A review of Warehouse Performance in South African Manufacturing Sector

Tshepo Phuti Mabotja, Ebrahim Parker
Faculty of Business and Management Sciences
Cape Peninsula University of Technology, PO BOX, 196,
Bellville, 7535,
South Africa
Tshepophuti.tm@gmail.com; tshepo.mabotja@maluts.co.za

Abstract

The research conducted in this study is aimed at enhancing warehouse performance in picking by sequence optimization, as the travel time covers most part of picking processes in storages, a right order of picking lines in a batch is critical to attain high productivity. For a research at the manufacturer in the electronic devices business segment, the quantitative assessment showed an overall improvement potential of 7.4%, but in disparity to systematically working enquiring for routing, the sequences generated by the LSO may look illogical to the picker - a qualitative evaluation must be considered to identify sequence patterns and to discuss the methodology with the picking Personnel. Consequently, the measurements of warehouse performance have become a buzz word amongst scholars and industry practitioners. Despite the fact that, the concept of warehouse performance is attending higher level of significance in western countries, America, Asia, due to its ability of smoothing the business environment, in Africa, particularly in South Africa the integration and adoption of warehouse performance concept is facing several challenges. To date, over the past decade a number of research have been done in the past decades to address these issues of warehouse performance in manufacturing sector and there is still gab in the current literature review, therefore the objective of this research is to review and assess storage performance in manufacturing industry. The results of critical analysis of the current literature clearly show that there are flaws in the current body language related to storage performance. However very few studies have been conducted from warehouse performance in South Africa, the overall of this study is to fill this gab by means of critically analyzing studies that were developed or conducted in the field of warehousing.

Keywords
Storage, research, performance

1. Introduction

Today's market environment is very competitive; the pressure is more on to organizations to find new better ways to add value and to deliver goods to end-user grow even stronger. The expanding demand for companies to compete with its products globally in terms of costing, proper quality materials and other services has had a rise to the desire to come up with more innovative or effective storage techniques. Storing has become the critical function with the increase of mass production systems, storage is where goods are stored and it is a distribution center for raw and finished materials. Therefore warehousing and distributions center have similar functions, as goods are stored (Coyle at el, 2003). They both perform vital functions of storage and movements of products (Langevin and Riopel Diana, 2005). Warehouse is the critical function in any company, whereby organizations can supply a customized or structured resources/services for their consumers in order to have advantage over their competitors. This means that an organization that can receive, store, do cycle counts, stock takes, dispatch, rename racks correctly at the right location, use scanners etc, at a faster rate and get a working culture in order might have an advantage over their rivals. However, there are critical factors and should they not be addressed or managed correctly they might results in a very serious impact in a competitive markets. There has been a rise in delay of end-user service both internally and external. Goods are damaged while in storage. There is excessive movements, this also has let to poor stock take and cycle counts, all this is because of various factors: such as order picking, receiving, how they do cycle counts and Culture

plays a critical role in this challenge, because most employees are reluctant to changes especially using technology as they used to do everything manually. Another important factor is that there is no area to store small items such as bolts and nuts, pins etc., so this has led to materials being missing without a trace or accountability. Cycle count and stock takes are done manually which has let few discrepancies in the warehouse. There is a shortage of specified places to store specialized items, wherever you find a space you can store which is not a good warehouse practice. Racks are not properly marked. The list is endless. Everything has to be looked for instead of just being picked because of warehouse that lack zone picking among other challenges, at the end, the customers suffer the most. `

