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Impact of responsibility shifts on warehouse performance of Indonesian police logistics staff

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ABSTRACT

The primary issue addressed in this research is the need for motivation from managers to implement responsibility shifts within the Republic of Indonesia State Police. The purpose of the study was to examine the relationship between shifts in responsibility and the performance of the Indonesian Police Logistics Staff in the Inbounding and Storage processes. The study used a qualitative approach, employing the Six Sigma method along with regression analysis and hypothesis testing. A sample of 132 Police Logistics Staff was surveyed. The findings showed a positive relationship between shifts in responsibility and improvements in warehouse performance, particularly in terms of inbound and storage efficiency. The results offer recommendations for enhancing efficiency through responsibility shifts. These findings could encourage officers to consider adopting responsibility shifts within the National Police Logistics Staff warehouse. Further research with a larger population and a more in-depth exploration of the impact of this transition is recommended.

1. Introduction

Warehousing is one of the essential elements in logistics operations. In this research, inbound and storage are the processes to be studied in the warehousing operation. The factors that drive the increase in warehouse needs are e-commerce enhancement, ease of import activity, and decentralization of cargo distribution. By implementing a warehouse management system, for example, the warehouse operation will be able to fulfill the requirements of speed, accuracy, and logistic process efficiency in the supply chain (Ricardianto et al., 2022). So that logistic management can be implemented professionally, transparently, and accountably in the territory of the Indonesian Police Logistics Staff needs management implementation by all the personnel who hold the function of facilities and infrastructure. An Indonesian Police officer assigned to the field of facilities and infrastructure must know the main job and function of the Facilities and Infrastructures Staff of Indonesian Police as the developer of facilities and infrastructures management function in the circle of Indonesian Police. This is important because any facilities and infrastructure management must refer to the strategic plan set by the Headquarters of the Indonesian Police.

The Logistics Bureau, as the developer of the logistic function, has a responsibility to conduct technical coaching of logistic function in terms of implementing governance and logistics management either in the implementation of procurement, distribution, or logistic material management in the forms of special tools, special material tools, individual equipment or other materials both received from the Indonesian Police Logistics Staff and self-held by decentralization so that all the facilities and infrastructures, and equipment supporting the police task can be utilized to help the police operational activities professionally, proportionally, and accountably. Previous research reviews the idea of implementing responsibility shift as a method that neglects workforce utilization. This study studies the implementation of responsibility shift measured by training, goal, feedback, visual

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management, and corporate strategy, which connects to the department as an essential element in motivation theory.

The goal-setting theory in employment occurs through systematic training, challenging goal allocation up to formal feedback (Linderman et al., 2003; Ricardianto et al., 2023a; Silitonga et al., 2020). In general, research on responsibility shift has ever been conducted, although not so many (Edwards and Goussios, 2021; Neef and Benge, 2022; Simmler, 2023; Whitson and French, 2021; Fatmawatie and Endri, 2022). The justification for this is that the initial research focuses on the outrounding process and the recent lack of theories concerning the performance of inbounding and storage (Faber et al., 2013; Petersen et al., 2005; Petersen and Aase, 2004). In addition, the government-funded census will aim to identify what competitive advantages the workforce provides based on the level of warehousing automation (Sweis et al., 2019). Armstrong et al. (2010) continued their theory through several surveys of 241 companies in Ireland, trying to understand the enabler of company performance, with extensive employee involvement but not supported by solid theories. Meanwhile, Bateman et al. (2016) and Locke and Latham (2002) claimed that visual management is essential for performance management, primarily related to the strategy at the departmental level.

Storage systems are an excellent practice that improves inventory management, adequate storage, and distribution, which will help researchers and managers understand how to adopt technologies in the warehouse management system (Ali and Kaur, 2022). In general, some research related to warehouse performance has been conducted (Angammana and Jayawardena, 2022; Kodithuwakku et al., 2022; Md Hanafiah et al., 2022; Wahyuni et al., 2022). These studies reveal the need for more attention to the criteria of warehouse performance and the factors in warehousing management and can inspire decision-makers to improve warehouse performance. Lao et al. (2011) stated that the performance of operational assignment to the receiving personnel and the activities of food quality assurance increases significantly through the technology of Radio Frequency Identification, Case-Based Reasoning, and the technique of Fuzzy Reasoning to help monitor the activities of food quality assurance. Franzke et al. (2017) stated that a warehouse with a return routing policy gives a travel distance that is expected to be shorter than those with a traversal routing policy, as well as related to a low-level storage policy, picker-to-part, and narrow aisle warehousing system. Tang et al. (2022) stated that accurate travel time calculation enables better monitoring and choosing cyclical configuration from the perspective of warehouse performance and policy assignment.

