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Improving Picking Efficiency in Warehouse Operations

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ABSTRACT

This study examines the factors influencing picking efficiency in warehouse operations, a critical component of supply chain performance. Efficient order picking plays a vital role in ensuring timely delivery, reducing operational costs, and improving customer satisfaction. The research focuses on key variables such as travel time to pick points, search time, retrieval time, return time, application of warehouse management systems (WMS), routing policies, and relocation of fast-moving items. A quantitative research approach was adopted using both primary and secondary data. Primary data were collected through questionnaires distributed to 100 employees working in private sector organizations with warehouse operations. The data were analyzed using statistical techniques, particularly the one-sample t-test, to evaluate the proposed hypotheses. The findings indicate that all selected factors significantly contribute to improving efficiency. Specifically, reducing travel, search, retrieval, and return times enhances operational performance, while the implementation of WMS and effective routing policies further optimizes warehouse processes. Additionally, proper placement and relocation of fast-moving items were found to play a crucial role in minimizing delays and improving accessibility. The study concludes that systematic warehouse management practices, supported by technology and efficient layout design, are essential for achieving higher picking efficiency. These findings provide valuable insights for warehouse managers and organizations seeking to enhance operational productivity and customer service in a competitive business environment.

Keywords: Picking Efficiency, Warehouse Operations, Public Sector, Warehouse Management Systems

INTRODUCTION

Retrieving the stock keeping units placed in the warehouse often becomes a matter of being able to serve or not serve the customer. Material made inaccessible due to poor placing often result in inability to serve the customer. At other times, retrieving the material from inaccessible places increases the costs of warehouse operations. Due attention to warehouse layout with focus on not just storing the material but also on ability to easily pick the materials helps in improving warehouse operating efficiency. Reorganization of picking operations in warehouse is all about the systems, people, training and processes (Stolarczyk, 2010).

Efficient warehouse operation requires close collaboration between various functional areas. Continuous training of employees, strategically placement of merchandise and exploration of new technology opportunities also lead to an efficient warehousing (Rider, 2011).

Distributors and manufacturers are also judged by the efficient delivery of goods to their customers and not only by the worth of their products. Focus of a manager remains on all of the functions of supply chain that includes procurement of materials, manufacturing, warehousing, distribution and other channels. These are the functions where improvement in performance can be achieved. In a larger perspective of the supply chain, the warehouse managers emphasize on the productivity in the warehousing system. This emphasis includes issues like planning, control and design of these systems. This research focuses on the warehouse's picking efficiency. Fast delivery of orders is the main concern of the customers and retailers, and it needs to be in perfect connection with the measures for an efficient warehouse. Batching of orders and order picking are both main problems in the operations of a warehouse. Batching reduces how long a customer must wait for his order. It increases the output and even reduces the average time of travel. It effectively uses the resource of machine, people and time (Won & Olaffson, 2005).

The objective of this research is to study picking efficiency improvements in warehouse operations.

Stock location in warehouse is a major concern for efficient warehouse management. Shelving, isle spacing, warehouse management systems all focus on ease of placement and retrieval of stock keeping units stored in the warehouse. An ill-managed warehouse where incoming stock is mindlessly placed without consideration of retrieval makes picking difficult and affects customer service and warehouse operation costs.

The objective of this study is to investigate warehouse practices with a focus on picking efficiency. Poor placement/storage result in failure to retrieve the stock keeping units as staff is reluctant to search and retrieve materials if it is hidden behind stacks of other materials. It also wastes a lot of time in picking the right material.
This research would be significant in contributing to warehouse managers' knowledge regarding the importance of warehouse management for efficient picking.

Chapter 1 presents a justification of the research project, providing background and objective of the study. The second chapter comprises of the essence

of research studies confined with various research resources. In this chapter, there is a club of articles, which highlights warehouse management system and picking efficiencies of the warehouse. Chapter 3 presents the research methods employed in this research. Results are covered in the fourth chapter, which demonstrates different variable's relationships. Lastly, all the after-result discussions, conclusions and future research possibilities are covered in chapter five.

