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The Effect of Warehousing Management on Warehouse Performance at Tema Oil Refinery (TOR) Ghana

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ABSTRACT

The research examines the influence of warehousing management on the performance of Tema Oil Refinery, concentrating on essential activities: receipt, put-away, storage, order-picking, and shipping. Data was gathered via questionnaires, interviews, and secondary sources, and analyzed using descriptive and inferential statistics with IBM SPSS. The investigation identified several challenges, including insufficient loading and unloading space, inadequate storage facilities, disorganization, and increased expenses. 100 sample sizes were collected for the investigation. Regression research indicated that all five warehouse operations significantly affect performance. The study advocates for enhancing management via automation, broadening operational domains, and systematizing materials to increase efficiency and mitigate theft and redundancy. Additionally, the business should improve warehouse performance by putting in place an automated system to get rid of unnecessary steps from receiving to shipping, setting up separate locations for each warehousing task, and giving each item a code to stop theft and duplication. Also, the company should improve the warehouse's performance by using an automated system to cut out unnecessary steps from receiving to shipping, setting up extra areas for each warehousing task, and giving each item in the warehouse a code to cut down on theft and duplication.

INTRODUCTION

Good management of warehouse operations is an important part of the supply chain, especially in the oil and gas industry. The Tema Oil Refinery (TOR) is a major participant in Ghana's oil economy, and its warehouses need to work well for it to be able to do its job. In today's business world, a warehouse is necessary to meet customer needs. It is an important part of competition since the company that can make things faster, cheaper, and more flexible is the one that wins. In this sense, managers need to know a lot about warehousing and how it affects the whole supply chain (Richards, 2017). You can tell if warehouses are getting better by how quickly and accurately they meet needs, how well they manage their resources, and how few tasks that don't add value they do (Trappy *et al.*, 2017). Another problem is putting information together, which includes important services for updating inventory, managing orders, and keeping track of products (Carol Stigum, 2024). The modern business world requires the deployment of inventive ways to effectively manage the increasing difficulties of warehouse management while also keeping prices down (Hackman, 2014). A warehouse is a structure inside the supply chain designed to aggregate products, hence minimizing transportation expenses and attaining economies of scale in manufacturing or procurement Another option is to use value-added processes and speed up the reaction time (Gong *et al.*, 2008). Storage has always been an important part of economic growth. In today's competitive market, businesses need to run at their best and provide great service to make sure they make money. The ease or difficulty of using warehouse management systems, product slotting methods, and organizing the layout of the warehouse are three things that affect how well and how efficiently warehouses work in the fast-moving consumer goods sector (Smith & Jones, 2018). The organization's ability to effectively manage the warehouse, save costs, and improve fulfillment operations is crucial to its success.

Despite several scholars proposing different justifications and alternative solutions, warehouse management remains under pressure to boost efficiency and accuracy, reduce costs and inventory, and enhance customer service. The situation in TOR is still being looked into and needs more research. Nonetheless, the researcher tackles this void by examining the conflicting viewpoints of different authors and underscores the imperative of exploring warehousing management. Moreover, these authors overlook essential warehouse performance measures, including quality, cost and financial considerations, productivity, and reaction time. The researcher intends to investigate the interrelationships among these parameters. Kusrini *et al.* (2018) conducted a study to determine essential performance indicators for evaluating warehouse performance, particularly concerning building materials. They said that the most important KPI for each activity should be the focus of improvements in warehouse activities. Campus (2013) and Aminoff *et al.* (2002) studied what affects warehouse operations in the supply chains of small manufacturing businesses. Their findings indicate that the primary factors influencing warehousing operations include extended lead times, suboptimal

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warehouse layouts, inconsistent deliveries, and inaccurate demand forecasting. The authors also point out that picking, packing, and shipping have a big effect on how well a warehouse works. They suggest ways to fix these problems by making picking lot sizes bigger, cutting down on picking times, and making better use of receiving and shipping facilities and aisles. However, those authors did not elucidate the key performance indicators (KPIs).

This study intends to explore the impact of warehousing management on the warehouse performance of Tema Oil Refinery, as the organization's economics primarily relies on the warehouse. No one has looked into how managing a warehouse affects how well it works at Tema Oil Refinery thus far.