Chen et al. (2010) introduced a framework for assessing the integral performance of order-picking systems with various combined storage and order-picking policies. Managers need an integrated and efficient framework to select the right portfolio of order-picking policies from a multi-criteria and contextual perspective. Minner and Silver (2007) explained that the method can help make tactical decisions on whether to store specific products or to replenish by the order, and the capacity of the available warehouse will restrict the aggregate supply level at any time. Bhasin (2011) included visual management in 12 audit categories to measure the Leanness of 20 manufacturing companies in England. Riyanto et al. (2021) explained the key finding of their research that if employee engagement and performance recognition as essential elements in Human Resources Management are well implemented, they can improve the company's business performance. Drohomeretski et al. (2014) found that companies in South Brazil implement lean with competitive priorities in quality, reliability, or speed, achieving excellent performance, and it becomes an operational strategy communicated.

Several previous researchers, namely Wahyuni et al. (2022), Hamour et al. (2023), Barata et al. (2024), Harsono (2023), and Barakat et al. (2023), have conducted many discussions related to operational performance in several areas of logistics. Operational performance directly related to supply chain management has also been researched previously (Abusaq, 2023; Alkhawaldah et al., 2023; Cahyaningratri and Naylah, 2023; Ibrahim et al., 2023; Suharto, 2023). Specifically, studies related to warehousing performance in logistics management, Ghaouta et al. (2023), Abdul Rahman et al. (2023), Ali and Kaur (2022), and Kumar et al. (2022) also provide insight to managers in deciding between various warehouse processes and performance measurement in the warehousing context as an academically interesting study topic. In the end, criticism of warehousing performance is still needed for improvements to improve warehousing performance (Ricardianto et al., 2023b; Barata et al., 2022).

This research found that the delegation of responsibilities positively correlates with aspects of warehouse performance, such as inbound efficiency and storage. These findings are consistent with several previous studies that show employee empowerment and the delegation of responsibilities can enhance operational performance. For instance, Levine and Prietula (2012) identified that transferring duties to those who perform the work can increase efficiency. Similarly, a study by Bowen and Youngdahl (1998) supported the concept of employee empowerment, which allows them greater control over their job performance. However, this research also indicates that, although delegating responsibilities can improve efficiency, several challenges must be considered. For example, Baird and Wang (2010) found that 88% of employees in manufacturing companies in Australia do not fully adopt the concept of employee empowerment, indicating barriers to its implementation. Hackman

et al. (2001) also showed that smaller warehouses have higher efficiency levels. This aligns with this research's finding that inbound and storage efficiency can vary depending on warehouse size and staff numbers.

While this research demonstrates that the delegation of responsibilities positively impacts warehouse performance, there are several potential challenges or adverse outcomes to consider for a more critical perspective on this topic, including (1) implementation barriers, as found by Baird and Wang (2010), not all employees or managers might be ready or willing to adopt the delegation of responsibilities. Organizational culture barriers and resistance to change can hinder effective implementation; (2) work quality, this research shows that delegation of duties can increase efficiency but only sometimes enhances work quality. For instance, regression analysis indicates that delegation of responsibilities accounts for 21% of the variation in storage productivity but only 15% in storage quality. This suggests that increased efficiency only sometimes aligns with improved quality; (3) workload and stress, delegation of responsibilities can increase workload and stress for employees if balanced with adequate training and support. Research by Alshumrani et al. (2018) showed that a poor risk culture can hinder managers and employees from generating and realizing new ideas; (4) resource constraints, delegation of responsibilities requires sufficient resources, including training, visual management systems, and managerial support. Without adequate resources, an implementation may fail or not yield the expected results; and (5) performance variability, this research uses the Six Sigma method to measure performance, emphasizing reducing variability. However, research by Antony et al. (2019) indicates that an excessive emphasis on reducing variability can negatively impact employee satisfaction and only sometimes reflects overall performance improvement. Considering these potential challenges and adverse outcomes, the discussion in this research can be more balanced and provide a more critical perspective on delegating responsibilities and warehouse performance. This also offers more comprehensive insights for managers and decision-makers in implementing the delegation of duties in their work environments.