Definitions

Warehouse	A large building where raw materials or manufactured goods may be stored prior to their distribution for sale
Warehouse Management System	A Warehouse Management System (WMS) is a key part of the supply chain and primarily aims to control the movement and storage of materials within a warehouse and process. The associated transactions, including shipping, receiving, put away and picking

LITERATURE REVIEW

The supply chain has become a vast field. Science has widened the doors for businesses all over the world. Distributors and manufactures have a very significant role in the field. They have to be very particular in delivering the products to their customers. In these competitive times, efficiency and quick delivery are as important as quality and other elements of the SC. High operational cost and substandard service are the results of an inefficiency in order picking which eventually effects the whole supply chain (Won & Olaffson, 2005).

While viewing the importance of serving the customers, importance of efficient manufacturing, product customization, cycle time reduction and of course, the use of delivery is crucial. SC has to ensure delivering the products on time. For larger businesses, companies have to maintain large warehouses, where wide attention is needed for planning and control. These warehouses are also responsible for adding value to the product for assorting, allocation and repackaging to meet customer requirements. Warehouse operations are depicted in Figure 2.1. The basic operations include receipt of materials received from suppliers or those returned from customers, transfer and storage, picking to meet customer order, sorting, cross docking and shipping (de Koster, Le-Duc & Roodbergen, 2006)

The order picking system in majority of warehouse systems relies on manual picking although warehouses with automatic storage and retrieval system receive more attention and research interest (De Koster et al, 2006). Figure 2.2 shows both type of picking systems

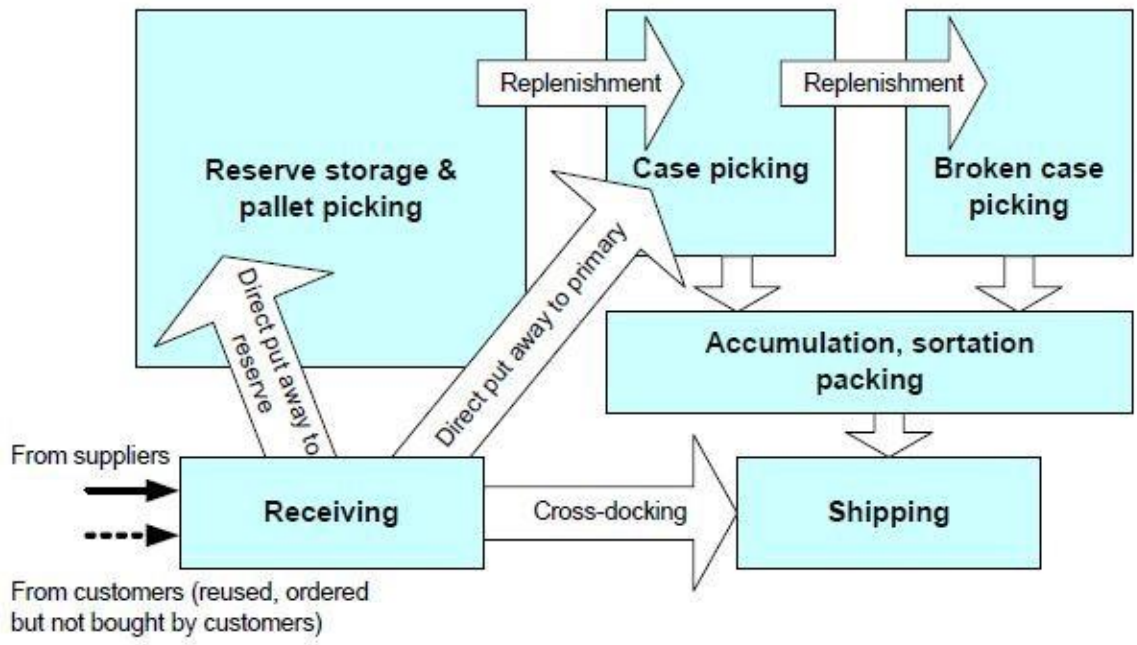

Figure 2.1 Picking as a part of warehouse operations (De Koster et al, 2006)

The products that arrive to these warehouses have their fixed processes through which they go through to meet customer requirement, often mixing with other products to complete the customer order (De Koster et al, 2006; Rouwenhorst et al., 2000).