LITERATURE REVIEW

According to Faber *et al.* (2013), Warehouse Management plans, controls, and optimizes the flow of materials and the use of warehouse resources on a daily basis. Its goal is to meet customer needs while keeping operating costs low (by cutting out unnecessary work and moving people and equipment around). Warehousing is the systematic and orderly storing of commodities on a big scale and making them easy to find when needed (Tsige, 2013). It makes time useful by shortening the gap between when commodities are made and when they are used. Also, cutting down on the time it takes to get from the supply point to the demand point can considerably boost production. But to make this efficiency gain happen, companies like Tema Oil Refinery need to set up ways to frequently check picking transit times and storage locations (Hackman, 2014). Karim (2018) says that a warehouse is more than just a location to keep stock. The goals of warehouse management are to improve productivity and accuracy, lower and control the costs of shipping and inventory, and provide exceptional customer service. On the other hand, TOR warehouse is mostly for receiving, storing, packaging, and shipping items. It needs workers, money (land, storage, and handling equipment), and information systems, which are all costly. A warehouse is a planned facility for storing and moving commodities and resources. In general, warehouses are places where products and information move between suppliers and customers (Anteneh, 2017). A warehouse performance measurement is an important way to find out how well a warehouse is doing its job, whether it's providing a service or running a program. A performance measuring system is a group of metrics that are used to measure how well an action works and how well it does. There are four main types of performance measurement: input, output, efficiency, and effectiveness. Efficiency and effectiveness are the most commonly used ways to measure performance (Kusrini *et al.*, 2018).

According to Ramaa *et al.* (2012), the main goal of a warehouse management system is to keep track of the movement and storage of commodities in a warehouse and process the related transactions, such as shipping, receiving, putting away, and picking. According to a study by Sneha & More (2016) on the efficiency and effectiveness of Warehouse Management, warehousing has become a critical activity in the supply chain due to global competition and supply chain concepts, including a focus on integral inventory control. This is necessary to outperform competitors in terms of customer service, lead-times, and costs. To make a planning and control structure work that effectively and efficiently delivers the high performance of warehouse operations needed in today's market, it is important to have timely and accurate information on items, resources, and processes. The author also demonstrated that warehouse complexity influences the planning and control structure by the extent of the tasks to be accomplished. It is hard to give the correct kind of information and expertise to the right people at the right time at TOR, which is a very complicated warehouse. Still, a complicated warehousing operation needs and control structures that have a lot of information, data, and knowledge about items, processes, customers, and resources that are easy to get to. So, optimization tactics are used to make product availability and delivery a competitive advantage while also getting the most value for money when it comes to transportation, facilities, equipment, personnel, and other important cost factors. The distribution facility also saves time by keeping products until they are needed. Shah and Khanzode (2017) assert that the trade-offs between picking efficiency and order responsiveness can be examined through several stochastic factors, including worker overtime, punctuality, penalties, order due dates, and associated expenses.

At Tema Oil Refinery, picking efficiency has the best practices, but the current research shows that an integrated model that includes responsiveness can work better. Karim *et al.* (2018) present their findings on the factors contributing to warehouse productivity failures, asserting that to maintain economic development, the warehousing sector must prioritize positive actions endorsed by all levels of government, private and nonprofit organizations, as well as the general public. So, proposals and recommendations for improving warehouse productivity will directly lead to higher levels of development and make the logistics service sector more competitive. But these tactics for warehousing and storage will only work if everyone is on board, tries to come up with new ideas, and works to make warehouse operations more efficient. Habazin *et al.* (2016) propose in their study of the order picking process in warehouses that every step, from receipt to shipping, as well as order picking, is the most expensive and time-consuming part of running a warehouse. When the picker starts picking items from orders, they walk, move, lift, put, pack, and execute other related tasks that take time and cost money. In order to make a suggestion for a remedy, the order selection process has been looked at in terms of its detailed steps and the time it takes to do them. It can be lowered by using several tactics, depending on its status. Companies that want to improve their processes usually measure them, and they also usually have an objective

assessment of the structure of the core process. It is very important for any process optimization to be open to change and to keep evaluating things. To talk about how well the warehouse is doing and how to make it better, we need to develop a process map. It is a good way to show everything that happens in the warehouse. In general, a company's warehouse operations can affect how well the organization does in terms of quality, cost, speed, and productivity when it comes to receiving, storing, and shipping (dispatching). Receiving, storing, picking, and shipping all have their own costs and quality standards. For example, flawless order fulfillment should include accuracy and reaction time, and speed should be assessed and improved all the time. The table below shows how performance metrics relate to telling the story of how Warehouse activities are going.