Theoretically, Womack et al. (1990) designed the variable of responsibility shift through the ideas of Toyota Production Systems in Japan, which identifies the main principles in the company of Lean Producer, which find responsibility shifts to those who perform the work. Furthermore, Womack et al. (1990) stated that Toyota proposes to reduce the team size and turn the foreman role into team leaders who also work in a team. The newly formed teams are provided with clear instructions on how to work best in the evolution of mass production. Then, a small part of the production line is allocated to the newly formed teams. Five years later, Bowen and Youngdahl (1998) revealed the concept of employee empowerment, which enables employees to have greater control over their job performance.

Meanwhile, a survey conducted by Baird and Wang (2010) of 250 manufacturing companies in Australia regarding employee empowerment found that 88% of employees in manufacturing companies did not adopt this concept. Visual management is a communication medium that provides messages in a common language that can be understood by everyone who works in the company (Bateman et al., 2016). Alshumrani et al. (2018) continued in their theory, stating that an adverse risk culture will hinder managers and employees from generating and realizing new ideas.

According to De Koster and Warffemius (2005), warehousing theory aims to reduce waiting time, increase reliability, and increase error-free delivery. Technically, Cheng et al. (2016) defined productivity measurement as the number of lines per hour processing a product in a standard pallet lot. Hackman et al. (2001) stated that a smaller warehouse has a higher efficiency level and proposed various measures to compare the results accurately. Linderman et al. (2003) calculated the level of Six Sigma with almost 100% results, namely the warehousing industry benchmark between Three Sigma and Four Sigma. Theoretically, Lao et al. (2011) described the inbounding process as one in which product checking must prioritize special checking to decide whether the product is defect-free or at what defect level. Fu et al. (2013) explained that using the volume-based process assigns complicated work to the operator to finish. In another study related to warehousing, Mickleson et al. (2019) stated that the layout of a warehouse contributes to its efficiency.

Meanwhile, warehouse slotting is secondary to preparing the cargo for order picking. Discretionary inputs focusing on the workforce are necessary because warehouse managers can exert the most significant influence. Hackman et al. (2001) identified a statistically significant relationship between warehouse size and efficiency level and explained that an enormous warehouse has a higher transportation level, making communication and control difficult.

Based on the description above, this research identifies some problems related to warehousing performance in the Indonesian Police Logistics Staff. As the initial results, this research can identify the problems associated with warehousing performance, namely responsibility shift, such as (1) inefficient quantity that is achieved from the implementation of responsibility shift and (2) unmotivated managers to contemplate the implementation of responsibility shift in their warehouse. This research aims to know the correlation between responsibility shift and warehousing performance of the Indonesian Police Logistics Staff.

This research analyzed the correlation between the effective transfer of responsibilities and warehousing performance of the National Police Logistics Staff in Pulo Gadung, East Jakarta, using

several questions. A conceptual framework with two latent variables is proposed (Fig. 1). In this concept, training, allocation of feedback objectives, visual management, and departmental strategy are used to measure the shift of responsibilities. In contrast, warehouse performance is measured by inbound, stocked, and outbound efficiency.