Order picking and batching of orders are two main operational factors in any warehouse operation. Batching reduces both, the waiting of the orders in the system, as well as the travel time per order. It is very important to properly form a batch so that the machine, time and labor's resource can be used professionally and efficiently. Once the batch is formed, the items of the order within the batch need to be verified to ensure accuracy (Won & Olaffson, 2005).

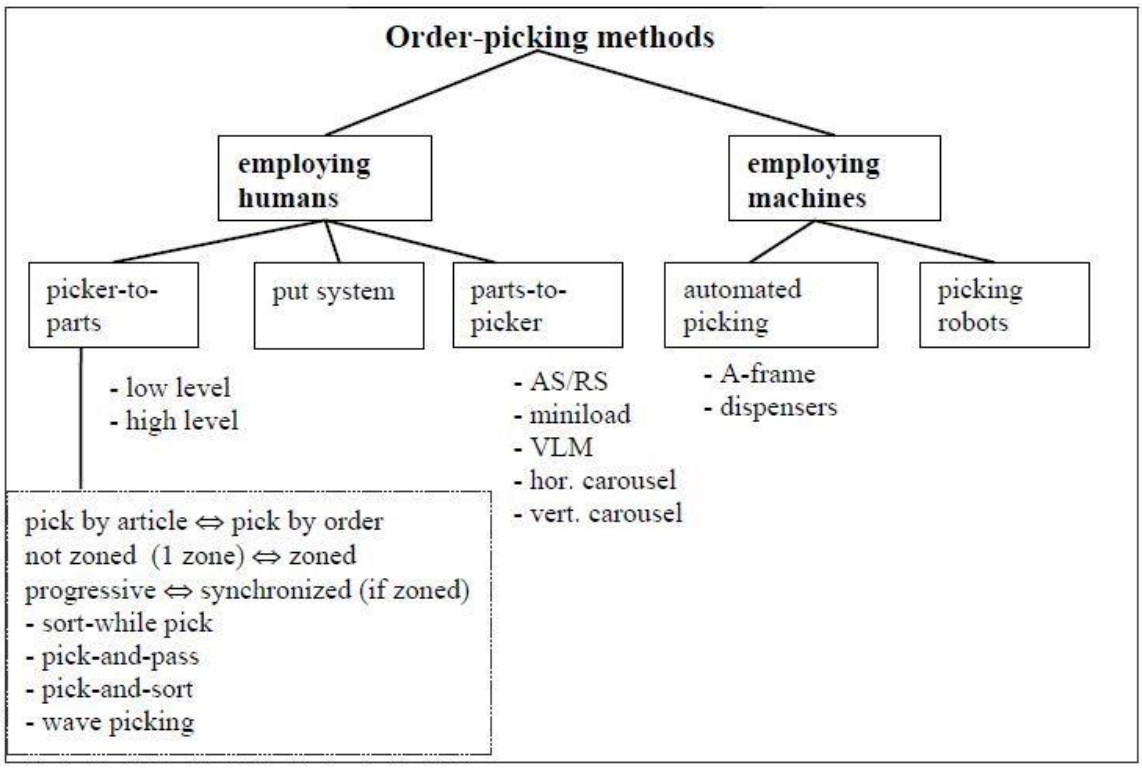

Figure 2.2: Types of Picking Systems (De Koster et al, 2005)

The distribution centers are affected by the order-picking process' network, which eventually affects the supply chain's performance. In these modern times, more inventive solutions have arisen in the order picking process, where on picker can process as many as a 1000 SKU per hour. Many researchers have studied order-picking processes and have developed some new models. But there is still a huge difference between what is practiced in reality and the academic research, many of the factors such as layout of optimal combinations, assignment of storage, clustering of orders, methods of order release, routing of pickers and accumulation of orders have been sparsely discussed (de Koster, et al, 2006).

