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Improving Warehouse Efficiency Through Effective Inventory Management Practices

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ABSTRACT

Several business establishments have used inventory management strategies to strike a balance between responsiveness and efficiency. This study's primary objective was to assess the effect of inventory management practices on the warehouse efficiency of supermarkets and retail stores in Kedah and Perlis, specifically supermarkets. This study utilises a quantitative method by using primary data from questionnaires and secondary data compiled from prior studies' results. Statistical Packages for the Social Science (SPSS) version 25 software was used to analyse the data. The relationship between the independent and dependent variables was determined using regression analysis. The outcome showed that the inventory reorders point and supplier partnership management variable were accepted. However, the information technology hypothesis was rejected. This study recommends that supermarkets and retail stores utilise the best inventory management strategies to increase warehouse efficiency. It enables the tracking of stock unit movement in the warehouse, facilitates stock counting in the warehouse, maximises the use of available warehouse space, improves inventory data accuracy, reduces inventory theft, and enhances inventory cycle counting.

Keywords: *inventory management practices, regression analysis, warehouse efficiency*

INTRODUCTION

Warehouse management is one of the essential aspects of corporate operations, especially for delivering to customers' high demands. The problem has intensified as technological advancements have made it possible for businesses to make things at a more incredible pace, design variety, and quality (Letinkaya & Lee, 2000). An essential advantage of systematic warehouse management is the ability to cut expenses associated with inventory holding, stock-out charges, and purchase prices by purchasing in quantity and speculating on price fluctuations (Jonsson & Mattsson, 2008; Koumanakos, 2008; Ahmad & Zabri, 2018).

Warehouses also play a crucial part in the supply chain processes of businesses Perkumienė *et al.* (2022). Well-managed warehouse systems enable a business to maintain adequate inventory management, maintain inventory levels as required, increase dependability, reduce labour costs, and guarantee correct maintenance and inventory processing (Tien *et al*., 2019). Good warehouse management will have a positive effect on the overall success of the organisation. However, most businesses today still need to address the warehousing issue seriously.

For instance, commodities and shipments from the same warehouses are stored and shipped in a disorderly manner. According to Kallina & Lynn (2015), products are transferred from the storage area to a different position where they are selected to fulfil pending orders. However, the issue is in the locating of products in the staging area which is a problem due to improper warehousing management that resulted in unnecessary labour expenses.

Moreover, according to Perkumienė *et al.* (2022), the leading retail warehousing concern is in terms of the lack of space. In order to satisfy a company's requirements, it must own or rent warehouses with sufficient capacity. However, ordering more products than the available space allows might lead to an underestimation of the required time. This issue emerges because of ineffective business practices, such as inefficient utilisation of available space and delays in delivering commodities to their final destinations (Perkumienė *et al.,* 2022).

This research will thus examine inventory management in both the literature and empirical aspects. Undeniably, inventory management has become widespread in retail outlets worldwide, owing to the multiple benefits a business has from regulating its inventories. Retail outlet manages inventory to determine and maintain the optimal stock rate investment for achieving the required operational quality. Retailers have continuously maintained inventories to enhance their operations and fulfil customer demand. To fulfil customer demand, businesses must guarantee that stock-outs are prevented without incurring excessive inventory expenditures. However, past research has yet to discuss inventory management systems in connection to the efficiency of retail warehouse storage. As a result, this study aimed to examine the impact of inventory management practices on warehouse efficiency among retail outlets in Kedah and Perlis through an assessment of inventory re-order points, supplier management, and information technology.

LITERATURE REVIEW

Warehouse Efficiency

Warehouses are among the most intensive supply chain nodes in today's market. According to Kolinski & Sliwczynski (2015), it is relatively challenging to define warehouse efficiency. Generally, efficiency may be described as a measurement (typically stated as a percentage) of the actual output to the standard output predicted. According to Jermsittiparsert *et al.* (2019), a warehouse is a structure for storing commodities. In today's climate, warehouses can be as simple as a garage-like section in a self-storage facility or as complicated as a massive facility that simultaneously stores things and supports many value-added businesses (Karagiannaki *et al.*, 2011).

