previous studies, System Quality plays a critical role in effective WMS implementation for Third Party Logistics (3PL) providers. High System Quality ensures that the WMS solution can support the decision-making process and provide reliable analytical reporting, especially in sustainability measures. As logistics operations become more complex with the integration of modern technologies and the demand for sustainability, the reliability, flexibility, and scalability of WMS are emphasized [15]. Service Quality in the implementation of intelligent WMS ensures that technical support, system reliability, and response times are optimized to meet operational needs. This includes regular system maintenance, training for warehouse staff, and timely responses to technical issues. A well-supported WMS allows for more seamless integration into the company's logistics processes, reducing downtime and improving overall service delivery. When system providers maintain high levels of service quality, warehouses can ensure smooth operation, leading to reduced costs, fewer errors, and enhanced competitiveness [16]. The use of WMS has a significant impact on the supply chain by improving inventory control and management. WMS enables supply chain managers to track inventory levels in real-time, reducing the risks of stockouts and overstocking. This, in turn, enhances operational efficiency and lowers storage costs. These advantages help organizations, especially in sectors like the textile industry, to boost their supply chain performance and maintain a competitive advantage [17]. Satisfaction with the Warehouse Management System (WMS) is shaped by how the warehouse layout and operations contribute to boosting efficiency, productivity, and quality in the supply chain. A well-designed WMS integration has a direct impact on inventory accuracy, which subsequently enhances job satisfaction and work efficiency [18]. Net Benefits refer to the favorable results that arise from implementing IoT in warehouse operations, especially regarding improvements in inventory accuracy, order lead times, workforce productivity, and overall return on investment (ROI). The survey identifies that IoT integration can improve these key performance areas, leading to substantial net benefits for warehouse operations. While some cost indicators, such as installation and data management costs, were initially viewed as challenges, the experts provided recommendations on how to address these costs, such as slow, phased implementation and the development of strategies to minimize data security risks [19].

2.3.1 Information quality

Organizations need to focus on delivering the right amount of information with the required quality and, most importantly, ensuring effective information sharing. High-quality information is essential for successful project management and numerous other areas [20].

2.3.2 System quality

The system quality dimension of success includes the favorable attributes of an information system (IS) and encompasses various metrics related to the system itself. These metrics generally emphasize the system's usability and performance features being assessed [21].

2.3.3 Service quality

Service quality refers to the standard of service delivered during interactions between service providers and customers. The importance of quality service has become a major concern for businesses to gain a competitive advantage in this competitive marketing era [22].

2.3.4 Use

The system considers use a key success factor, where use reflects actual behavior, while Intention to Use indicates an attitude. Use refers to the actions taken by the user in interacting with and learning the information system (IS) [23].

2.3.5 User satisfaction

System user satisfaction reflects the reactions and feedback provided by users following their interaction with the information system. It represents a subjective assessment of how much users value and enjoy the system they are utilizing [13].

2.3.6 Net benefit

Net benefits refer to the effect that the presence and use of technology have on improving user performance, both individually and at the organizational level. This includes enhancements in productivity, increased knowledge, and reduced time spent searching for information. Net benefits encompass the positive effects that technology has on user performance, improving productivity, expanding knowledge, and decreasing the time required to find information [24].

3. RESEARCH METHODS

The study adopted a quantitative approach, using both primary and secondary data. As shown in Figure 5, primary data was obtained through an online questionnaire sent to respondents. In addition to distributing questionnaires to employees, unstructured interviews were also conducted with the head of the warehousing department to analyze and identify more detailed problems regarding the warehousing system used in the Logistics Company. Secondary data was obtained from various literature such as books, journals and articles obtained from the internet, as well as other literature related to the topic discussed.

The purposive sampling technique uses certain criteria in drawing the samples used in this research. The response criteria in this research are employees of Logistics Company in the warehousing department and his work activities are directly related to WMS. The number of employees at logistics company who work in the warehousing section is 73 employees.