In the process of picking, one or more order pickers assigned with various orders. Various order pickers depending upon the zoning policy of a company can serve the picking zone; here parallel and sequential zoning may be employed. Secondly, a policy of single order picking or policy of batch picking is also used where orders are picked and sorted by a single picker-using pick and sort as a single process. Thirdly, the picking process of orders tries the sequence to be determined in which locations of items are visited so that distance of total travelling can be minimized. Finally, the task of the workers and the equipment are to be ordered and assigned earlier by the in charge of these sorts (Rouwenhorst et al., 2000). Efficient usage of both the resources and space in any warehouse improves customer service while minimizing costs of operations (Chow, 2006).

The resources of a warehouse are extremely important for better customer service. They include the *storage unit* where the products may be stored. This can be anything such as carton and the plastic boxes but must make sure that anything is chosen must be reliable for the long-term process otherwise products' quality may be

affected. The *storage systems* are very wide-ranging to store different types of products; it may consist of simple shelves to the cranes and conveyors that are highly automated. The retrieval of items can be performed manually from the storage system or by the means of the selection of equipments. Bar code scanners, computer system and such latest technologies are considered necessary resources of a warehouse, as they are helpful in the management of this network. Finally, the warehouse performance depends on the availability and the efficiency of personnel. The labors are very important along with all the above systems and technologies (Rouwenhorst et al, 2000).

Computer based acknowledgement is required for a proof of delivery to the carrier as finished goods, parts or materials are received in the facility. If the unloading docks are installed with the RFID readers, this process can be significantly simplified as; the number of incoming materials can be accurately counted, minimizing the cost.

The first test of application of RFIDs was conducted in 2001A large-scale field test was conducted at Procter & Gamble warehouse, where Auto ID Centre read the dispatch to Wal-Mart and at the other end received by Wal-Mart. Since then, many other companies also started using RFID technology. The RFID based systems have been found to have the following advantages:

Efficiency: Putting the items away and the retrieval of the items is the central function of any warehouse. RFID based system can have a continuous and constant tracking of the inventory level always leading to a real time inventory count. It also leads to efficient and accurate operations of packing and picking operations.

Reach: RFID systems can track the inventory even when in motion, making the inventory accounting and its location known accurately.

Productivity: RFID systems let the workers know, which item is present in which location and in how much quantity, all on their local device via a message, so that the workers will not take long to find a product. It helps when a warehouse has many Stock Keeping Units (SKU)

Accuracy: Cross-dock operations can be used to run facilities as many warehouses now act as distribution centers. RFID systems make sure that the corrected routing is selected (McFarlane & Sheffi, 2003).

Intel's Logistic department is somehow the same when it comes to their warehousing operations, even though their microprocessors have been completely transformed. They are still stored in tubes or trays in the same number of units per box. In the mid-1997, a threat was posed to the existing warehousing operations by the new processor. It was no more a single chip and was bigger in size. Therefore, the box's volume increased hugely taking a lot more space of the warehouse. Hence, new warehouses were constructed, and a warehouse design was made with the help of simulation modeling. The Integrated Warehouse (IW) was one of the simulation models used to build the warehouse (Kosfeld, 1998).

The customers of a manufacturing firm have only the finished goods warehousing operations in view of the firm's operational capabilities. For many

reasons, other aspects of the company affect the effectiveness of the finished goods warehousing operations. As we all know, the tailored consolidation and packaging of different items in the warehousing operations adds value. Another point is that all warehousing problem's solution is not hiring more labor. Labor is required in many cases and solves a lot of problems, but labor is not the solution to every problem. Many alternate solutions are available including the AS / RS, i.e. Automatic Storage /Retrieval System and AGVS, i.e. Automatic Guided Vehicle System, and other automatic solutions. Finally, the information system installed must be interfaced with the production and material management system. Information system plays a vital role in an effective warehousing operations system. It solves many problems or even avoids problems. Hence, selection of an appropriate information system is an important decision for the warehouse manager.

