

Implementation of Digitalization and Work Effectiveness on Reducing Human Error Rate in Store Send Indonesia

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ARTICLE INFO

Article history

Received

Revised

Accepted

Keywords

Digitalization

Work Efficiency

Human Error

Warehouse

ABSTRACT

The condition of logistical activity that is currently ongoing in the warehouse of Cakung PT. Store Send Indonesia still needs improvement, especially in the storage process, because there are still some problems, such as goods returned from customers because of the wrong goods, goods Less, Goods More, and Inappropriate goods caused by Human Error. This research aims to analyze the implementation of digitalization and the effectiveness of work in reducing the level of human error in the operational warehouse of PT. Store Send Indonesia. The study involved 82 respondents from PT. Store Send Indonesia employees as a population and sample, using saturated sampling techniques. The research method used is a double linear regression analysis to determine the impact of digitization implementation and work efficiency on the level of human error. In addition, validity tests are also carried out to ensure that the data obtained is valid. The results show that digitalization does not significantly reduce human error; work effectiveness significantly reduces human error, and digitalization and work effectiveness simultaneously reduce human error in the PT Store Send Indonesia warehouse.

1. INTRODUCTION

In Indonesia and Southeast Asia, e-commerce has generally experienced massive and expected development in recent years. Indonesia's growing number of start-ups and fintech companies shows that the environment supports e-commerce. Indonesia is expected to control 52% of Southeast Asia's e-commerce market by 2025. In addition, Indonesia accounts for 4% of global e-commerce sales, which is growing [1]. In the e-commerce industry, the need for warehouses has become increasingly important. Warehouses serve as a buffer to adjust to changing production flows, consolidate products, and add marginal value such as customization, pricing, and labeling. This activity allows e-commerce players to customize products before distributing them, increasing delivery efficiency. A well-managed warehouse can also support a smooth logistics flow, allowing goods to be distributed quickly to the fulfillment center warehouse or directly to customers. Thus, an organized warehouse is a key for e-commerce players to fulfill customer orders effectively and efficiently [2].

As stated by [3], the physical work environment is one of the crucial elements that companies must pay attention to. This is because this work environment can provide a sense of security and peace of mind and improve good work outcomes, improving employee performance. In the warehousing world, the physical work environment is an activity carried out regularly by workers, and human error is one of the main challenges that companies must face. Mistakes made by workers can significantly impact the effectiveness of work and operational productivity of the warehouse. According to the latest research, human error in the warehouse is a big problem for companies [4]. Mistakes made by workers, such as errors in stock recording, verification of receipt of goods, placement of goods on the shelf, or the picking and delivery process, can cause serious problems, such as inaccurate storage data, loss of goods, delays in delivery, and complaints from customers. This can harm the effectiveness of warehouse operations and the company's competitiveness in the market. Therefore, identifying and managing the risk of human error in the warehouse is an essential key for companies to increase productivity, meet customer needs, and maintain a competitive advantage [5].

The high rate of human error in warehouses is a challenge that companies continue to face. To overcome this challenge, companies can implement digital solutions that can help reduce the rate of human error in warehouses. Digitalization can significantly increase work effectiveness in various fields, including industry and business. Recent studies show that digital technologies such as robotics, process automation, and data analytics can improve work productivity and operational efficiency [6]. Digital technology in warehouses, for example, can speed up the process of picking and packing goods, reduce the rate of human error, and improve storage accuracy. In addition, digital solutions such as cloud-based warehouse management systems and the Internet of Things (IoT) can provide more effective real-time access to warehouse data, stock monitoring, and warehouse performance analysis. Thus, digitalization can potentially increase work effectiveness and assist companies in optimizing their warehouse operations [7].

In this study, we researchers raised the company PT. Store Send E-Logistic Indonesia is a service company that provides comprehensive e-logistics solutions, ranging from product management services in the warehouse and online store management to delivering products to customers. The company has a fulfillment center warehouse in Cakung, East Jakarta, with a logistics network spread throughout Indonesia. PT Store Send Indonesia serves the needs of shipping goods for e-commerce business actors from the scale of MSMEs to large corporations. In addition, the company also provides specialized logistics solutions for products with complex characteristics and shipping requirements, such as electronics, pharmaceuticals, and fashion [8]. The logistics activities currently taking place in the Cakung warehouse of PT are in good condition. Store Send Indonesia is still in dire need of improvement, especially in the warehousing process. There are still several problems, such as Goods returned from customers due to Wrong Goods, Missing Goods, Excess Goods, Non-Conforming Goods, and so on, caused by Human Error. So, productivity in the warehousing process has not been maximized. The following is an example of item data from customers for the January-March 2024 period:

Table 1. Data from customers for the January-March 2024 period

Date	Qty	Date	Qty
01-March-2024	26	13-March-2024	88
02-February-2024	58	15-February-2024	42
02-January-2024	77	15-January-2024	32
02-March-2024	31	16-February-2024	34
03-January-2024	77	16-January-2024	31
04-February-2024	19	17-February-2024	25
04-January-2024	81	17-January-2024	57
04-March-2024	43	18-January-2024	44
05-February-2024	38	19-February-2024	40
05-March-2024	56	19-January-2024	36
06-February-2024	66	20-February-2024	38
06-March-2024	76	21-February-2024	64
07-February-2024	74	22-February-2024	33
07-March-2024	34	22-January-2024	30
08-February-2024	51	23-February-2024	60
08-January-2024	67	23-January-2024	5
08-March-2024	44	24-January-2024	46
09-February-2024	81	25-February-2024	22
09-January-2024	87	25-January-2024	73
10-January-2024	53	26-January-2024	73
10-March-2024	25	27-February-2024	58
11-January-2024	23	27-January-2024	59

12-February-2024	75	29-February-2024	21
12-January-2024	20	29-January-2024	71
12-March-2024	84	30-January-2024	101
13-February-2024	51	31-January-2024	81
Total	1417	Total	1264
Grand Total	2681		

(Source: PT Store Send Indonesia)

Based on this description, the researcher is interested in taking the title "Implementation of Digitalization and Work Effectiveness on Reducing Human Error Rate in Store Send Indonesia." Most previous research has focused on the influence of digitalization and work effectiveness on overall employee or organizational performance. However, research that specifically examines the impact of digitalization and work effectiveness on the level of human error in warehouses is still limited, especially PT. Store Send Indonesia. Therefore, this study intends to fill the existing research gap by comprehensively exploring the implementation of digitalization and the effectiveness of work on Reducing human error rate in the warehouse of PT. Store Send Indonesia in terms of quantitative impact.

2. LITERATURE REVIEW

2.1 Digitization

Digitalization is the shift from analog to digital technology. Technological advances then influenced this process, so the industry is now more modern and relies on this technology to continue operating. Digitalization transforms analog data into digital using technology and digital data in automated and computerized operating systems. Technology is a method of increasing added value and generating a product that is inseparable from the other existing products, especially in the digitalization of logistics. Shipping providers can upload the electronic delivery order (E-DO) to the website. The term "logistics digitalization" refers to a collection of logistics-related tasks, including organizing, carrying out, and managing the smooth and efficient movement of products and services. The data also includes the beginning and ending points up until the point at which it is used to satisfy client needs and is converted into a digital format [9].

According [10], using digital tools to optimize revenue and product suitability is crucial to meeting customer needs effectively. This strategic integration aids in the company's growth to maximize profits, enhance customer satisfaction, and provide personalized service.

Digitalization can be applied to many things in the warehouse, such as receiving, storing, picking, and shipping. Digital technologies such as barcode scanning, RFID, and warehouse management systems (WMS) can help automate processes and reduce human errors. The dimensions of logistics digitalization are as follows [11].

1. Planning the flow of goods or services and information in digital format
2. Implementation of the flow of goods or services and information in digital format
3. Control of the flow of goods or services and information in digital format

E-logistics shows the transfer of various goods and services through internet communication technology such as e-mail, the World Wide Web (WWW), and electronic data interchange (EDI) [12]. The following are the services in the logistics process:

- a) Receipt of goods
- b) Product packaging and labeling
- c) Carrying out the handling process
- d) Carry out the entire loading process electronically using automation software,
- e) Planning post-loading preparation routes,
- f) Tracking vehicles through satellite and communication systems
- g) Automatically unload goods to ports, warehouses, or transshipments by implementing a computerized integrated automation system.

2.2 Work Effectiveness

According to [13], effectiveness is communication, which is the process of achieving the planned objectives by the budgeted costs, time determined, and the number of personnel determined. According to the interpretation above, effectiveness indicators are targets met per the plan. They are used to measure the success of a goal or predetermined aim.