The research model aims to assess the implementation of WMS systems in warehouse management and examine how this technology influences different aspects of warehouse performance. Researchers will focus on various main variables identified in the modified Updated DeLone and McLean Information System Success model, namely including Information Quality, System Quality, Service Quality, Use, User Satisfaction, and Net Benefits variables [13]. Each of these variables will be analyzed to understand their contribution to the success of WMS implementation at the logistics company Logistics Company.

Based on the research model in Figure 6, the following hypotheses were formed in this study:

H1: Information Quality has a significant effect on Use.
H2: Information Quality positively influences User Satisfaction.
H3: System Quality plays a significant role in determining Use.
H4: System Quality positively impacts User Satisfaction.
H5: Service Quality significantly contributes to Use.
H6: Service Quality has a notable effect on User Satisfaction.
H7: Use significantly impacts User Satisfaction.
H8: Use positively influences Net Benefit.
H9: User Satisfaction significantly affects Net Benefit.

The score given to each answer ranges from one to five based on a Likert scale [25]. The Likert scale options for respondents' answers to the survey questions are as follows:

1). Strongly Disagree
2). Disagree
3). Neutral
4). Agree
5). Strongly Agree

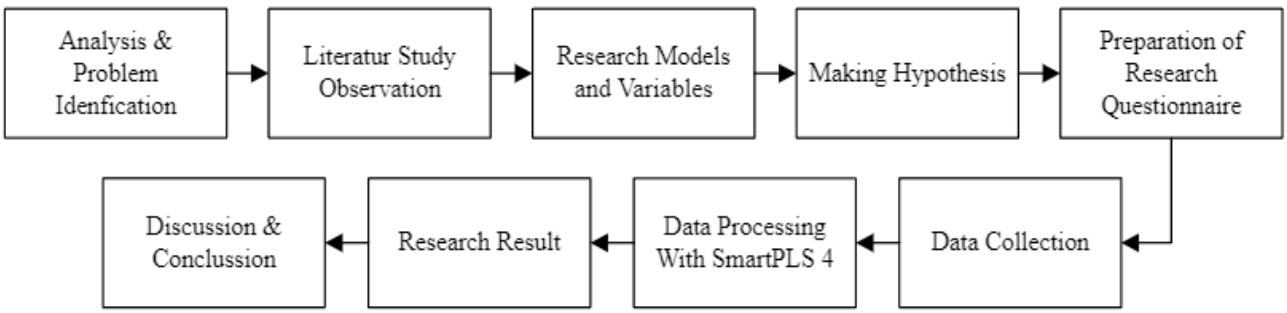

Figure 5. Research method

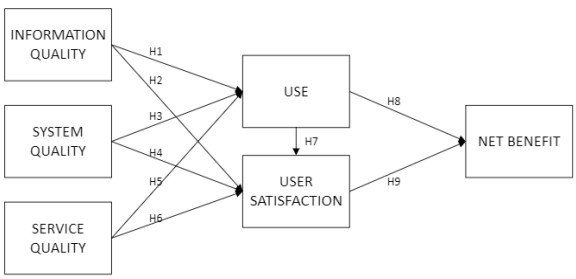

Figure 6. Research model

The detailed research indicators and corresponding questionnaire items are presented in Table 1.

The SEM-PLS method allows researchers to address and estimate complex causal relationship models with both latent and observed variables [26]. Structural equation modeling (SEM) was used to analyze the collected data. The analysis follows a two-step process: first, assessing the measurement model, and second, estimating the structural model [27]. The evaluation in the process of implementing SEM-PLS that must be followed by researchers involves detailing the outer-inner model.