The collection of implementations of the above-mentioned factors leads to an overall improvement of the warehousing operations (Gray, Karmarker & Seidmann, 1992).

The warehouse simulation system can lead to determine the best design for a warehouse management system and the best warehouse design development and selection can be achieved. The investment required to alter the current warehouse can also be determined by the warehouse stimulation system. This system helps override the current rule-of thumb design and results in more accurate design enabling the warehouse to perform its functions and characteristics. It also helps in deciding the requirement of the size for any warehouse and makes the design accordingly (Macro & Salmi, 2002).

Lean manufacturing techniques can save a significant proportion the supply chain cost. The world of warehouse is continuously changing. The leading organization's supply chain managers are now realizing the significance of the lean techniques and that these techniques can be applied in the warehouse context as well and that the results are vivid. Companies who have successfully implemented the lean techniques have reported cost savings of 20 to 40 percent and these could be half to one percent of the total sales. The levels of service and the flexibility are also substantially improved by the lean techniques without having and major investment. Even the logistics provider can take advantage of these lean techniques. These techniques reduce costs of the overall warehouse operating systems, but not all this is that easy. The initial challenge is that there is no standard or a particular guidebook that can instruct how to apply lean techniques according to different requirements. Compare an automotive parts shop to a frozen food business. One has a very slow inventory turnover while the other having an extremely fast inventory turnover.

Consequently, the application of such system gets even more difficult (Alicke & Leopoldseder, 2008). The design and management of order picking have become more composite and significant in both the distribution and manufacturing in the recent times. Point-of-use delivery, cycle time reductions, smaller-lot-sizes and order & product customizations are the recent moves in the manufacturing. Business has become competitive; therefore, companies now accept urgent orders. In addition, to

fulfill these orders, the distribution logistics must provide the delivery in a short time window making the order picking time even tighter. Economies of scale have made multiple small sized warehouses replaced by fewer large sized warehouses where there is large day-to-day pick volume with short time window.

Order picking processes have been a major highlight over the last decade, as its importance has been determined. Development of new models has been made after studying new problems. The application of these models is far from practice as an optimal combination of layout, order accumulation, method of order release, storage assignment, picker routing and order clustering is somehow still awaited and been studied just to a little extent only (de Koster, et al, 2006).

A major element of cost and an important connection of supply chain is what an order picking is. Increasing the momentum of the activity of order picking and at the same time cutting down the cost is a serious matter. Assessing multiple policies for routing in any random environment of storage, assessing the locations from where the pickups and drop-offs are made, assessing the shape of the warehouse, and finally inspecting the connection between all the above in various sizes of orders. Picking efficiency can directly be affected from the locations from where the pickups and drop-offs are made and the warehouse shapes (Peterson, 1997).

The order picking performance is affected directly from the application of policies of storage assignments that utilizes the space of storage at a minimum possible amount so that the total distance of travelling can be reduced. Simultaneously, performance of picking in unit time can be enhanced and order picking cost can also be minimized by proper routing planning. Therefore, route of picking, layout type and quantity of aisles in a warehouse system, density of picking inside an aisle, policy of storage assignment and combination of order type are some of the factors that can affect on the performance of order picking system (Hsieh & Tsai, 2006).

Automatic warehousing systems using computer-controlled stacker cranes are seen to be installed in the previous few years. The working of these systems is defined as the received items are distributed to the appropriate pallets and the same is then communicated to an automated computer. The computer then decides a location for the pallets, which are placed in their positions through an automated stacker crane, and the computer simultaneously records the same. When an order is placed in the system, the computer directs the stacker crane to the recorded location for pallet retrieval. Many benefits are incurred from this system including reduced labor cost, improved flow of stock, good utilization of space, improved inventory control and a lower theft chance (Hausman, Schwarz & Graves, 1976).