Work effectiveness is a way to complete work on time with a predetermined time. This means that whether the implementation of these activities can be said to be good enough or not depends on the activities carried out, how to implement them, and how much costs are [14].

Organizational effectiveness can provide an overview of an organization's performance in accomplishing its objectives. The process approach defines effectiveness as the efficiency and sound state of an internal organization or as well-functioning internal activities and processes. The process approach examines an organization's internal operations and gauges effectiveness using internal metrics like workgroup loyalty, cooperative spirit, and service efficiency [15].

Effectiveness is a word that essentially signifies accomplishing something or doing it correctly. In the meantime, labor might be characterized as an action-oriented activity. The achievement of work objectives through activities carried out based on indicators, such as (1) the accuracy of the job completion process, (2) evaluating how to complete work, (3) success in making decisions, (4) timely completion of work, (5) achieving the stated goals, and (6) appropriate resource utilization, can be combined to form the concept of work effectiveness [13].

2.3 Human Error

A company's collaborative ability to identify the optimum solution is reflected in its human factor. According to the knowledge that each member of the company possesses. In this instance, The ability of an individual to act in different organizational contexts using knowledge, skill, competence, and attitude indications is known as the "human factor" [27].

Human error is human error in doing work, where the work is not following the procedures set both systematically and at the time of the work, including the negligence and negligence of the workforce in doing the work. Poor interaction between humans, equipment, and environmental elements is the cause of work accidents [16].

Human error is an insignificant action that can reduce the system's efficiency, security, and performance. There are two ways to examine human error: the subject-doing approach and the systems approach. The approach to the subject of the perpetrator includes an analysis of unsafe acts (unsafe acts), which includes the types of mistakes committed by the subject due to mistakes or violations of procedures. Irregularities or indifference lead to unsafe actions. Some attitudes that can lead to insecure actions include forgetting procedures, forgetting, not paying attention, poor motivation, and not focusing [17].

Human Error is an inappropriate human decision or behavior that can potentially reduce the system's effectiveness, safety, or performance. Human error is the probability of the human condition completing an activity successfully within a predetermined period. Human error is defined as a failure to complete a task or work that can cause obstacles in the work process until there is damage to the objects and equipment used [18].

Errors or errors made by operators and some of the causes of their occurrence are a terrible environment, complex tasks, lack of proper procedures, operator indifference, and poor operator selection and training [28]. According to [29] and [19], the discrete-action study is one of individuals' most straightforward classification schemes. Discrete actions are:

1. Fault of negligence
2. Commission errors
3. Sequence errors
4. Time error

2.4 Research Model

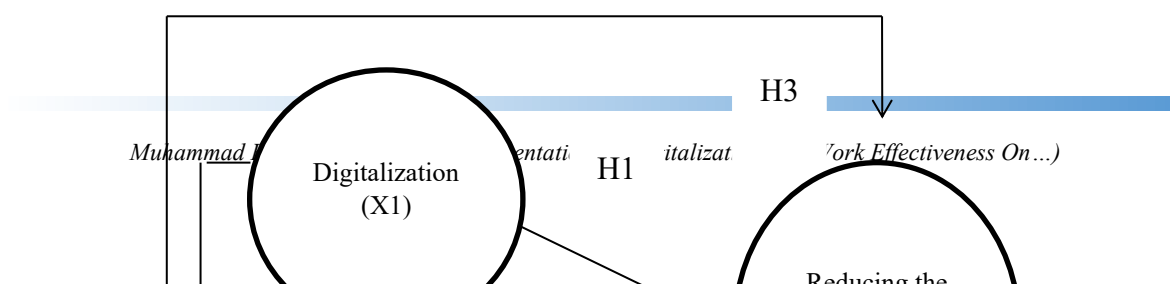


Fig. 1. Research model

2.5 Research Hypothesis

From the development and research framework that has been described, the hypothesis set in this study is as follows:

- H1: It is suspected that there is an influence of Digitalization on Reducing the Rate of Human Error
- H2: It is suspected that there is an effect of Work Effectiveness on Reducing the Rate of Human Error
- H3: It is suspected that there is an influence of Digitalization and Work Effectiveness on Reducing the Rate of Human Error