Table 1. Research indicator and questionnaire

Variable	Indicators	Questionnaire	Code
Information Quality (IQ)	Accurate [28]	I get product and location information generated by WMS according to actual physical	IQ1
	Timeliness [29]	Product stock data at the location is updated in real-time when products enter or leave the warehouse	IQ2
	Understandability [30]	WMS presents warehouse data information that is easy to read and understand	IQ3
System Quality (SQ)	Ease Of Use [31]	I find it easy to use WMS	SQ1
	Response Time [32]	I can quickly search for products and locations using WMS	SQ2
	Reliability [29]	I think WMS is reliable when product transactions inbound or outbound from warehouse	SQ3
Service Quality (SERQ)	Responsive [32]	Vendors and IT are easy to contact when there is a problem with WMS	SERQ1
	Empathy [33]	I think WMS is designed with understanding the needs of work in the warehouse	SERQ2
	Assurance [33]	I feel confident that WMS maintains the confidentiality of warehouse data well	SERQ2
User Satisfaction (SAT)	Overall Satisfaction [34]	I am very satisfied with this WMS	SAT1
	Enjoyable Experience [35]	WMS provides a pleasant experience	SAT2
	Effectiveness [36]	I feel that using WMS has increased the effectiveness of work	SAT3
USE	Daily Use [37]	I always use WMS when goods transactions inbound or outbound	USE1
	Depend [38]	Warehouse transaction activities depend on WMS	USE2
Net Benefits (NB)	Speed Of Accomplishing Task [28]	I can complete work faster by using WMS	NB1
	Usefulness in Work [28]	WMS is very useful in completing work	NB2

4. RESULT

4.1 General description of respondents

There were 73 respondents in this study who were employees in the warehouse operations section at the Logistics Company. Based on position, most respondents have the position of Operation Warehouse 56% or 41 respondents, Warehouse Admin 34% or 25 respondents, Warehouse Leader 3% or 2 respondents, and Supervisor 7% or 5 respondents. Warehouse operators have a dominating number because warehousing operations require more labour than other positions. Warehouse operators at Logistics Company are divided into checkers & pickers. Both positions are responsible for checking & picking in and out of the warehouse.

Based on the length of time working at Logistics Company, less than 1 year 23% or 17 respondents, 1-2 years 52% or 38 respondents, 3-4 years 15% or 11 respondents, and more than 5 years 10% or 7 respondents. The longer one's work experience will develop skills in dealing with tasks and responsibilities at work. According to the study by Widyaningrum et al. [39], the length of employment has a significant positive effect on employee performance within the company. This means that employees with longer tenure tend to perform better in utilizing the WMS system, as their experience and familiarity with the system increase over time, leading to more efficient use and improved overall performance.

While this study engaged 73 respondents from the warehouse operations section at Logistics Company in North Jakarta Indonesia, it is crucial to recognize that this sample size is relatively small. However, despite the limited number of participants, several factors support the reliability and significance of the results obtained in this study.

First, the distribution of positions among the respondents is representative of the warehouse operational structure. This concentration reflects the essential roles of checkers and pickers in the warehousing process, whose insights are critical to understanding day-to-day operations. The perspectives of these employees provide a substantial foundation for analyzing the effectiveness of WMS, as they are directly involved in the core activities that drive operational success [40].

Additionally, statistical analyses conducted on the data collected from these respondents can provide robust evidence to support the study's conclusions. Techniques such as hypothesis testing, applied to the gathered data, can reveal significant relationships between variables even in smaller samples, if the sample is adequately powered to detect these effects.

Lastly, the results obtained from the 73 respondents offer valuable insights that can inform operational improvements and contribute to the ongoing dialogue about the effectiveness of WMS in warehouse operations. Future research could aim to replicate this study with a larger and more diverse sample to further validate these findings and explore variations across different logistics contexts.

4.2 Measurement model

4.2.1 Convergent validity test

The convergent validity is assessed through the loading factor value, if the value is >0.70 then it is declared valid. Table 2 shows that all indicators are>0.70, so all indicators are declared valid.