In the previous few years improvement of the production areas has been made but warehousing activities have not been given importance for enhancements. Difficulties are now being experienced by companies regarding the goods receiving from processing areas to distribution and warehouse areas. Some of the challenges include handling of material, utilization of space and collection of data. Companies are hiring more labors for their warehousing requirements nowadays. Reducing those steps, which are non-value adding for a warehouse, is the key for a successful

warehouse. Value stream mapping is the starting point for the implementation of a lean warehouse (Garcia, 2004).

Hypotheses

H1 Reducing the time required to reach the pick point improves picking efficiency

H2 Reducing the search time required to find the product improves picking efficiency

H3 Reducing the retrieval time for product retrieval improves picking efficiency

H4 Reducing the return time to order point improves picking efficiency

H5 Application of Warehouse Management System improves picking efficiency

H6 Application of routing policies improves picking efficiency

H7 Relocation of fast-moving items improves picking efficiency

RESEARCH METHODS

This study utilizes a mixed-methods approach to data collection, incorporating both secondary data derived from scholarly articles in published journals and primary data gathered through interviews and questionnaires. The sampling technique specifically targets organizations with established warehouse facilities, utilizing a structured questionnaire for data elicitation. Consequently, a sample size of 100 employees from various private sector firms was selected to provide a comprehensive overview of the target demographic.

Instrument of Data Collection

Convenience based sampling was used to conduct the research. This sampling was used because respondents and researchers need convenience while interacting with the researcher.

Convenience based sampling was used on randomly selected sample from the population. Managers working in the private sectors who practice different approaches in the workplace were part of the sample. The procedure that was followed was that the respondents would be found from easily accessible locations, so it was convenient for researchers as well as for respondent to interact conveniently.

Research Model Developed

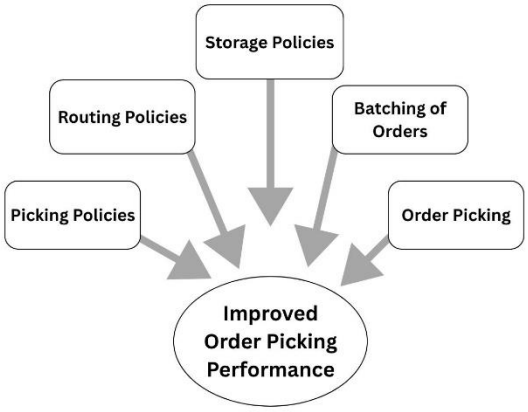

Figure 3.1: Conceptual Model

The data test analysis has been done using one sample t-test. The size of sample is of 100 employees working at various levels, meeting them personally and getting the questionnaires filled by them.

RESULTS

The data collected through the survey was fed into SPSS 17 Data form. This data was analyzed using one sample t-test using the test value as four. This value corresponds to acceptance of our hypotheses. A response of 4 or higher corresponded to agreement/strong agreement with the statement presented to the respondents. The one sample statistics (Table 4.1) demonstrates that the mean values are very close or higher than 4 indicating agreement with the statements.

TABLE 4.1 One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Reducing the time required to reach the pick point will improve picking efficiency	100	3.9800	.63532	.06353
Reducing the search time required to find the product will improve picking efficiency	100	4.0000	.71067	.07107
Reducing the retrieval time for product retrieval will improve picking efficiency	100	4.0400	.68046	.06805
Reducing the return time to order point will improve picking efficiency	100	4.1400	.76568	.07657

Application of warehouse management system will improve picking efficiency	100	4.3300	.63652	.06365
Application of routing policies will improve picking efficiency	100	4.1100	.66507	.06651
Relocation of fast-moving items will improve picking efficiency	100	3.9700	.73106	.07311

One sample test value show p-values greater than 0.05 and showing that these values and mean values show acceptance of all hypotheses.