2.6 Previous Research

Table 2. Previous Research

It	Name (Year) and Title of the Study	Variable	Similarities	Research Methods	Research Results
1	[30] "Strategy for Strengthening the Internal Control System to Avoid Human Error in Cash Management"	Variable: Internal control system, Human error, Cash Management	Human error is the primary variable in the study	Qualitative	The study results show that an effective internal control system avoids human error in cash management at PT Surabaya Industrial Estate Rungkut (Persero). Strengthening an effective internal control system can help companies avoid potentially detrimental human errors.
2	[20] "Human-factor related mistakes in the logistics industry and opportunities for their reduction"	Variable: Human-related mistakes	Human error is the primary variable and the object of research in logistics.	Quantitative, descriptive, and factorial analysis	The study's results show that the operational performance of logistics service providers is greatly affected by human-related errors, especially errors in manual computing and incorrect preparation of cargo documentation.
3	[21] "Digital transformation	Variable: Digital	Research variables regarding digitalization	The research methods are mixed (qualitative)	This study concludes that digitalization transformation affects the challenges in Bulgaria's logistics sector and that there is great potential for the digital

It	Name (Year) and Title of the Study	Variable	Similarities	Research Methods	Research Results
	challenges of logistics in Bulgaria"	Transformation	and research objects in the field of logistics	and quantitative) with descriptive and comparative analysis.	transformation process in the sector. Analysis shows that companies in Bulgaria are still in the early stages of digital transformation in the sector.
4	[22] "Impact and Sustainability of Digital Transformation in Peln Logistics"	Variable: Digital Transformation	Digitisation research variables and research objects in the field of logistics	Qualitative	The results show that digitalization can improve production/services, operational processes can be well integrated, real-time information can provide efficiency that will contribute to the company's profits, and can create more diverse products/services. Digitalization provides many benefits, such as cutting costs by up to 90% and improving uptime.
5	[23] "Managing Human Errors in Smart Factories Using Augmented Reality"	Variable: Human error, Augmented reality, Smart factories	Similarities exist in the variables of human error and augmented reality, which are also included in digitalization	using a combination of qualitative (interviews and case studies) and quantitative approaches (empirical analysis)	The results show that AR technology is effective in reducing human error by improving operator training and decision-making processes
6	[24] The Effect of Implementing Digital Innovation and the Work Environment on Employee Work Effectiveness STUDY: EMPLOYEES OF PT. TIKI JNE EXPRESS MAIN BRANCH OF SUKABUMI CITY	Implementation of Digital Innovation, Work Environment, and Employee Work Effectiveness	There are similarities in digitalization variables and work effectiveness.	Quantitative	The study results show that implementing Digital Innovation positively and significantly affects Employee Work Effectiveness. The Work Environment has a positive and significant effect on Employee Work Effectiveness. Implementing digital applications is very helpful for employees in managing their work, especially in personnel administration. The work environment around employees dramatically affects the work done and the effectiveness of employees' work.

3. RESEARCH METHOD

This study uses a quantitative research design with a survey method. Quantitative research is a type of research in which hypotheses are tested, conclusions are drawn, and an understanding of how the variables studied interact with each other is used [25]. The quantitative approach was chosen because it aims to test hypotheses and measure research variables objectively. The survey method was used to collect primary data by distributing questionnaires to respondents. This research is included in the type of explanatory research. Explanatory research aims to test the relationship between independent

variables (digitalization implementation and work effectiveness) and dependent variables (human error rate) and analyze the influence between these variables.

The method of this study is to use multiple linear regression analysis. The instrument used is an item validity test to measure the accuracy of an item in a questionnaire or scale, whether the items in the questionnaire are correct in measuring what is to be measured or can be assessed directly by the person correlation method or the corrected item-total correlation method. If the item is declared valid, it will be followed by a reliability test, which is used to determine the consistency of the measuring tool and whether it is reliable and remains consistent if the measurement is repeated. In addition, the Ttest and Ftest of the population in this study were 82 respondents, and the sample used a saturated sampling technique or made all populations as research samples.