Table 2. Convergent validity test result

Variables	Indicator	Value	Description
Information Quality	IQ1	0.795	Valid
	IQ2	0.726	Valid
	IQ3	0.796	Valid
Net Benefit	NB1	0.910	Valid
	NB2	0.827	Valid
Satisfaction	SAT1	0.826	Valid
	SAT2	0.817	Valid
	SAT3	0.785	Valid
Service Quality	SERQ1	0.780	Valid
	SERQ2	0.826	Valid
	SERQ3	0.803	Valid
System Quality	SQ1	0.740	Valid
	SQ2	0.841	Valid
	SQ3	0.843	Valid
Use	USE1	0.835	Valid
	USE2	0.881	Valid

4.2.2 Discriminant validity test

The discriminant validity test is performed by evaluating the cross-loading values and the Fornell-Larcker criterion for each indicator. A good cross-loading value, which satisfies the discriminant validity requirement, occurs when the cross-loading value of each item is higher with the variable it is intended to measure [41]. The Fornell-Larcker criterion test for discriminant validity shows that the square root of the AVE for each construct exceeds its correlation with other constructs. The value of fornell larcker creation in Table 3 shows results that have met the test of discriminant validity, meaning that each indicator can be predicted well by each latent variable. The fornell larcker creation value is shown in Table 3.

Table 3. Fornell Larcker criterion test result

	IQ	NB	SAT	SERQ	SQ	USE
IQ	**0.773**					
NB	0.521	**0.870**				
SAT	0.484	0.580	**0.809**			
SERQ	0.530	0.389	0.358	**0.803**		
SQ	0.664	0.643	0.594	0.544	**0.809**	
USE	0.684	0.526	0.536	0.323	0.568	**0.858**

4.2.3 Reliability test

This test is conducted by evaluating both the Cronbach's Alpha and Composite Reliability values. A variable is considered reliable if the Cronbach's Alpha value >0.60, which indicates that the items within the variable consistently measure the same underlying construct. This threshold helps ensure that the data used in the analysis is dependable and that the measurement instruments are adequately capturing the intended concepts, contributing to the overall reliability of the study's findings [42]. And the Composite Reliability value >0.70 [43]. The reliability test result value is shown in Table 4.

Table 4. Reliability test result

	Cronbach's Alpha	Composite Reliability	Result
IQ	0.665	0.816	Reliable
NB	0.684	0.861	Reliable
SAT	0.737	0.851	Reliable
SERQ	0.733	0.845	Reliable
SQ	0.736	0.850	Reliable
USE	0.643	0.848	Reliable

4.3 Structural model

4.3.1 R-Square coefficient

The R2 value is used to measure the proportion of variance in the dependent variable that can be explained by changes in the independent variable. A higher R2 value indicates that a larger portion of the variation in the dependent variable is accounted for by the independent variable(s). Specifically, an R2 value of 0.67 is considered good, suggesting that a substantial amount of variability is explained. A value of 0.33 indicates a moderate level of explanation, while 0.19 is considered weak, implying that the independent variable account for only a small portion of the variation in the dependent variable. These benchmarks help interpret the strength of the relationship between the variables in the model. [19]. The r-square value is shown in Table 5.

Table 5. R-square value

	R-Square	R-Square Adjusted
NB	0.402	0.385
SAT	0.412	0.378
USE	0.500	0.478

4.3.2 Path coefficient result

The structural model further is evaluated based on t-value (T-Statistic) through the bootstrapping procedure [42]. Based on Table 6 and Figure 7 of the t-statistic test results in this study, there are only 6 accepted hypothesis lines from 9 existing hypotheses because the t-test or t-statistic value is above 1.96. While the other 3 hypotheses are rejected because the t-statistic value is below 1.96.