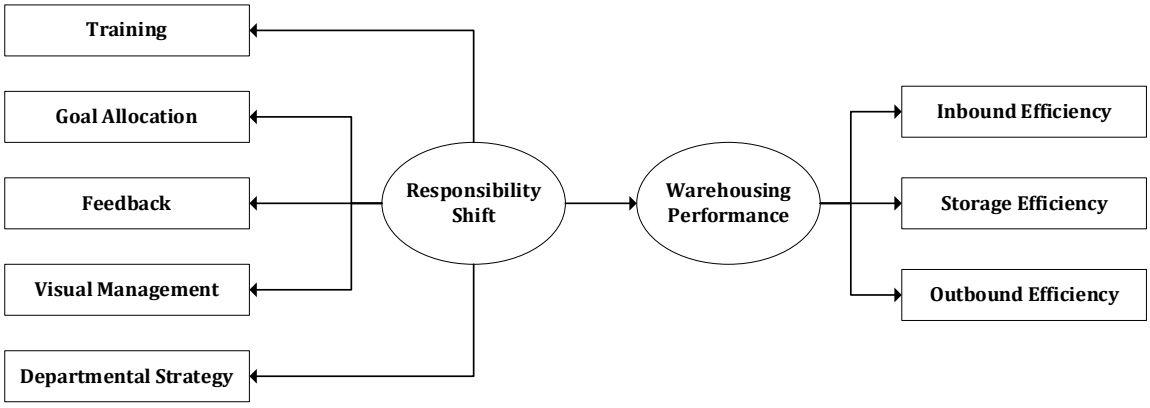

Fig. 1: Framework

The trend of a company depends on the responsibilities given to the people who carry out the work (Womack et al., 1990). Locke and Latham (2002) stated that the resulting shift in responsibility is demonstrated through visual management, training, formal feedback, allocation of challenging goals, and departmental strategies to increase work speed, which can further increase employee productivity and satisfaction. Improving receiving and storage functions can reduce cycle times in the incoming process (units per M/H). The increased work that can be completed per M/H depends on the operator and is facilitated by shifting responsibilities. As previously explained, productivity alone cannot measure warehouse performance effectively. Therefore, it must include quality dimensions. Gutiérrez Gutiérrez et al. (2009) stated that quality measurement uses a scale that indicates various levels of Sigma quality in a process known as opportunity. Hackman et al. (2001) tested the receiving, storing, and replenishing accuracy. Thus, this study proposes a research hypothesis that there is a collaborative shift in the responsibility and warehousing performance of the National Police Logistics Staff.

2. Research method

The research method used is a qualitative approach using the Six Sigma method. Hypothesis testing on the Full Truck Load (FTL) and Full Container Load (FCL) reviews was carried out using regression analysis. Samples were distributed to 132 National Police Logistics Staff in Pulo Gadung, East Jakarta. Responsibility shift is an aggregate score of training, goal allocation, visual management, feedback, and strategy related to department staff (receiving/inventory) that indicates the amount of responsibility that the personnel performing the job have. The questionnaire measures the transfer of responsibility using a system where the warehouse creates unweighted points for each activity carried out by the warehouse. The processes measured to determine warehousing performance are the inbound and storage processes (Fig. 2).

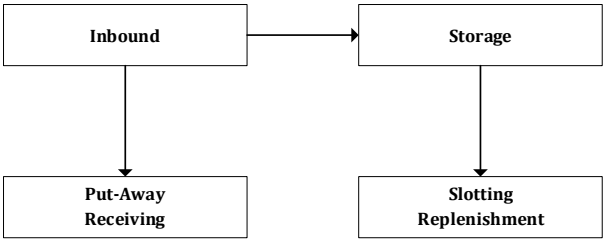

Fig. 2: Process and function of warehousing

The questionnaire measures productivity and quality at the scale of industry benchmark using lines per person-hour, and the percentage of results is equal to that of Six Sigma. A pilot survey involves creating a questionnaire distributed to the identified samples from twelve professionals, resulting in 15 additional steps to gather demographic data and further examine storage efficiency through replenishment. Questionnaire distribution is targeted at supervisors and managers of the Indonesian Police Logistics Staff in the warehousing department to ensure that the instrument catches the most representative data of the actual warehousing process.

Quality improvement will achieve customer satisfaction by considering the level of productivity in combination with the level of Six Sigma results (Hackman et al., 2001). Productivity is measured through the tasks completed M/H; this measure identifies transport as the primary contributor to processing time. For this research, the sample data will be divided into two sample groups: the number of jobs, which represents the workforce, and the warehouse size, which represents the space. Given that the theoretical productivity hours per person are static, this study uses a sample of 132 Police Logistics Staff as an essential input for the workforce measure in hours worked.

The output size reflected through inbound efficiency and storage efficiency can be measured

using an industry-accepted scale with productivity measured in meters per hour, where the total number of operators is multiplied by the number of operating hours in one day (Hackman et al., 2001). The number of trailers or containers measures the inbound efficiency the warehouse can unload and the number of put-away jobs versus the number of error-free yields. Storage efficiency is measured by the minutes taken to fill the pick-face and error-free yield. The scales used to measure quality aligns with the results of the Six Sigma error-free rate, with Six Sigma results greater than 99.9997%, Five Sigma greater than 99.997%, Four Sigma greater than 99.38%, Three Sigma greater than 93.3%, and Two Sigma greater than 69% and finally One Sigma greater than 37%.