Warehouses are used by producers, importers, exporters, wholesalers, transporters, and many more. A warehouse is a supply chain facility in which aggregates items to cut transportation costs, gain manufacturing or purchasing economies of scale, or provide value-added operations and reduce waiting times (Ramaa *et al.*, 2012). As underlined by Jermsittiparsert

et al. (2019), warehouse operations are to be planned and handled which include inbound flow management, inventory-to-location allocation, product processing, order-to-stock allocation, order batching and release, order selection, packing, value-added logistics and shipping. A production warehouse stores raw materials, semi-finished goods and final items at a manufacturing facility. A contract warehouse is a distribution operation performed for one or more clients.

According to Jermsittiparsert *et al.* (2019), warehouses assess their efficiency using a variety of indicators that may be categorised as operations and stocking efficiency. The primary objective of operational metrics is to analyse the success of the warehouse's material handling operations, regardless of whether people, automation, or a combination of both handle them. In addition, according to Karim *et al.* (2021), warehouse efficiency is a collection of metrics that primarily quantify warehouse space capacity. According to Jermsittiparsert *et al.* (2019) and Kithinji (2015), the effectiveness of warehouse efficiency can be measured by the following: enabled tracking of stock unit movement in the warehouse made stock-taking in the warehouse easier, more efficient use of available warehouse space, greater data accuracy on inventories, decreased inventory theft, and enhanced cycle counting.

Inventory Re – Order Point

Reorder point (ROP) known as necessary storage or inventory level for a particular product that, when reached, prompts the reordering of additional inventory (Lopienski, 2019). It is crucial for supply chain management (Nobil *et al.*, 2020). The reorder point is one of the most effective methods for improving safety stock management, productivity, inventory expenses, and income (Inprasit & Tanachutiwat, 2018).

According to Gitonga *et al.* (2012), the practical reorder point is determined by the inventory and the required delivery time throughout the lead time (i.e., the gap between the order date and the arrival of the ordered inventory and the storage stock kept as a shortage buffer due to demand fluctuations). Moreover, Victoire (2015) demonstrated that the following factors are considered when determining the amount of reorder: the consumption rate of the material, the lead time, the time necessary to

receive a new shipment, the reorder quantity, and the minimum level. The reorder point may be calculated using the following formula:

- Re-order level = Minimum level + consumption during period required to get fresh delivery.
- Re-order level = Maximum consumption x Maximum Re-order Period.

The main importance of reorder point is s a critical milestone for companies to decide about an appropriate time of ordering such that they avoid overstocking or shortage (Nobil *et al.*, 2020). Therefore, when the forward inventory of an item reaches the reorder point, an internal replenishment from the reserve area to the forward area is completed.

Supplier Partnership Management

Supplier Partnership Management is known as a process of establishing and sustaining cooperative partnerships with a company's suppliers to obtain reciprocal advantages, such as cost reductions, higher efficiency, and enhanced quality (Sodhi & Chopra, 2004; Monczka *et al.*, 2020). It also requires interacting directly with suppliers to comprehend their skills, strengths, and shortcomings and find improvement possibilities (Monczka *et al*., 2020). It shows that in order to have proper supplier partnership management, it is crucial for every company to have appropriate communication in order to avoid any misunderstanding during the partnership process.

According to Monczka *et al.* (2020), effective supplier partnership management necessitates a systematic strategy, with businesses constantly pursuing suitable suppliers that match their values and objectives and are eager to cooperate and develop. In addition, it entails creating clear communication lines, defining performance criteria that are mutually agreed upon, and conducting continuous improvement initiatives (Sodhi & Chopra, 2004).

In short, supplier partnership management is a crucial aspect of supply chain management that may aid expense reduction, quality improvement, and innovation development (Monczka *et al*., 2020). Establishing collaborative connections with suppliers is vital for obtaining these benefits,

and various activities, ranging from cooperative product creation to shared risk management, may be utilised to foster these partnerships (Monczka *et al.*, 2020).

Information Technology

Commonly, Information Technology (IT) is typically characterised as a tool, such as computer software and hardware technologies, required to assist the management, operations, and strategists in boosting an organisation's productivity (Sabirin *et al.*, 2022). Technology is created to resolve industrial issues and meet market demands (Sabirin *et al*., 2022).