Table 1: Warehousing / Storage performance indicators

Quality Indicators	Response Time Indicators	Cost/Financial Indicators	Productivity Indicators
Inventory accuracy rate	Warehouse order / processing time	Total warehousing cost	Storage space usage
Put-away accuracy	Customs clearance cycle	Value of product damaged in the warehouse	Units moved per person hour
Picking accuracy rate	Put-away time		% of storage space dedicated for handling
Warehouse accident rate	Defined security measures		

Source: A modified adoption from (Aronovich et al., 2010)

Conceptual Framework

Figure 1 is the conceptual framework constructed for this study, based on the methodologies and concepts discovered in the literature survey. The framework's goal is to make clear the study's conceptual logic and direction. It engages with prominent ideas and elucidates the importance of the notions in this study. Since this research aims to ascertain warehousing management techniques, it is essential to first delineate the primary activities involved in warehousing management.

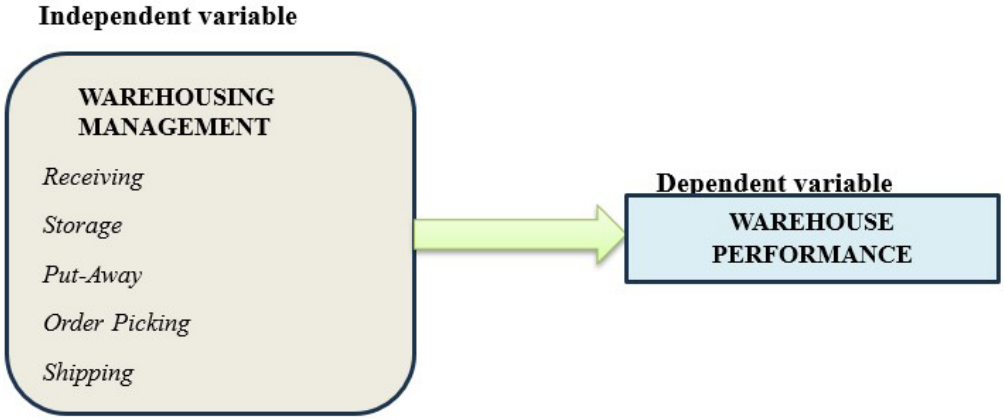

Figure 1: Conceptual frameworks of the study
Source: Authors own construct, 2024

MATERIALS AND METHODS

This study utilized a quantitative research methodology. The quantitative technique is a way to gather and analyze quantitative data (Creswell, 2011). Data were predominantly collected using a questionnaire, resulting in quantitative data. We did a correlation analysis to find out how the independent elements of warehousing management were related to the dependent variable of warehouse performance. A descriptive research design was utilized. Convenience sampling was used to choose employees from each department (Warehousing Management, Transportation Management, and Customer Response). We used the Yamane sampling determination model to find a statistically viable sample size of 101 people from the three departments we were interested in.

$n= N/(1+N(e^2))$

where: n = sample size; N = target population; and e = level of precision. Expected precision level = 95%, the sample size was: (n) = 135/ $(1+135\ (0.05)^2)$ = 101.

The model (Multiple Linear Regression) developed for the study is stated below:

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \ldots\ldots + \beta_nX_n + \varepsilon i$

Where Y is the dependent variable (how well the warehouse works). Xn is a set of independent variables that includes receiving, storing, picking orders, putting things away, and shipping. β0 stays the same. The coefficients of the independent variables X1 to Xn are β1, βn. ε is a term for an error.

RESULTS AND DISCUSSION

Regression Analysis

Regression analysis is a technique used to predict an outcome variable using either a single predictor variable (simple regression) or many predictor variables (multiple regression) (Shiau & Lee, 2010). The goal of this study is to find out how managing a warehouse affects its performance.