2. Background

This section covers factors influencing importance of storage performance. It reviews literature from the past researches; even though several researchers have put a lot of efforts to investigate the factors influencing storage performance, very few have gone further to study the factors that influence the importance of having a warehouse that can give you a competitive advantage over their rivals. The study seeks to review the different models that can improve the performance of modern storage facilities. These are summarized using a conceptual framework. This chapter is aimed at addressing the research design that is relevant to this study. The warehouse can be defined or defined in different ways (Cavinato, 1990), storage generally is a place to hold goods, move them, sorting and transferring from one place to another. Whereas (Spencer, 1993) has a different opinion, that warehouse is a production system,he further states that storage is a combination of single operations, culminating at the end as a whole process. (Gunasekaran et al, 1999) believe that the storage is a combination of more than one processes which is material handling and methodologies such as inventory control and production control, The better method to describe it, is quantitative approach. This may be explained as a value that is very objective because it is simple to grasp. According to (John J. Bartholdi, Iii and Steven T. Hackman, 2011) a warehouse rationale discussed below: He asked a simple question; why should we have a warehouse, is it necessary to have it? A warehouse requires staff, meaning people, which they all come with problems and challenges, money (area (Land) and facilities and other tools), and other systems such as (IT), and all of them are costly. Can these expenses be avoided? In certain production or operations the simple answer is definite NO. Warehouses, and or its various components or stages offer a very critical role and services in any organization, and country's economic growth. Few challenges are as follow: To fully meet end-user ever changing demand: The main task in such department is that demand changes very fast, but it takes a while to change a supply.

3. Gab identification in the current literature

ISI web of science data base was used with – (warehouse management system) as the key word, the search resulted in 825 journals before below steps where taken, 30 best studies related to my topic was filtered and it should also be pointed that studies not related to the topic were not taken into considerations The main objective of this section is to analyse the previous studies and critisize the gabs or evaluate the work that has been done by the author. The analysis will be looking at the core study of the research, the year published, location of the study,the sample size,methodology and the findings of the study in order to increase the readers knowledge or understanding of the research. To this end, the table below demionstrate the 15 best studies in the field of warehousing management perfomance.A critical analysis is subjective to a number of steps to be followed and are as follow:

- Publication year
- Language selection
- Source tittle
- Country/ region
- Most cited articles (an avarage of 10 citations)

3.1 Table of Gab identification

			Industry type						Methodology		
Authors	**SME**	**LME**	**Manufacturing**	**Mining**	**food**	**Automotive/**	**Transportati**	**Health**	**Qualitative**	**Quantitative**	**Countries**
S.G. LI & X. Kuo 2008		x				x				x	China
Arno Meyer & Others 1995		x			x					x	South Africa
Vaidyanathan Jayaraman 2006		x				x				x	USA
H.Y Lam & Others 2015		x				x				x	China
Uday Venkatadri & others 2016		x				x				x	India
Rui Liu & Others 2015		x	x							x	China
Mark W. Horner 2010		x				x				x	USA
Andre Johnson & Leon Mcginnis 2010		x	x							x	USA
Johannes Wollenburg 2017	x				x				x		Germany
Vaidyanathn Jayaraman & Others 2008		x			x					x	USA
BhavinShah & Vivek Khanzode 2016		x			x				x		India
Charles G. Petersen II 1999		x			x					x	USA
Francielly Hedler Staudt & others 2015								x		x	France
Peter Kolarovszki & Juraj Vaculik 2013		x	x							x	Latvia
D. du Toit & P.J Vlok 2014		x	x							x	South Africa

3.2 Critical review of previous studies

S.G. Li *, X. Kuo (2008) Due to complicated form of spare fragments of supply chain, the traditional approaches, that don't contemplate the relationships between decision factors globally, cannot obtain maximum performance. Therefore, this paper aims to develop an improved fuzzy neural network (IFNN) based decision support programme for managing automobile spares inventory during a central storage. During this system, the IFNN is used to predict the demand for spare elements. However, while not considering relevant domain information, ancient neural networks area unit found to be suffered from the matter of low accuracy of low predictions. Therefore, the subsequent improvement is made: initially, it assigns affiliation weights supported the fuzzy analytic hierarchy method (AHP) methodology while not fastidiously turning them. Second, by generating and refinement activation functions in step with genetic rule, our IFNN will offer comprehensive and correct activation functions and match a wider vary of nonlinear models. Last, however not least, Associate in nursing adaptation input variable is introduced to decrease the impact of the bullwhip impact on the forecasting accuracy. The projected system is evaluated with the $64000 word information and experimental results indicate that our EFNN outperforms different 5 models in fill rate and stock price measures and there was no size of organization outlined.