Table 6. T-statistics test

Hypothesis		T statistics (|O/STDEV|)	Result
H1	IQ->USE	5.266	Supported
H2	IQ->SAT	0.122	Not Supported
H3	SQ->USE	2.171	Supported
H4	SQ->SAT	3.022	Supported
H5	SERQ->USE	1.254	Not Supported
H6	SERQ->SAT	0.363	Not Supported
H7	USE->SAT	2.084	Supported
H8	USE->NB	2.391	Supported
H9	SAT->NB	3.967	Supported

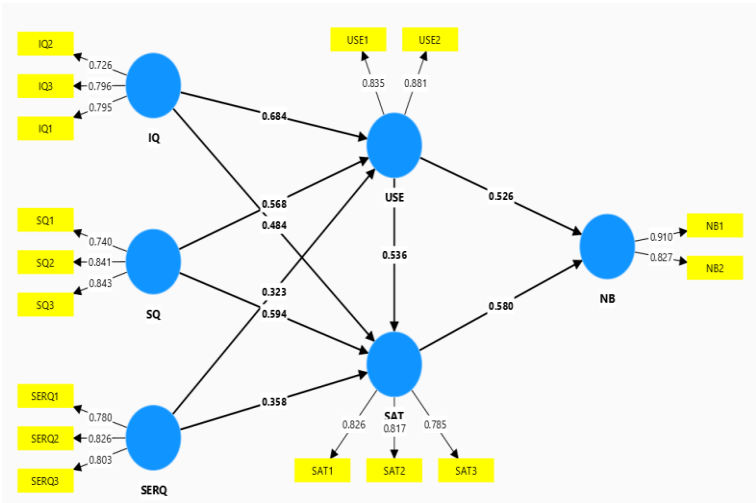

Figure 7. Structural model

4.3.3 Hypothesis testing result

The following is an explanation of the inner model measurements that have been carried out based on the analysis results, namely:

H1: IQ ->USE

As indicated in Table 6, H1 is supported, demonstrating that an improvement in the quality of information provided by the WMS leads to higher system usage. Discrepancies in inventory data may arise from poor information quality; therefore, when the information becomes more accurate and relevant, the use of the WMS tends to increase, reducing reliance on manual processes.

H2: IQ ->SAT

As presented in Table 6, H2 is not supported. This indicates that the quality of information provided by the WMS does not significantly influence user satisfaction. Even though the information provided is of high quality, user satisfaction remains low if it is not consistently applied across the warehouse.

H3: SQ ->USE

As shown in Table 6, H3 is supported. This indicates that high system quality positively influences the level of WMS usage. With a more stable, user-friendly, and functional system, it is hoped that warehouses that have not been orderly in using the WMS will be more motivated to transition from manual methods to automated systems.

H4: SQ ->SAT

As shown in Table 6, H4 is supported. This indicates that good WMS system quality will enhance user satisfaction. In this context, if the WMS can operate well without disruptions and provide accurate results, users in the warehouse will be more satisfied and may be more inclined to abandon manual methods.

H5: SERQ ->USE

As shown in Table 6, H5 is not supported. This indicates that the quality of service provided by the WMS provider does not significantly influence the use of the system. Nevertheless, this serves as feedback that WMS providers need to improve the quality of support and training to encourage users to be more consistent in using the system.

H6: SERQ ->SAT

As shown in Table 6, H6 is not supported. This indicates that the quality of service provided does not have a significant effect on user satisfaction. However, service providers should still strive to improve service quality, particularly in providing quick solutions to problems that arise during WMS use.

H7: USE ->SAT

As shown in Table 6, H7 is supported. This indicates that more frequent and effective use of the WMS has a positive effect on user satisfaction. In other words, the more often and effectively users utilize the WMS, the higher their level of satisfaction, which can ultimately reduce dependence on manual methods.

H8: USE ->NB

As shown in Table 6, H8 is supported. This indicates that the more effectively the WMS is used, the greater the net benefits gained by the company. Consistent and optimal use of the WMS will enhance operational efficiency and reduce errors, ultimately resulting in greater economic benefits.