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.652[a]	.425	.394	9.16803
a. Predictors: (Constant), Storage, Order picking, Shipping, put away, Receiving				
b. Dependent Variable: Warehouse performance				

Source: Own Survey, 2024

The summary of the study model is displayed in Table 2 above. This summary identifies the importance of warehousing management dimensions in elucidating warehouse performance. The table indicates that the R-squared value is 0.425, while the adjusted R-squared value is 0.394, signifying that 39.4% of the variation in the dependent variable is elucidated by the independent variables incorporated in the model. This indicates that 39.4% of the variation in the warehouse performance of Tema Oil Refinery is influenced by warehousing management.

Table 3: ANOVA[a]

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	5890.784	5	1178.157	14.017	.000[b]
Residual	7985.018	95	84.053		
Total	13875.802	100			
a. Dependent Variable: Warehouse performance					
b. Predictors: (Constant), Storage, Order picking, Shipping, put away, Receiving					

Source: Own Survey, 2024

The above table 3 shows ANOVA. The goal of this study is to find out how warehousing management affects warehouse performance. This analysis is also used to find out if the model is good for figuring out how warehousing management affects warehouse performance. The model's F-statistic value is 14.017, which is significant at 0.000. This means that the model utilized is good for explaining how warehousing management affects warehouse performance. This means that how well Tema Oil Refinery manages its warehouses has a big effect on how well they work.

Table 4: Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	21.482	7.422		2.894	.005
Receiving	.441	.138	.290	3.197	.002
Shipping	.831	.295	.259	2.817	.006
Put away	.379	.188	.169	2.019	.046
Order picking	-.300	.128	-.185	-2.344	.021
Storage	.269	.126	.175	2.139	.035
a. Dependent Variable: Warehouse performance					

Source: Own Survey, 2024

Table 4 above shows how each part of warehousing management affects the whole. The researcher utilized unstandardized coefficients and their respective signs to evaluate the influence on warehouse performance. The coefficient of receiving is statistically significant at the 0.01 level and is positive. The positive coefficient shows that improving the receiving part of warehouse management improves the performance of the organization's warehouse, as long as other parameters stay the same. This shows that warehouse receipt makes the organization's warehouse work a lot better. Frazelle (2002) supports this result. Receiving is the most important part of all the other warehousing processes. Managing merchandise well during put away, storage, picking, and shipping and receiving involves a number of steps that make sure all materials entering the warehouse are received in an orderly manner, that the quantity and quality of these materials match the order, and that they

are sent to storage or other places. The shipping coefficient is positive and statistically significant at the 0.01 level, which shows that shipping has a positive effect on warehouse performance. The positive shipping coefficient means that if shipping goes up, warehouse performance goes up as well. If shipping goes down, warehouse performance goes down as well, as long as all other factors stay the same. This shows that the port's shipping and dispatching activities help the organization's warehousing operations. This result is in line with what Shiau and Lee (2010) said: shipping is the process of checking, packing, palletizing, and loading products onto a carrier so that they can be delivered later.

The put-away coefficient is both positive and statistically significant at the 0.05 level. The positive coefficient means that if storage space increases, the company's warehouse will work better, as long as nothing else changes. This means that the put-away process is helping the organization's warehouse work better. This outcome corresponds with the conclusions of Bartholdi and Kackman (2011). After that, this information will be used to make useful pick lists that will help order-pickers get things for customers. Moving things a long way to their storage facility may make the put-away process take longer. An order picking coefficient that is both negative and significant shows that it has a bad but big effect on warehouse performance. This conclusion is at odds with what Collins *et al.* (2006) found when they used warehouse indicators like picking and inventory accuracy to do a multi-attribute utility theory study to discover the best warehouses. The storage coefficient is both positive and statistically significant at the 0.05 level. The positive coefficient means that, all other things being equal, an increase in storage is linked to better warehouse performance for the company. This shows that storage is helping the organization's warehouse work better. Frazelle (2002) agrees with this finding.

The storage plan depends on the size and amount of the things in stock, as well as how the product or its container should be handled. The connection between the dependent variable Y and the independent variables X1, X2, X3, and so on. You can write Xn as $Y = \beta0 + \beta1X1 + \beta2X2 + \beta3X3 + \beta4X4 + \beta5X5 + e$. In this instance, β0 signifies a constant, whereas βn indicates the coefficient of independent variables (Satendra *et al.*, 2011). The researcher utilized unstandardized coefficients to create a regression equation (Pallant & Julie, 2005). Coefficient table 4 shows that the equation for Warehousing Management is: Warehousing Management = 21.48 + 0.441 receiving + 0.831 shipping + 0.379 put away + 0.269 storage - 0.300 order selection.