Table 3. Operational Definition

Variable	Operational definition	Source
Digitalization	Converting analog data into a digital format that can be processed and stored by computers and digital devices is known as digitization.	[26]
Work Effectiveness	The ability to use existing resources effectively to achieve a desired goal or outcome is known as work effectiveness.	[31]
Human Error	Human errors are errors or failures caused by human actions or intentional or unintentional decisions.	[19]

4. RESULT AND DISCUSSION

4.1. Multiple Regression Analysis

Multiple linear regression aims to see the relationship and direction of the relationship between independent variables and dependent variables in the form of equations. The Multiple Regression equation is as follows: $Y = a + bX_1 + bX_2 + e$

Table 4. Coefficients

Type	Unstandardised Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.889	1.764		1.071	.288
Total_X1	.122	.064	.149	1.917	.059
Total_X2	.716	.072	.779	9.992	.000

a. Dependent Variable: Total_Y

Source: SPSS Version 26 Output

Based on the table above, it can be seen that the multiple linear regression equation is as follows: $Y = 1.889 + 0.122 X_1 + 0.716 X_2$

1. Constant (a) = 1.889 means no digitalization and work effectiveness if the free variable is ignored. Then, the human error in PT Store Send Indonesia Company will be worth 1.889.
2. A coefficient value of 1 = 0.122 means that for every change in one unit of Digitalization assuming Work Effectiveness, then Human Error in PT Store Send Indonesia Company will increase by 0.122.

3. A coefficient value of $2 = 0.716$ means that for every change in one unit of Work Effectiveness assuming Digitalization, Human Error in PT Store Send Indonesia Company will increase by 0.716.

4.2 Test the hypothesis

The hypothesis test was carried out to determine the influence between independent variables on dependent variables, both simultaneously and partially.

a. Test T

The T-test aims to determine whether there is a significant relationship between variables X1, X2, and Y. The data is presented in the table below, with $t = 1.664/1.67$ (see table t for $N=79$).

Table 5. Test T

Type	Unstandardised Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.889	1.764		1.071	.288
Total_X1	.122	.064	.149	1.917	.059
Total_X2	.716	.072	.779	9.992	.000

a. Dependent Variable: Total_Y

Source: SPSS Version 26 Output

The Effect of Digitalization on Human Error

The test results obtained a t-value for the Digitization variable, showing a value of $t = 1.917 > t_{\text{table}} = 1.664$ with a significance value of $= 0.059 > 0.005$, which means that Digitization does not significantly influence reducing the level of Human Error.

The Effect of Work Effectiveness on Human Error

The test results obtained a t-value for the Work Effectiveness variable showing a value of $t = 9.992 > t_{\text{table}} = 1.664$ with a significance value of $= 0.000 < 0.005$, meaning that Work Effectiveness significantly influences reducing the level of Human Error.

b. Test F

The F-test was carried out to examine and analyze the influence of independent variables on dependent variables simultaneously. The results of the calculation of the F test are presented in the table below:

Table 6. ANOVA

Type	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	2318.244	2	1159.122	167.040	.000b
Residual	548.196	79	6.939		
Total	2866.439	81			

a. Dependent Variable: Total_Y

b. Predictors: (Constant), Total_X2, Total_X1

Source: SPSS Version 26 Output

From the data processing results above, it can be seen that the value of F Count = $167.040 > F_{\text{Table}} = 3.11$ (see F table for $N = 79$) with a probability value, namely sig is $0.000 < 0.05$. Thus, Digitalization and Work Effectiveness simultaneously have a significant effect on reducing the level of Human Error.

4.3 R2 Determination Coefficient

This determination coefficient determines how much influence the independent variables have on the bound variables. The value of R square determines the value of the Coefficient of Determination.

Table 7. Model Summary

Type	R	R Square	Adjusted Square	R	Std. Error of the Estimate
1	.899a	.809	.804		2.634

a. Predictors: (Constant), Total_X2, Total_X1

Source: SPSS Version 26 Output

From the results of the data processing above, it can be seen that the value of the R Square correlation coefficient is 0.804. This means that Digitalization and Work Effectiveness have an effect of 80.9%, while factors outside the variables studied influence the remaining 19.1%.

4.4 Discussion

The results of this study highlight important findings regarding the impact of digitalization and work effectiveness on reducing human error in the warehouse operations of PT Store Send Indonesia. While the study aimed to evaluate the role of digitalization and work effectiveness in improving the accuracy of warehouse operations, the findings revealed nuanced insights into how these factors interact and contribute to error reduction.

Despite the growing body of research that suggests digital technologies, such as Warehouse Management Systems (WMS), RFID, and barcode scanning, can significantly improve operational efficiency and reduce errors in warehouse management, the results of this study indicate that digitalization alone did not have a significant impact on reducing human error at PT Store Send Indonesia. The t-test results revealed that the digitalization variable had a significance level greater than 0.05, which means there was insufficient evidence to support the hypothesis that digitalization significantly reduces human error.