H9: SAT ->NB

As shown in Table 6, H9 is supported. This indicates that the higher the user satisfaction with the WMS, the greater the net benefits that the company can obtain. High satisfaction typically reflects success in system usage, which directly impacts efficiency and productivity improvements, as well as reducing operational costs caused by errors or inefficiencies.

5. DISCUSSION

The results of the hypothesis testing provide valuable insights into how different factors are interrelated and contribute to the effectiveness of a Warehouse Management System (WMS) implementation. These findings highlight the significant connections that drive the system's usage, user experience, and the overall benefits gained from its adoption. Understanding these relationships is crucial for improving the system's performance, user satisfaction, and the long-term advantages it brings to the organization.

The finding that Information Quality (IQ) has a significant positive effect on Use (H1), but not on Satisfaction (H2), presents an interesting divergence from expectations. While accurate and relevant information increases the usage of the WMS, it does not automatically result in higher user satisfaction. This could be due to the fact that users are more focused on operational efficiency addressing immediate concerns such as stock discrepancies than on the broader concept of satisfaction, which may be influenced by multiple factors beyond just the accuracy of information. In particular, the warehouse team's frustration over mismatches between physical stock and WMS data suggests that, while users acknowledge the value of better information, these improvements alone are insufficient to enhance overall satisfaction if not paired with practical, on-the-ground system consistency. This finding aligns with the DeLone & McLean IS Success Model, where information quality is crucial but needs to be complemented by effective system use and reliability to fully impact satisfaction. The study by Lee et al. Although quality information improves system utility, satisfaction may depend more on the total system experience, including ease of use, responsiveness, and flexibility. These factors are especially important in dynamic warehouse environments, where swift and accurate decision-making is critical System Quality as a Key Driver of Use and Satisfaction The positive and significant effects of System Quality on both Use (H3) and Satisfaction (H4) demonstrate that the technical performance of the WMS is crucial for both user engagement and overall satisfaction. This finding reinforces the importance of a system that is stable, user-friendly, and capable of meeting operational demands. A system that functions seamlessly and without major disruptions can encourage users to engage more frequently, resulting in greater satisfaction with their work processes. This outcome also echoes the broader literature, where high system quality has been shown to improve user adoption and satisfaction, leading to greater operational efficiencies.

For Logistics Company in north Jakarta, this finding underscores the importance of continuous investments in system improvements. In the context of WMS, performance bottlenecks such as slow response times and inflexibility in adapting to specific project needs are critical areas that need to be addressed. Ensuring a reliable, user-friendly system will not only foster greater system use but also create an environment where employees feel more satisfied and empowered in their roles.

The results for Service Quality (SERQ) indicate no significant effect on either Use (H5) or Satisfaction (H6), suggesting that the quality of service provided by the WMS

vendor has not been a decisive factor in influencing how much the system is used or how satisfied users feel. This might be due to the operational maturity of the users, who, despite inconsistent or suboptimal service quality, are able to continue using the system effectively. Another plausible explanation could be that users are more concerned with the system's functionality rather than external service support, given the day-to-day pressures of warehouse operations. However, improving service quality especially in areas like system troubleshooting and user training could still play a crucial role in fostering long-term user engagement and satisfaction. Future discussions with WMS vendors about enhancing support and tailoring training programs could be instrumental in improving overall user satisfaction. The findings suggest that while service quality might not directly influence immediate user satisfaction, it could have long-term implications for building a more supportive system environment that fosters higher adoption rates.

The results indicate that Use has a significant positive effect on both Satisfaction (H7) and Net Benefits (H8), highlighting the importance of consistent and effective system usage in improving operational performance. This finding suggests that encouraging users to more frequently and thoroughly engage with the WMS can lead to greater satisfaction, as well as tangible improvements in operational efficiency, cost reduction, and overall profitability.