The specific Six Sigma tools applied in this research include (1) DMAIC (Define, Measure, Analyze, Improve, Control); this methodology was used to define the problem, measure critical aspects of the current process, analyze the data, improve the process based on data analysis, and control the future state process to ensure any deviations from the target are corrected before they result in defects; (2) control charts, used to monitor the process performance over time and identify any variations that need to be addressed; (3) Pareto analysis, applied to identify the most significant factors affecting warehousing performance; (4) root cause analysis, used to identify the underlying causes of inefficiencies in the warehousing process.

Linear regression analysis was applied to test hypotheses on complete sample data. The results of hypothesis testing conclude that the alternative hypothesis can be accepted if the probability value of the determining variable coefficient is more significant than five percent. The regression analysis summarizes seven independent variable tests against their dependent variables, which are carried out on the functions and processes covered in the research. A statistically significant positive relationship is expected between the responsibility shift variable and the aggregate dependent variable. The linear regression test calculates the coefficient, adjusted R^2, and $p_{\text{-value}}$. A $p_{\text{-value}}$ lower than 0.05 is considered statistically significant. A $t_{\text{-test}}$ is also needed to test the research hypothesis regarding the partial effect of the responsibility shift variable on its dependent variable.

To ensure the robustness and replicability of the regression model, several statistical assumptions were examined: (1) linearity, the relationship between the independent and dependent variables was checked to ensure it is linear; (2) homoscedasticity, the variance of errors was examined to ensure it is constant across all levels of the independent variables; (3) normality, the distribution of errors was checked to ensure it follows a normal distribution; and (4) independence, the observations were checked to ensure they are independent of each other. The technical feasibility of the study was ensured by providing detailed information on the statistical methods and questionnaire validation. The questionnaire was designed to capture comprehensive data on warehousing performance and responsibility shifts. It was validated through (1) pilot testing, a pilot survey was conducted involving twelve professionals to refine the questionnaire and ensure it captures relevant data; (2) reliability testing, Cronbach's alpha was used to test the internal consistency of the questionnaire items; and (3) content validity, experts in logistics and warehousing reviewed the questionnaire to ensure it covers all relevant aspects of the research topic. This research enhances its methodological rigor by detailing the statistical assumptions, specific Six Sigma tools, and validation methods, and it provides a robust framework for replication and further studies.

3. Results and discussion

3.1. Data description

The instrument collects data on size used to understand the warehousing performance of the Indonesian Police Logistics Staff and its correlation with the responsibility shift. This enables the identification of specific data characteristics. The first sample group illustrated in Fig. 3 measures the number of staff in Sample Groups A to E. Groups A and B were selected as the most significant samples. Group A represents 23 percent of the data employing 1 to 10 operators. Group B represents 23 percent of the data and employs 1 to 10 operators, with 47 percent of the warehouse sample employing 10 to 50 operators.