Regarding inventory management, Information Technology is a tool for boosting productivity and reducing costs (Kithinji, 2015). According to Karagiannaki *et al.* (2011), market competition necessarily requires constant enhancement in the design and operation of warehouses, which either changes the proper function of a warehouse or assumes that warehouses face the challenge of enhancing their activities with new information technologies as a catalyst for better corporate practices and not as a cost of conducting business. Information technology is required to monitor and manage inventories for a successful inventory system (Ontita, 2016).

In addition, Fatima *et al.* (2022) stated that with the advancement of Information Technology, it is feasible to create solutions that may assist management in handling warehouse and inventory challenges more effectively. The use of technology facilitates the maintenance of accurate records and optimal inventory levels. Kmiecik *et al.* (2022) revealed that technology could aid inventory control in estimating the optimal quantity of inventories to keep and transport to meet the customers' needs. According to Onita (2016), Electronic Data Interchange (EDI) services are utilised with the usage of information technology. For example, barcodes improve the movement of items and data across the organisation. This technology enables direct contact between different entities involved in inventory management. In addition, electronic point of sale (EPOS) is another inventory management technology. According to Kmiecik *et al.* (2022), EPOS aims to scan and record information regarding sold products. An EPOS system validates checks, offers real-time sales figures, charges transactions, and transmits intra- and inter-store communications.

Research Framework

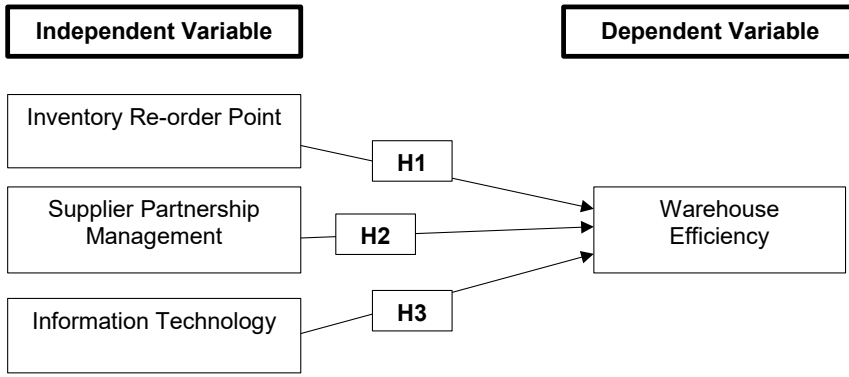

Figure 1: Research Framework

Hypothesis

H_1: There is significant relationship between Inventory Re-order Point and Warehouse Efficiency.

H_2: There is significant relationship between Supplier Partnership Management and Warehouse Efficiency.

H_3: There is significant relationship between Information Technology and Warehouse Efficiency.

METHODOLOGY

This section discusses the practical application of variables obtained from this study and the measuring instruments for each construct derived from prior research in the same area. Additionally, this study analysed the dependent and independent variables with existing research approaches in mind. Quantitative methods were used over qualitative ones because they are more applicable to the study's larger population sample (Hanafi *et al*., 2022). Comparatively, qualitative methods need limited surveys and time-consuming interviews (Hanafi *et al*., 2022). Malaysian store supervisors and managers in Perlis and Kedah comprise the study's population. In this study, a sample of supervisors and managers will be chosen since the role would involve inventory management. There are 272 supermarkets and

retail stores in Kedah and Perlis, with 76 in Perlis and 196 in Kedah. As a result, this study employs simple random sampling as the sampling technique and chooses supermarkets and retail stores by an odd number, resulting in the selection of 136 supermarkets and retail stores have been chosen. The majority of the survey was conducted online, while the remainder was conducted in person to managers or supervisors. The survey for this study was done using a Likert-scale questionnaire. Moreover, the Likert scale gives a measure of agreement based on the thoughts of responders. Version 26 of the Statistical Package for the Social Sciences (SPSS) was used to analyse the data for this study.