Table 5: Linear relationship (Pearson Correlation) between the variables

		Warehouse performance	Receiving	Storage	Shipping	Put away	Order picking
Warehouse performance	Pearson Correlation	1					
	Sig. (2-tailed)						
	N						
Receiving	Pearson Correlation	.507**	1				
	Sig. (2-tailed)	.000					
	N	101					
Storage	Pearson Correlation	.298**	.217*	1			
	Sig. (2-tailed)	.002	.029				
	N	101	101				
Shipping	Pearson Correlation	.487**	.481**	.134	1		
	Sig. (2-tailed)	.000	.000	.183			
	N	101	101	101			
Put away	Pearson Correlation	.345**	.190	.232*	.320**	1	
	Sig. (2-tailed)	.000	.057	.020	.001		
	N	101	101	101	101		
Order picking	Pearson Correlation	-.218*	-.116	.075	-.058	.015	1
	Sig. (2-tailed)	.029	.247	.458	.568	.882	
	N	101	101	101	101	101	

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Source: Own Survey, 2024

This study utilized both descriptive and explanatory methodologies to fulfill the specified objectives. Correlation analysis is an explanatory method designed to elucidate the relationship between independent variables in warehouse management and the dependent variable of warehouse performance. The Pearson correlation method is used to find the correlation, assuming that the variables have a linear connection. Table 5 shows the correlation coefficients and the levels of significance that go with them. The correlation between receiving and warehousing performance is positive and significant ($r=0.507$, $N=101$, $p<0.01$), suggesting a link between the two variables. There is a strong and positive relationship between storage and warehouse performance ($r=0.298$, $N=101$, $p<0.01$), which means that the two variables are related. There is a strong and significant correlation between put away and warehouse performance ($r=0.345$, $N=101$, $p<0.01$), which means that the two variables are related. There is a strong negative correlation ($r=-0.218$, $N=101$, $p<0.05$) between order picking and warehouse performance, which means that the two variables are related in the opposite way. There is a strong and positive association between shipping and warehousing performance ($r=0.487$, $N=101$, $p<0.01$).

Discussion of Results

This study sought to examine the influence of warehousing management on the operational efficiency of the Tema Oil Refinery's warehouse. Different books and real-world examples of organizations use receiving, storage, put-away, order selection, and shipping/dispatching as ways to measure how well they manage their warehouses. We got information about warehouse management and how it affects warehouse performance by using a questionnaire and interviews. The independent variables in the study have a big effect on the dependent variables. The organization has low shelves, pallets, and racks where they can store things. The failure to update material records contributes to deterioration and theft. The organization doesn't have a good means to put away received objects, and it's not making good use of the storage spaces it has. Also, there isn't enough information on where things are. Stoltz *et al.* (2017) stress that augmented reality (AR) technology has a lot of potential to improve warehouse operations by making processes like picking and managing inventory more accurate and efficient. They do, however, stress that high implementation costs, technology limitations, and user resistance could make it hard for warehouses to widely adopt it.

On the other hand, the organization does not do a good job of inspecting and cleaning storage spaces on time, and the items are not stored in a way that follows a code. Also, item retrieval doesn't follow the order of customer orders, especially when it comes to choosing an order. The design of the warehouse system doesn't work well enough to improve customer service when orders are being picked. The business has trouble getting goods to end users according to their order specifications and meeting the best order delivery times. There are also problems with the inventory in the warehouse, items not being safe, and a lot of mishaps. Also, items are not always kept in the right places, and not enough is being done to lower the expenses of storing and handling inventories.

CONCLUSION

The study shows that warehousing plays a vital role in business operations by providing storage, ensuring supply availability, reducing risk, facilitating goods movement, and supporting customer service. The main reason companies implement warehouse management is to store materials safely while maintaining quality. The research finds a strong link between effective warehouse management and improved warehouse performance. However, many organizations struggle to deliver efficient warehousing services due to issues such as unskilled personnel, poor storage equipment, high costs, lack of safety measures, neglect of customer orders, poor communication, and inadequate facility maintenance Regression analysis identifies receiving, storage, putting away, order picking, and shipping as key functions that directly affect performance. The study concludes that to achieve better warehouse performance in terms of quality, cost-effectiveness, responsiveness, and productivity, companies must improve their warehouse management systems. Investing in skilled staff, proper equipment, and better processes is essential for optimizing warehouse operations.