TABLE 4.2 *One-Sample Test*

	Test Value = 4					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2tailed)	Mean Difference	Lower	Upper
Reducing the time required to reach the pick point will improve picking efficiency	-.315	99	.754	-.02000	-.1461	.1061
Reducing the search time required to find the product will improve picking efficiency	.000	99	1.000	.00000	-.1410	.1410
Reducing the retrieval time for product retrieval will improve picking efficiency	.588	99	.558	.04000	-.0950	.1750
Reducing the return time to order point will improve picking efficiency	1.828	99	.070	.14000	-.0119	.2919
Application of warehouse management system will improve picking efficiency	5.184	99	.000	.33000	.2037	.4563
Application of routing policies will improve picking efficiency	1.654	99	.101	.11000	-.0220	.2420
Relocation of fast-moving items will improve picking efficiency	-.410	99	.682	-.03000	-.1751	.1151

The analysis of the research data shows that respondents appreciate the importance of careful storage and stacking of materials in the warehouse and remembering that the material that is stored must be retrieved to serve the customers. If the material is poorly stacked making retrieval difficult the tendency is to postpone the delivery in the name of being out of stock. The layouts of the warehouse, quick and easy access to all stock keeping units facilitate workers to pick the material and serve the customers. All matters related to proper storage, picking and picking accuracy result in an efficient warehouse that is planned to serve the customer well. The result shows that one of the common mistakes that are happening in most warehouses is mindless placement of arriving inventory in the store, often blocking access to other stock keeping units. Minor mishandling often locks pallets with one another and accessing material behind these pallets often requires manual removal of all materials stacked on pallets in the front row. This is enough work to deter the labor from getting the material out for the customer.

Hypothesis Assessment Summary

The data test analysis has been done using one sample t-test and the results show that all hypotheses have been accepted. Since we know that in one sample t-test, either the mean value should be equal or more than the test value for the hypothesis to be accepted, here, the test value is 4, because the level of agreement starts from number 4. As we can see in the result, that in all questions, the mean value is approximately 4 or greater. This means that all the hypotheses are accepted. The sig.-2 values (p-values) are greater than 0.05, which also shows that the hypotheses are accepted. Only in question 5, the value of sig. is less than 0.05 but, in that case, also, the mean difference is positive which shows that the hypothesis is again accepted. Therefore, all the hypotheses have been accepted (Table 4.3).

Table 4.3: ***Hypothesis Assessment Summary***

Hypotheses	Mean	p-values	Empirical Conclusions
Reducing the time required to reach the pick point will improve picking efficiency	3.9800	.754	Accepted
Reducing the search time required to find the product will improve picking efficiency	4.0000	1.000	Accepted
Reducing the retrieval time for product retrieval will improve picking efficiency	4.0400	.558	Accepted
Reducing the return time to order point will improve picking efficiency	4.1400	.070	Accepted
Application of warehouse management system will improve picking efficiency	4.3300	.000	Accepted

Application of routing policies will improve picking efficiency	4.1100	.101	Accepted
Relocation of fast-moving items will improve picking efficiency	3.9700	.682	Accepted

DISCUSSIONS

Warehousing in Pakistani industry is still a partially mechanical but largely manual handled operation. As the material arrives from suppliers and surplus returned from customers the material is often stacked without much thought. Shortage of space in bust seasons often means several stock keeping units are kept one behind the other making retrieval and picking difficult. It is not uncommon to postpone the order fulfillment to the customer for the next day. Improving picking efficiency is one of the most common concerns in our warehouses. Efficient management of warehouse and with help from simple machinery such as fork lifters proper storage is an important factor in ensuring that pickers are facilitated in finding the materials easily. Layout of the picking zones helps in reducing the picking times. Roughly, 50% of picker's time is spent in travel to the picking point while 20% of the time is spent in searching for the material while remaining time is used in effort associated with filling the order. This research shows that reducing the travel, search and pick up time improves picking efficiency. Automatic Research and Retrieval Systems are more suitable for small and expensive systems. These systems are still of theoretical interest for Pakistani warehouses, but Warehouse Management Systems are useful not only in tracking the materials but also help manage the warehouse in operational areas as well. These systems should now be part of all mediums to large warehouses.