FINDINGS

Demographic Analysis

Based on Table 1, the majority of the supermarkets surveyed have been operating for over 10 years (58.8%), with a smaller percentage having been in operation for 6-10 years (20.6%), 2-5 years (16.9%), and less than 1 year (3.7%). In terms of inventory management practices, the most commonly used practice was supplier partnership management (49.3%), followed by inventory re-order point (32.4%) and information technology (18.4%). When it comes to the frequency of inventory monitoring, the most common frequency was weekly (41.0%), followed by daily (33.3%), monthly (20.5%), and quarterly (5.1%). Similarly, the most frequent frequency of order inventory was weekly (46.2%), followed by monthly (28.2%), quarterly (15.4%), and daily (10.3%).

Table 1: Demographic Analysis

Profile	Description	Frequency	Percentage (%)
Operation Year of Supermarkets	Below 1 Year	5	3.7
	2 – 5 Years	23	16.9
	6 – 10 Years	28	20.6
	Above 10 Years	80	58.8
Inventory Management Practices	Inventory Re-order Point	44	32.4
	Supplier Partnership Management	67	49.3
	Information Technology	25	18.4
Frequency of Inventory Monitoring	Daily	45	33.3
	Weekly	56	41.0
	Monthly	28	20.5
	Quarterly	7	5.1
Frequency of Order Inventory	Daily	14	10.3
	Weekly	63	46.2
	Monthly	38	28.2
	Quarterly	21	15.4

Reliability Analysis

Cronbach's alpha is commonly utilised to measure reliability, which quantifies the degree of random measurement error in a sum score or average derived from a multi-item measurement scale (Hayes & Coutts, 2020). Therefore, the result of the reliability test for each variable in this study is summarised in Table 2. It shows that Cronbach's alpha value for supplier partnership management got the highest value of Cronbach's alpha (0.907) which indicates the value is excellent. It is followed by Warehouse Efficiency (0.808), information technology (0.804) and inventory re-order point (0.801), which the values imply as good value.

Table 2: Reliability Result

Variables	Cronbach's Alpha	Items (N)	Status
Inventory Re-order Point	0.801	6	Good
Supplier Partnership Management	0.907	7	Excellent
Information Technology	0.804	6	Good
Warehouse Efficiency	0.808	6	Good

Regression Analysis

Based on the Table 3, the relationship between supplier partnership management and warehouse efficiency is favourable and statistically significant ($p = 0.000$). Same with the relationship between inventory reorder point and warehouse efficiency is statistically significant ($p = 0.005$). The relationship between information technology and warehouse efficiency, however, is not statistically significant ($\beta = 0.033$, $p = 0.716$).

Table 3: Regression Test

Variables	Beta (β)	Standard Deviation	*T* - Values	*P* - Values
Inventory Re-order Point	-0.425	0.856	-2.985	0.005
Supplier Partnership Management	1.255	0.927	2.192	0.000
Information Technology	0.033	0.845	0.367	0.716

DISCUSSION

The inventory re-order point has a significant relationship with warehouse efficiency, with a significant value of 0.005 based on the findings of table 3. Most supermarkets in Kedah and Perlis utilised inventory re-order point procedures to manage their warehouses. Due to insufficient inventory, potential sales will be lost and warehouse space will be wasted since not enough products will be stocked. According to Thayer (2016), the re-order point formula will assist supermarkets and retail stores in maintaining adequate inventory to fulfil demand while minimising surplus inventory. The inventory re-order point reveals the supermarkets and retail stores best techniques for maintaining warehouse efficiency.

According to Table 3, supplier partnership management has a significant association with warehouse efficiency, with a significance level of 0.000. Supplier partnership management is one of the most critical warehouse efficiencies practices that supermarkets or retail stores must undertake. According to Davies (2022), applying supplier partnership management methods inside an organisation will result in several benefits, including decreased costs, increased efficiency, reduced price volatility, outsourcing some operations, and continuous improvement. Long-term cost reductions may be pursued by a business with strong relationships with its major suppliers. A solid working connection with all suppliers may result in cost savings and reduce current difficulties, quality concerns, and delivery delays. This finding is also supported by Yen (2019), who states that automated inventory counts provide more accuracy and will lower warehousing expenditures.