RECOMMENDATION

Management should make the most of the space they have in the warehouse, use lean inventory practices (like getting rid of or cutting back on safety stocks and encouraging suppliers to deliver smaller amounts more often), use enabling technology (like a warehouse management system (WMS) or an ERP system with a strong WMS module to suggest the best routes and methods for picking or putting away), organize workstations to cut down on the time workers spend looking for tools or equipment, and use the "5S" method—Sort, Set in order, Shine, Standardize, and Sustain—to cut down on clutter, mistakes, and improve safety.

Policy Implication

Enhanced Operational Efficiency

Improving warehousing management practices can lead to better operational efficiency at the Tema Oil Refinery. This includes optimizing inventory levels, reducing storage costs, and ensuring timely delivery of products, which can contribute to the overall performance and profitability of the refinery

Regulatory Framework

There is a need for a robust regulatory framework to oversee warehousing operations. This includes setting standards for warehousing units, ensuring compliance with safety and environmental regulations, and providing guidelines for effective warehouse management

Investment in Training and Technology

Based on this study, there is the need for policies that promote investment in employee training and modern warehousing technologies. Implementing advanced management systems can optimize warehouse operations, leading to enhanced performance and reduced operational risks.

Enhanced Safety and Compliance Protocols

Given that warehousing in oil refineries involves hazardous materials, the study prompts policymakers to develop stricter safety and compliance measures to minimize risks related to storage, handling, and distribution of oil and gas products.

Incentives for Efficiency

Policies could be designed to incentivize companies that adopt best practices in warehousing management. These incentives could be in the form of tax benefits or subsidies for investing in better infrastructure and technology that improve warehouse performance.

Environmental Considerations

Given the environmental sensitivity of oil refineries, the research suggests policies that encourage sustainable warehousing practices. This could include regulations for waste management, pollution control, and energy efficiency in storage operations.

Practical Implication for Business

The findings highlight specific warehousing practices that can directly enhance the efficiency of operations at Tema Oil Refinery. This could involve better inventory management, streamlined storage processes, and optimized space utilization, leading to reduced lead times and improved productivity. Effective warehousing management can reduce stock discrepancies, improve inventory tracking, and minimize overstocking or stockouts. Implementing these findings can help the refinery better manage its raw materials and products, reducing waste and lowering operational costs. Improved warehousing practices leads to cost savings in areas such as labor, storage, and equipment maintenance. By identifying inefficiencies in the current warehousing setup, the refinery can implement cost-effective solutions, such as automation or better layout design, to cut unnecessary expenses.

The study reveals gaps in safety protocols related to warehousing operations, especially when dealing with hazardous materials. Addressing these gaps can reduce workplace accidents, equipment damage, and potential environmental hazards, leading to safer working conditions. The research may suggest that adopting modern warehousing technologies, such as Warehouse Management Systems (WMS), barcode scanning, or automated retrieval systems, can greatly improve performance. These technologies can enhance accuracy, speed up processes, and provide real-time data for better decision-making. Findings may encourage the refinery to improve its integration with other parts of the supply chain, ensuring smoother coordination between warehousing, procurement, and distribution. This could result in a more seamless flow of materials, reducing bottlenecks and improving overall supply chain performance.

These practical implications can guide managers and decision-makers at Tema Oil Refinery in adopting actionable improvements that directly boost warehouse performance and contribute to overall organizational success

Direction for Further Research

The researchers did not investigate the impact of warehousing management on organizational performance because of the limitations of the research objective. Subsequent research may investigate the impact of warehouse management on organizational performance. Additionally, the current study employed five characteristics as independent variables within warehousing management dimensions and analysed their influence on warehouse performance. This indicates that additional variables pertaining to warehousing dimensions were not taken into account. Therefore, it is recommended that future investigations consider additional aspects of warehousing dimensions, such as packing, packaging, and accumulation, and evaluate their influence on warehouse performance.

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