CONCLUSION

Based on the findings and interpretation of the results, it is concluded that all proposed hypotheses were validated, demonstrating that picking efficiency is significantly enhanced through targeted operational improvements. Specifically, efficiency gains are achieved by reducing the time required to reach pick points, find products, retrieve items, and return to the order point. Furthermore, the implementation of a Warehouse Management System (WMS), the application of strategic routing policies, and the relocation of fast-moving items are identified as critical drivers of performance. Ultimately, this research confirms that addressing these specific technical and structural factors is vital for optimizing the overall efficiency of warehouse operations.

Policy Implications

The points indicated in this research are vital for the improvement and efficiency of a warehouse to achieve excellence. The test result clarifies that any warehouse should follow the points focused on this research regardless of the size of the warehouse. It is implied that warehouses need to focus more on reducing the time

required to complete the order cycle.

Future Research

Purpose built warehouses is still not common in Pakistan. It is only now that companies are considering purpose-built warehouses. In the design of new warehouses access to the warehouse, docking points, headroom and internal design like zoning and layout need to be further researched to ensure efficient operations and ease of order picking in warehouse operations.

REFERENCES

Alicke, K., Leopoldseder, M., Mishra, D., & Schulze, W. A. (2008). What's in your warehouse? Cited in http://www.logistics-journal.de/proceedings/2012/3436/11vojdani-wgtl2012.pdf

Chow, H. K., Choy, K. L., Lee, W. B., & Lau, K. C. (2006), Design of a RFID casebased resource management system for warehouse operations. *Expert Systems with Applications,* 30(4), 561-576

De Koster, R., Le-Duc, T., & Roodbergen, K. J. (2007), Design and control of warehouse order picking: A literature review. *European Journal of Operational Research,* 182(2), 481-501.

Garcia, F. C. (2004). Applying lean concepts in a warehouse operation. In *IIE Annual Conference and Exhibition*,pp. 2819-59).

Gray, A. E., Karmarkar, U. S., & Seidmann, A. (1992), Design and operation of an order consolidation warehouse: Models and application, *European Journal of Operational Research*, 58(1), 14-36

Hausman, W. H., Schwarz, L. B., & Graves, S. C. (1976), Optimal storage assignment in automatic warehousing systems, *Management Science,* 22(6), 629-638

Hsieh, L. F., & Tsai, L. (2006), The optimum design of a warehouse system on order picking efficiency, *The International Journal of Advanced Manufacturing Technology*, 28(5-6), 626-637

Journal of Operations & Production Management, 17(11), 1098-1111

Kosfeld, M. (1998), Warehouse design through dynamic simulation, In *Simulation Conference Proceedings*, Winter Vol. 2, pp. 1049-1053, IEEE

Macro, J. G., & Salmi, R. E. (2002, December). Warehousing and inventory management: a simulation tool to determine warehouse efficiencies and storage allocations, *In Proceedings of the 34th conference on winter simulation: exploring new frontiers*, pp. 1274-1281, Winter Simulation Conference

McFarlane, D., & Sheffi, Y. (2003), The impact of automatic identification on supply chain operations, *The International Journal of Logistics Management*, 14(1), 1-17

Petersen II, C. G. (1997). An evaluation of order picking routing policies, International

Rider, S., (2011). National Conference on Operations & Fulfillment, Retrieved from http://www.retailonlineintegration.com/article/5-tips-make-your-

warehouse-moreefficient/1

Rouwenhorst, B., Reuter, B., Stockrahm, V., Van Houtum, G. J., Mantel, R. J., & Zijm, W. H. M. (2000). Warehouse design and control: Framework and literature review. *European Journal of Operational Research*, 122(3), 515-533.

Stolarczyk, M. J. (2010) "10 Ideas for a More Efficient Warehouse Operation", The Journal of Commerce. Retrieved from http://www.joc.com/2010/10-ideas-moreefficient-warehouse-operation

Won, J., & Olafsson, S. (2005). Joint order batching and order picking in warehouse operations, International Journal of Production Research, 43(7), 1427-1442.