This outcome is somewhat surprising, given that previous studies have shown that digital tools can reduce human errors by automating processes such as stock recording, order picking, and packaging (e.g., [6], [7]). One possible explanation for this discrepancy could be that the digital systems in place at PT Store Send Indonesia were either not fully integrated or not utilized to their full potential. Additionally, the complexity of the tasks in the warehouse, combined with the learning curve associated with new technology, could have hindered the expected improvements in accuracy. Therefore, it is important to recognize that the mere presence of digital tools does not automatically lead to significant improvements unless these systems are fully optimized and effectively integrated into daily operations.

The Significance of Work Effectiveness

In contrast to the results regarding digitalization, work effectiveness emerged as a significant factor in reducing human error. The findings from the t-test, with a significance level of less than 0.05, indicated that work effectiveness had a strong and positive influence on reducing human error in the warehouse. This result aligns with previous studies that emphasize the importance of efficient work practices in improving operational performance and reducing mistakes (e.g., [13], [14]).

Work effectiveness encompasses various aspects, including employee training, task management, decision-making processes, and the optimization of available resources. The high level of significance for this variable suggests that improvements in work practices, such as clear procedures, well-defined roles, and ongoing training, can have a direct impact on minimizing human errors. PT Store Send Indonesia should, therefore, prioritize enhancing work effectiveness through regular training, better communication, and continuous monitoring of performance.

Combined Effect of Digitalization and Work Effectiveness

The study also examined the combined effect of both digitalization and work effectiveness on human error reduction. The F-test results confirmed that, when considered together, these two factors had a significant impact on reducing human error in the warehouse. This finding highlights the importance of adopting a holistic approach to improving warehouse operations. While digitalization alone did not yield significant results, its potential to complement work effectiveness in improving operational performance cannot be overlooked. The combined efforts of technology and human factors appear to be crucial for achieving the desired outcomes.

This suggests that companies should not treat digitalization and work effectiveness as isolated initiatives. Instead, they should focus on integrating technological solutions with enhanced work practices. For instance, the use of digital tools can facilitate the execution of well-designed work processes, while work effectiveness ensures that employees are able to leverage these tools effectively. A balanced approach, where technology and human-centered improvements go hand in hand, is likely to result in a more efficient and error-free warehouse operation.

Limitations and Future Research

One key limitation of this study is the relatively small sample size (82 respondents), which may not be representative of the entire workforce at PT Store Send Indonesia or other similar warehouses. A larger sample size, particularly from multiple warehouse locations, would provide more robust and generalizable findings. Additionally, the study focused on only two variables—digitalization and work effectiveness. Future research could explore other factors, such as employee characteristics (e.g., experience, motivation), organizational culture, or warehouse layout, that may contribute to reducing human error in warehouse operations.

It would also be valuable to investigate the role of specific digital tools, such as automation and real-time tracking systems, in reducing particular types of human error (e.g., stock discrepancies, incorrect order fulfillment). A more granular examination of these technologies could help identify which aspects of digitalization are most effective in addressing specific operational challenges.

5. CONCLUSION

Based on the discussion in Chapter 4 of the research entitled "Implementation of Digitalization and Work Effectiveness to Reduce the Human Error Rate in the Warehouse of PT Store Send Indonesia," the author draws the following conclusions:

1. Digitalization in PT Store Send Indonesia's Warehouse

The study results and the t-test show that digitalization does not significantly reduce the human error rate in the PT Store Send Indonesia Warehouse. The results of hypothesis 1 in the framework of the study proved that there was not enough evidence to prove it.

2. Work Effectiveness at PT Store Send Indonesia Warehouse

The t-test results show that work effectiveness significantly reduces human error in the PT Store Send Indonesia Warehouse. The results of hypothesis 2 in the research framework proved correct in that work effectiveness positively affected reducing human error in the PT Store Send Indonesia Warehouse.

3. The influence of digitalization and work effectiveness simultaneously reduces the human error rate in the PT Store Send Indonesia Warehouse. From the results of the analysis carried out, Test F shows that digitalization and work effectiveness have a significant effect on reducing the human error rate at the PT Store Send Indonesia Warehouse.

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