Arno Meyer, Wesley Niemann, Justin Mckenzie,Jacques Lombaard, (1995)-Reverse logistics has been seen as a costly exercise before, however it has seen a major attention from practitioners due to ever expanding competition from competitors. The main objective of doing study for this paper was to uncover the internal and external barriers and drivers of (RL) reverse logistics in South Africa's retails organizations. Qualitative methods was used to uncover few facts related to study and was used in a large grocery organizations and cost reduction and barriers were identified and reduced companies environmental impact, however author should have also used quantitative methods so as to have an accurate data and be able to expand readers understanding, mining sector should also be considered as well as barriers to entry is difficult.

Vaidyanathan Jayaraman , Anthony D. Ross & Anurag Agarwal (2006) Closed-loop supply-chain channels are distribution programmes that consists of activities supporting both the forward flow of merchandise from the manufacturer to the buyer and the reverse flow from the buyer to the manufacturer. During this paper, we determine the reverse supply supply-chain channels determine issues that corporations face after they handle product returns on these channels and gift the vital role that info technology and collaboration will play to mitigate several of the issues and deficiencies. A key part in reducing uncertainties within the completely different stages of the reverse channel is access to correct and timely info on the standing, location, and condition of product moving regarding in the supply chain. It's imperative that companies operational within the reverse supply-chain channels collaborate to integrate and share info during a timely fashion. We give a case study supported by interaction with two major clients in electronic corporations and demonstrate how the utilization of radio identification device technology during a reposting operation will scale back the general distribution prices for the organisation. Author should also consider using qualitative method to expand readers' knowledge and also show the scale of each organization consulted during the research.

H.Y.Lam,K.L.Choy n, G.T.S.Ho,StephenW.Y.Cheng,C.K.M.Lee (2015)- End-user orders with big product varieties in little quantities are normally received by logistics service providers with request for specialized value-added

services and timely delivery, so the storage has to plan its strategy in such a way that it can efficiently maintain its quality services expected by customers. In addition attention has be taken into consideration for possible danger that can happen while logistics operation is taking place so that any failures can be prevented to avoid possible loss or risks. To facilitate this decision in storage operations, a system is required or suggested, the system will make use of radio frequency identification programme, this system will help in categorizing potential risks factors considered by consumers and formulate strategy. The author should also specify what methodology is going to be used and also point out the industry type to increase the readers knowledge and understanding. Systems shows that there is there is significant improvement in this programme but no data that's how how has it been tested.

Uday Venkatadri, Kasinadhuni Shyama Krishna, and M. Ali Ülkü (2016) - The physical Internet (PI) is a theoretic, innovative, and simultaneous modular distribution logistics system that has gained the interest of both researchers and practitioners as a replacement to conventional logistics. The objective is to be more environmentally friendly, more socially responsible, and also more profitable. The vital concept behind the PI logistics system is the routing of highly modular containers through transit centres (called PI hubs) to attain a very effective transport network that exploits enhanced opportunities. This programme networks is developed as an antagonism of optimal point-to-point dispatch models between pairs of cities. It is used to characterize the behaviour of the traditional and PI logistics systems for variety of many logistics system key performance indicators. Based on the modelling assumptions in this paper, it is concluded that the benefits of the PI are in reducing the inventory cost and the total logistics system cost. However, no mention of methodology used, no mention of size of the organization, author should also try using both methodology to see if the results will be as predicted.

Rui Liu, Shan Liu, Yu-Rong Zeng, Lin Wang, (2015) –The objective of this research is to investigate a new pragmatic decision support model of coordinated replenishment and delivery (CRD) problem with multi storage to increase performance in supply chain. The proposed model is suitable for directors and managers of organizations to choose the best storage and to decide on delivery planning or schedule. Quantitative approach seem to be used, I use seemed because author was not specific and also not did not specify industry type for readers to have a full or through understanding.