Based on Table 3, the *p*-value of 0.71 suggests that no significant relationship exists between information technology and warehouse efficiency. Hence the hypothesis is rejected. It demonstrates that most supermarkets and retail stores have negative opinions of the impact of using information technology practices in warehouse management. According to Scalzo (2019), deploying information technology might provide several difficulties for operations managers and supervisors in general. Scalzo (2019) stated that the problems might include the initial cost of implementation, the sourcing of new technical personnel, and increasing operating costs due to the rapid technological change. Concerning this study, supermarket and retail store managers and supervisors cannot afford to employ information technology practices in their operations.

LIMITATION AND FUTURE RESEARCH

This research limits its focus on the supermarkets and retail stores only in Kedah and Perlis which seek to find the perceptions among the respondents towards the effect inventory management practices towards warehouse efficiency. Thus, the findings of this study cannot be used to generalise the supermarkets and retail stores in the whole of Malaysia.

Due to some limitations of this study, there are some recommendations for the future scope includes by conducting the same research, the number of populations and sample sizes need to be increase. Future study should sample in the whole Malaysia in order to get the best views of the problems. Future study can increase the other inventory management practices as the independent variables such as inventory planning, cross- docking, demand forecasting and others.

Furthermore, future research should analyse the mediating effect between the independent variable (Inventory Re-order Point, Supplier Partnership Management, Information Technology) and dependent variable (Warehouse Efficiency. The possible mediating variable is Inventory Management System (IMS). It is a software program that enables organisations to monitor inventory levels, orders, sales, and delivery. The IMS can optimise the inventory re-order point, assist supplier partnership management, and increase warehouse efficiency via real-time monitoring, automatic re-ordering, and improved decision-making.

REFERENCE

Ahmad, K., & Zabri, S. M. (2018). The mediating effect of knowledge of inventory management in the relationship between inventory management practices and performance: The case of micro retailing enterprises. *Journal of Business and Retail Management Research, 12*(2), 83-93.

Davies, J. (2022, September 6). *The benefits of supplier relationship management.* Winman. https://www.winman.com/blog/bid/366854/the-benefits-of-supplier-relationship-management

Fatima, Z., Tanveer, M. H., Zardari, S., Naz, L. F., Khadim, H., Ahmed, N., & Tahir, M. (2022). Production plant and warehouse automation with IoT and industry 5.0. *Applied Sciences, 12*(4), 2053. https://doi.org/10.3390/app12042053

Gitonga, F., Seriah, G., & Mercy, C. (2012, August). *An evaluation on the effects of inventory management practices on an organization.* Academia. *edu*. https://www.academia.edu/4172336/AN_EVALUATION_ON_THE_EFFECTS_OF_INVENTORY_MANAGEMENT_PRACTICES_ON_AN_ORGANIZATION

Hanafi, A., Mustafa, W. M. W., Kassim, M. A. M., & Safizal, M. (2022). Purchase intention on cars among Malaysian in the central region of Malaysia. *International Journal of Business and Technopreneurship, 12*(3), 73-84.

Hayes, A. F., & Coutts, J. J. (2020). Use omega rather than Cronbach's alpha for estimating reliability. But…. *Communication Methods and Measures, 14*(1), 1-24. https://doi.org/10.1080/19312458.2020.1718629.

Inprasit, T., & Tanachutiwat, S. (2018, July). Reordering point determination using machine learning technique for inventory management. In *2018 International Conference on Engineering, Applied Sciences, and Technology (ICEAST)* (pp. 1-4). IEEE. https://doi.org/10.1109/ICEAST.2018.8434473.

Jermsittiparsert, K., Sutduean, J., & Sriyakul, T. (2019). Role of warehouse attributes in supply chain warehouse efficiency in Indonesia. *International Journal of Innovation, Creativity and Change, 5*(2), 786-802.

Jonsson, P., & Mattsson, S.-A. (2008). Inventory management practices and their implications on perceived planning performance. *International Journal of Production, 46*(7), 5-28. https://doi.org/10.1080/00207540600988071

Kallina, C., & Lynn, J. (2015). Application of the cube-per-order index rule for stock location in a distribution warehouse. *Interfaces, 7*(1), 37-46.