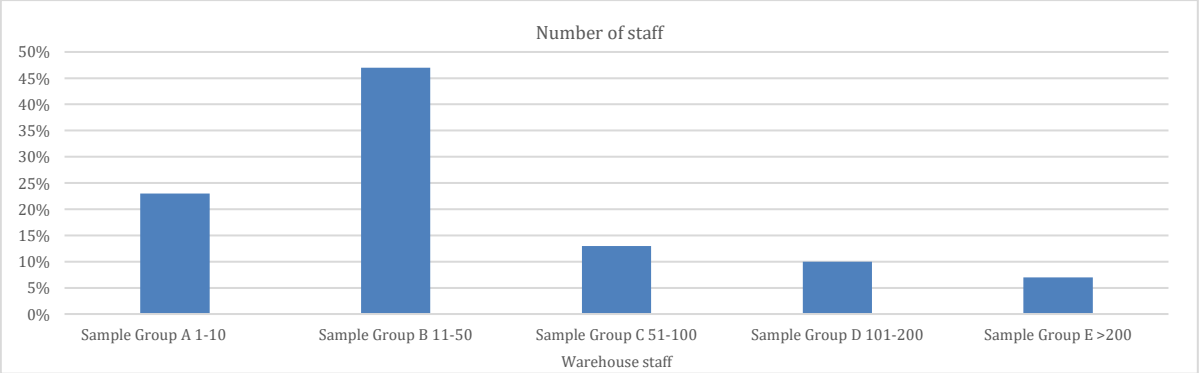

Fig. 3: Sample group's number of employees

3.2. Results of hypothesis testing

Based on the analysis results, it was found that 57 percent of Group A processed one to five FTL per M/H, while 14 percent had less than one FTL per M/H (Table 1). 29 percent of A1 processes 15 to 20 sorting jobs, and 14 percent of A2 processes a further less than one sorting job per M/H. In Group B, around 43 percent of B1 processes 1 to 5 FTL per M/H, while around 21 percent of B2 does not measure loading and unloading activities. Group B1 processes one to five sorting jobs per working hour, while B2 processes 15 to 20 sorting jobs per working hour. Table 2 presents an overview of inbound quality variables. Group A1, as a war, processes one to five trucks per working hour, and 25 percent of A1 reaches the Six Sigma level, and 33 percent of A2 reaches the Three Sigma level in loading and unloading activities. Group B achieved the Six Sigma level in approximately 67 percent of warehouse processing, one to five FTL per M/H (B1), while 33 percent of B2 did not. Fig. 4 shows that 30 percent (Group F) have a warehouse area of less than 5,000 sq.m, and 22 percent (Group G) have a warehouse area of 5,000 to 10,000 m^2.

Table 1: Inbound productivity

Number of staff	Average number of FTL unloaded (M/H)							Average number of sorting works (M/H)						
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
1-10	29%	14%	57%	0%	0%	0%	0%	14%	14%	29%	14%	29%	0%	0%
11-50	21%	21%	43%	14%	0%	0%	0%	7%	0%	36%	29%	14%	7%	7%
51-100	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	25%	25%	50%
101-200	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	33%	67%	0%
>200	0%	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	50%	50%	0%

a: Do not be measured; < 1 per M/H; c: > = 1 < 5 per M/H; d: > = 5 < 15 per M/H; e: > = 15 < 20 per M/H; f: > = 21 < 25 per M/H; g: > = 25 per M/H; h: Do not be measured; i: < 1 per M/H; j: > = 1 < 5 per M/H; k: > = 5 < 15 per M/H; l: > = 15 < 20 per M/H; m: > = 21 < 25 per M/H; n: > = 25 per M/H

Table 2: Unloading quality tariff by the number of staff (Level of error-free unloading)

Number of Staf	Number of FTL unloaded per M/H	> = 99.99966%	99.977%	99.38%	99.30%	69%	31%	< 31%	Do not be measured
1-10	> = 1 < 5 per M/H	25%	50%	0%	0%	0%	14%	14%	29%
1-10	< 1 per M/H	0%	0%	33%	33%	0%	7%	0%	36%
11-50	> = 1 < 5 per M/H	67%	0%	67%	0%	0%	0%	0%	0%
11-50	Do not be measured	33%	0%	0%	0%	0%	0%	0%	0%