The positive relationship between Use and Net Benefits aligns with resource-based theory, where effective use of technology can enhance organizational performance. This result also supports the DeLone & McLean IS.

6. CONCLUSION

The evaluation of the Warehouse Management System (WMS) revealed that most of the proposed hypotheses were supported. This indicates a positive and significant relationship between the various variables studied. The findings showed that both information quality and system quality significantly influence WMS usage, suggesting that the accuracy and quality of the information provided, along with the system's reliability and functionality, play a crucial role in determining the level of system usage. This aligns with prior research emphasizing the transition from technocratic to humanistic paradigms in organizational systems, highlighting the importance of socio-economic factors and modernized systems in enhancing organizational performance [44]. Furthermore, system quality has a positive and significant effect on user satisfaction, suggesting that a well-performing system enhances users' satisfaction with their experience in using the WMS. Additionally, the use of the WMS is found to have a positive and significant impact on net benefits, meaning that the greater the number of users utilizing the system, the higher the benefits the company gains from the WMS implementation. This underscores the importance of widespread adoption and effective use of the WMS system in achieving the desired business benefits for the company. This underscores the importance of integrating effective systems that align with human-centric approaches, as noted in the context of personnel management systems in engineering enterprises transitioning to Industry 5.0 [44]. In conclusion, this assessment demonstrates that the implementation of the WMS at the logistics company has had a notably positive effect on system usage, user satisfaction, and the net benefits derived, thereby supporting the success of the implementation and its role in ensuring the efficient operation of the company's supply chain.

Based on the results of structural analysis which shows the significant influence of several variables on use, user satisfaction, and net benefit, researchers can provide several things to logistics companies in North Jakarta:

1). Improving Information Quality, given that information quality has been shown to significantly impact user usage and satisfaction, the logistics company should prioritize enhancing the quality of data and information provided by the system. This can involve improving the processes for collecting, storing, and maintaining data to make it relevant, accurate, and reliable.

2). Improving System Quality, System Quality has also been proven to influence user usage and satisfaction. Therefore, the Logistics Company needs to ensure that the WMS implemented has good performance, is easy to use, and is reliable. This can include user training, regular system maintenance, and feature or functionality improvements that meet user needs.

3). Service Measurement and Improvement, although service quality was not proven to have a direct effect on user usage or satisfaction in this research, Logistics Company still needs to pay attention to measuring and improving the services provided to WMS users. This can help guarantee that users feel valued and supported during their interaction with the system.

4). Focus on Use and User Satisfaction, with proven use and user satisfaction (User Satisfaction) affect net benefits, the Logistics Company needs to continue to integrate and improve the level of system usage and user satisfaction. This can be done through user satisfaction surveys, analysis of system usage, and efforts to continuously improve the user experience.

With the completion of this study, several recommendations can be given to future researchers for further research:

1). Comparative Studies between Industries or Companies, Future research can broaden the scope to include comparative studies between different industries or companies. such as cross-industry analyses comparing WMS effectiveness across sectors, such as retail, manufacturing, and pharmaceuticals, can highlight challenges and best practices, providing a broader understanding of the role of WMS in logistics.

2). Qualitative Analysis of User Experience, In addition to the quantitative analysis conducted in this study, follow-up research could explore user experience in more depth through interviews or case studies. This will provide richer insight into the factors influencing usage, user satisfaction, and net benefit from a direct user perspective.

3). Artificial Intelligence and Automation in WMS, Exploring the integration of AI and automation within WMS could offer insights into the next phase of technological innovation in warehouse management. Research could focus on how AI-driven tools improve inventory accuracy, demand forecasting, and real-time decision-making. In line with this, previous studies have highlighted the importance of developing and implementing machine learning algorithms and artificial intelligence for more accurate demand forecasting [45].

4). Integration with Other Systems, Researchers could investigate how integrating WMS with other systems, such as ERP or TMS, enhances overall supply chain performance and warehouse efficiency.

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