Karagiannaki, A., Papakiriakopoulos, D., & Bardaki, C. (2011). warehouse contextual factors affecting the impact of RFID. *Industrial Management & Data Systems, 111*(5), 714 – 734. https://doi.org/10.1108/02635571111137278

Karim, N. H., Abdul Rahman, N. S. F., Md Hanafiah, R., Abdul Hamid, S., Ismail, A., Abd Kader, A. S., & Muda, M. S. (2021). Revising the warehouse productivity measurement indicators: Ratio-based benchmark. *Maritime Business Review, 6*(1), 49-71. https://doi.org/10.1108/MABR-03-2020-0018

Kithinji, F. M. (2015). Impact of information technology on inventory management in supermarkets in Nairobi City County. Doctoral dissertation. University of Nairobi.

Kmiecik, M. (2022). Logistics coordination based on inventory management and transportation planning by third-party logistics (3PL). *Sustainability, 14*(13), 8134.

Kolinski, A., & Sliwczynski, B. (2015). Evaluation problem and assessment method of warehouse process efficiency. In *Proceedings of The 15th International Scientific Conference Business Logistics in Modern Management* (pp. 289-297).

Koumanakos, D.P (2008).The effect of inventory management on firm performance. *International Journal of Productivity and Performance Management, 57*, 355-369.

Letinkaya, S. & Lee, C.Y. (2000). Stock replenishment and shipment scheduling for vendor-management inventory system. *Management Science, 46*(2), 26-32.

Lopienski, K. (2019, August). *How to calculate reorder points with the ROP formula*. ShipBob. https://www.shipbob.com/blog/reorder-point-formula/

Monczka, R. M., Handfield, R. B., Giunipero, L. C., & Patterson, J. L. (2020). *Purchasing and Supply Chain Management.* Cengage Learning.

Nobil, A. H., Sedigh, A. H. A., & Cárdenas-Barrón, L. E. (2020). Reorder point for the EOQ inventory model with imperfect quality items. *Ain Shams Engineering Journal, 11*(4), 1339-1343. https://doi.org/10.1016/j.asej.2020.03.004

Ontita, D. S. (2016). Inventory management approaches and performance of textile manufacturing firms in Kenya. Doctoral dissertation, University of Nairobi.

Perkumienė, D., Ratautaitė, K., & Pranskūnienė, R. (2022). Innovative solutions and challenges for the improvement of storage processes. *Sustainability, 14*(17), 10616.

Ramaa, A., Subramanya, K. N., & Rangaswamy, T. M. (2012). Impact of warehouse management system in a supply chain. *International Journal of Computer Applications, 54*(1), 14-20.

Sabirin, N. H. A., Fadhil, N. F. M., & Arifin, J. (2022). Information technology (IT) in agriculture sector: Issues and challenges. *Social and Management Research Journal, 19*(2), 111-137. https://doi.org/10.24191/smrj.v19i2.19307

Scalzo, C. (2019, December 9). *Challenges of implementing new technology and how to address them.* Online Computers. Retrieved from https://www.onlinecomputers.com/2019/01/challenges-of-implementing-new-technology-and-how-to-address-them/

Sodhi, M. S., & Chopra, S. (2004). Managing risk to avoid supply-chain breakdown. *MIT Sloan Management Review, 46*(1), 53-61.

Thayer, A. (2016, November 8). *Missing sales? Use the reorder point formula.* SKUVAULT. https://www.skuvault.com/blog/reorder-point-formula/.

Tien, N. H., Anh, D. B. H., & Thuc, T. D. (2019). *Global Supply Chain and Logistics Management.* Academic Publications.

Victoire, M. (2015). Inventory management techniques and its contribution on better management of manufacturing companies in Rwanda. *European Journal of Academic Essays, 2*(6), 49-58.

Yen, L. S. (2019, January 12). *Cost reduction strategy through supplier-managed inventory.* SIPMM. https://sipmm.edu.sg/cost-reduction-strategy-through-supplier-managed-inventory/.