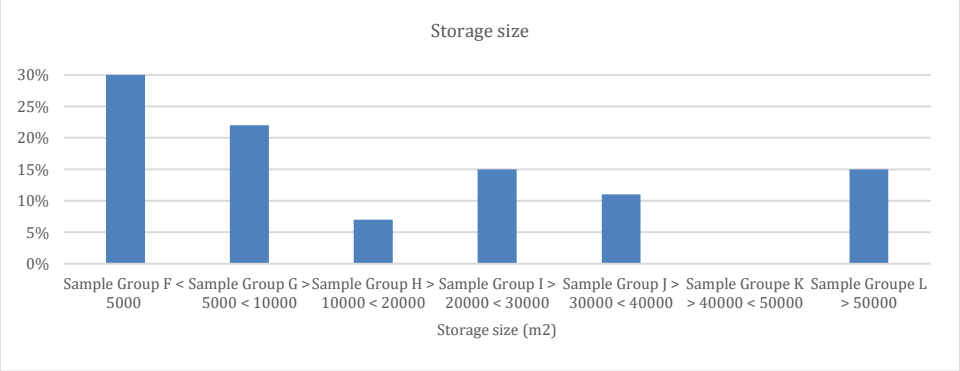

Fig. 4: Range of warehouse size

Measurements show that 63 percent of Group F has 101 to 1,000 Stock Keeping Units (SKU), 75 percent has 11 to 100 picking locations, and 50 percent consists of 21 to 30 storage aisles. In Sample Group G, each of the three-thirds had 101 to 1,000 SKUs, 1,001 to 10,000, and more than 10,000, respectively. Additionally, 67 percent of these groups have 101 to 1,000 pick-face locations, and 66 percent have 11 to 30 storage aisles. Thirty-three percent of warehouses that use a random picking policy for pick-face replenishment (F1) take less than two minutes, and another 33 percent (F2) use a picking policy based on a combination of eight to ten minutes for replenishment. In Group G, warehouses that implement a combined storage policy (G1) take two to four minutes to replenish, while 50 percent of Group G that uses pure class-based storage (G2) takes four to six minutes. A summary of the quality characteristics review found that Sample Group F1 had a Six Sigma level of quality, while F2 had a Two Sigma level. Group G1 has Six Sigma, and Group G2 has Five Sigma. The level of responsibility reflects the overall score of the activities carried out, where the higher the level or the more significant the score, the better. The shift in responsibility measurement adopts the lean philosophy proposed by Womack et al. (1990). Based on this philosophy, companies will profit from workers responsible for improving their work environment. Shifting responsibilities can effectively combine goal setting and equal empowerment theories by equating training with knowledge, equating targets and challenges with management support, and rewarding with feedback (Randolph and Sashkin, 2002).

Sample Group A1 was identified as having a high level of warehouse responsibility score in most areas except the numerical target of getting a score of 20. At the same time, Sample Group A2 failed in training, getting a score of 19. Sample Group B1 got a high score in formal feedback with a score of 30, while B2

got an average score of 24 in all areas. The F1 group had strength in training with a score of 11, while F2 got 8 in all areas. Group G1 has an advantage in departmental objectives with a score of 15, and G2 has a low score of 7 in all areas. The quality level of Six Sigma is very high and difficult to see. Trucks and containers in the inbound warehouse are treated as 40-foot containers. If the pallets used by the Indonesian Police Logistics Staff are standard, a 40-foot container will contain around 40 pallets. There are two dimensions to be considered to assess productivity: volume and time.

However, a Logistics staff member at the Indonesian National Police has the right to a minimum lunch break of 30 minutes and 15 minutes of rest in an eight-hour shift. Warehouse productivity is 1,812 hours per staff. With these assumptions, Group A1 processes 72,480 to 724,800 pallets per year unloaded from trucks (Table 3). If Group A1 has a two-step stage for inbounding, namely unloading and sorting, then Group A1 can experience one error in one process step per year. However, if Group A1 has a four-step login process, then Group A1 experiences nine errors per year. This shows that the smaller the number of process steps, the stricter the Six Sigma quality level in maintaining the harmony of productivity and quality.

Table 3: Six Sigma in warehousing inbound

Sample Group	Number of Staff	Theoretical productive hours per year	Maximum theoretical pallets per year	Opportunities per 2-step process	Opportunities per 4-step process	Defect Limit of Six Sigma per year (2 steps)	Defect Limit of Six Sigma per year (4 steps)
A1	1	1,812	72,480	144,960	289,920	0,5	1
A1	10	18,120	724,800	1,449,600	2,899,200	5	10
B1	11	19,932	797,280	1,594,560	3,189,120	5	11
B1	50	90,600	3,624,000	7,248,000	14,496,000	25	49
B1	11	19,932	797,280	1,594,560	3,189,120	5	11
B1	11	19,932	797,280	1,594,560	3,189,120	5	11
B1	50	90,600	3,624,000	7,248,000	14,496,000	25	49
B1	50	90,600	3,624,000	7,248,000	14,496,000	25	49

Table 1 details loading and unloading data, while Table 2 details checking and sorting. For example, if Group B1 has a two-step sign-in process, that group has a maximum capacity of 1,594,560 to 7,548,000 opportunities per year. Furthermore, if Group B1 had a four-step process, there would be 3,189,120 to 14,496,000 opportunities yearly. The Six Sigma quality level can be achieved if B1 cannot make 11 to 49 errors in one process step per year.

3.3. Discussion

Regression analysis has been conducted on all sample data. In summary, Groups A through E characterize the descriptive data in Fig. 3. A clear pattern is described in detail, linking productivity responsibility scores and higher levels of quality. The regression results summarize this study's seven functions and processes tested (Table 4). The regression of the shift in responsibility and measurement of productivity and quality from individuals and storage is analyzed using tests one to four.

In particular, the shift in responsibility impacts all dependent actions. Analysis of storage productivity and shifting responsibilities explains 21 percent of changes and 15 percent of the variation in storage quality. Examining the dependent variables, shifting responsibilities also explains 31 percent of the variation in inbound and 24 percent of retention efficiency. Although there are significant limitations in the number of samples obtained, the findings above provide an exciting picture of the warehousing performance of the National Police Logistics Staff and the influence of the shift in responsibility on aspects of warehousing performance. The research results contribute to the empirical literature on shifting responsibilities. Studies on the influence of the shift in responsibility on the warehouse performance of Logistics Staff in the case of the Republic of Indonesia Police, focusing on inbound and storage, have yet to be carried out. Notable for the use of the Six Sigma method, the result of this research is in line with some previous research that the implementation of Lean Six Sigma will save working hours in the goods transportation department, warehousing, or logistics management in general (Abdallah, 2020; Ismail et al., 2014; Lemke et al., 2021; Tarigan et al., 2023). This research supports some other research by Beškovnik (2023), Niérat (2022), and Kabadurmus and Erdogan (2020) that generally use FTL or FCL to improve warehousing performance, supply chain management, and inter-mode transportation. Based on theoretical study and previous research concerning the correlation between responsibility shift and warehousing performance, as well as the use of the Lean Six Sigma method and FTL or FCL, especially the research on the Indonesian Police Logistics Staff, this research can be stated as a relatively new one.

In other research, Adeodu et al. (2023), lean warehousing using Lean Six Sigma has been used to explain solutions to real-time productivity problems that have a negative impact on management and customer satisfaction and is helpful in developing a framework for process improvement. Warehouse management must still adapt to the Lean Six Sigma method, which can improve production processes, quality, and efficiency. The results indicate that the method process should be studied more thoroughly (Lemke et al., 2021). In general, this research is still in line with the evaluation results of several researchers, which stated several weaknesses and limitations in the use of Six Sigma, including the integration of Six Sigma with Big Data, the excessive

emphasis of Six Sigma on reducing variability, poor implementation of Six Sigma and its negative impact on employee satisfaction and the absence of integration exploitation (Antony et al., 2019; 2020; Sony et al., 2019).

Table 4: Regression analysis

Test number	Independent	Dependent	Coefficient	Adjusted R^2	P-value	t-statistics
1	Responsibility shift	Inbound productivity	0.258	21%	0.009	2.81
2	Responsibility shift	Inbound quality	-0.337	15%	0.028	-2.34
3	Responsibility shift	Storage productivity	-0.360	18%	0.016	-2.58
4	Responsibility shift	Storage quality	-0.328	12%	0.044	-2.12
5	Responsibility shift	Inbound efficiency	0.289	29%	0.002	3.39
6	Responsibility shift	Storage efficiency	0.344	21%	0.009	2.81
7	Responsibility shift	Warehousing performance	0.321	28%	0.003	3.33

4. Conclusion

The results of this study primarily affirm the hypothesis without a critical examination of anomalies or data trends that do not align with the expected outcomes. For instance, while the regression analysis shows a positive correlation between responsibility shift and warehousing performance, exploring why specific subgroups, such as Group A2, failed in training and received lower scores is essential. This could indicate underlying issues, such as inadequate training programs or resistance to change among staff, which need to be addressed to improve overall performance. Additionally, the negative coefficients observed in some tests suggest that responsibility shift might only sometimes lead to improved quality or productivity. These anomalies should be critically examined to understand the specific conditions under which responsibility shifts may not yield the desired outcomes. This could involve investigating factors such as the complexity of tasks, the adequacy of support systems, and the readiness of staff to take on additional responsibilities. This study was conducted on a national scale with a high density of data distribution; however, the response rate could have been higher. The research also aims to guide officers considering the adoption of responsibility shifts within the Indonesian Police Logistics Staff warehouse. Successful implementation, however, requires substantial support and clear guidance from senior officers. This study focuses on a specific subgroup within the Indonesian Police Logistics Staff, which may limit how widely the findings apply to other sectors or locations. The unique structure, culture, and operational environment of the Indonesian Police Logistics Staff differ from other logistics settings, so while the findings offer valuable insights, they should be applied to different contexts with caution. Future research should consider broader populations and diverse environments to enhance the applicability of these findings. Similar studies could be carried out in logistics companies, the private sector, and different regions or industries with varying degrees of automation and complexity. This would help validate the findings and provide a more comprehensive understanding of the impact of a responsibility shift on warehousing performance. However, high officers' support and high-level direction are required to implement a responsibility shift successfully.

Compliance with ethical standards

Ethical considerations

Informed consent was obtained from all participants, and data privacy was maintained by anonymizing personal information. This study complies with ethical research standards and was approved by the relevant ethics committee.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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