Mark W. Horner, (2010) - Over the past decades, hurricane emergencies has been the most dangerous disruptions in the US, especially in the south-east region of the country. The key factor of managing hurricane catastrophe includes logistical scheduling to smoothen the distribution and transportation of relief products to people in need. This research shows how an adaption of the capacitated storage area model can be used to manage the flow of products shipment, to people in need. In this requisition, the model is used with protocols set forth in Florida's Comprehensive Emergency Plan and tested in a smaller city in north Florida. However it would be useful to also check the scenario in much more bigger or larger environment, examples explored the results of alternate products distribution strategies on the provision of disaster relief. Feedback shows that measures describing people's accessibility to relief products are affected by the distribution infrastructure used to provide relief, as well as assumptions made regarding the population(s) assumed to be in need of aid.

ANDREW JOHNSON1,∗ and LEON MCGINNIS2, (2010) – Storages are important parts of logistics operations and a vital contributor to speed and costing in chain of supply. Even though there are many acceptable standards for individual storage functions such as order picking, cycle counts, etc, small is known for overall technical effectiveness of storages. Unavailable information or general lack of understanding storage technical effectiveness and related information related to improvement has caused industry limits or ability to identify best practises or opportunities. The main problem is gab in education sector relating to warehousing or lack of professional in this field. This study is aimed at addressing this gab by identifying methods to such, by collecting data. Author used large scale operations but never specific on industry type. It is logical to also use quantitative approach and consider small medium enterprise as well.

Johannes Wollenburg, (2017) - Objective – These research structures verifiable contributions in retail operations and logistics on different channels that have been published until the year 2015 in order to develop an schedule of research

in this location. The methodology used to review is documented or conducted based on recommendation, so it is critical not only to rely on the factual results as they may be inaccurate. Industry sector should also be taken into considerations as well as methodology type, I suggest quantitative analysis should be applied to extend readers mind.

Bhavin Shah and Vivek Khanzode, (2016) - Purpose – The retail revolution swing from ancient distribution to e-tailing services and unprecedented growth in internet adoption insists practitioners to variously storage strategies. More than practically needed storage space has been known as wastes, and additionally it doesn't improve performance. Organized framework consolidation storage style policies, operational performance and client worth improvement for retail-distribution management is lacking. Therefore, the aim of this paper is to develop broad tips to style the "just-right" quantity of forward space, i.e., "lean buffer" responsive to the subsequent questions: "What can be lean buffer size? How efficient the forward storage is? Question will always be asked; author need to specify that quantitative approach is more suitable and also industry type should also be considered especially in manufacturing sector.

Charles G. Petersen II,(1999) - Order choosing, the activity by which a variety of products are retrieved from a warehousing system to satisfy variety of end-user orders, it's a vital link within the supply chain and its the major costing part of storage. The important issue at the same time is to reduce the value and increase the speed of the order choosing activity. The most objectives of this paper are: measure numerous routing heuristics Associate in Nursing and best routine in a very volume-based and random storage environment; compare the performance of volume-based storage to random storage; and examine the impact of travel speed and choosing rates on routing and storage policy performance. The experimental results show the answer gap between routing heuristics and best routing is very obsessed with the travel speed and choosing rate, the storage policy, and also the size of the decide list. Additionally, volume-based storage created important savings over random storage, however once more these savings area unit obsessed with the travel speed and picking rate. Qualitative methodology should also be considered to get alternative results.

Francielly Hedler Staudt, Gülgün Alpan,Maria Di Mascolo and Carlos M. Taboada Rodriguez, (2015) As the supply chain get more complicated, the difference of indicators and equipment to measure performance has also expanded. Again, the metrics that are utilized for performance assessment are evaluated in a variety manner and that's why there isn't clear definition for most of these matric. To name these issues, this literature review will put more focus on operational storage performance measurements, for which the storage owners will need to do few analysis periodically. We give the definitions for the performance indicators and a framework to show their boundaries and, finally, based on the literature analysis, we also provide some discussions on current Trends in storages and propose future research directions on warehouse performance evaluation. To enhance reader's knowledge qualitative methodology should also be considered to get the actual theoretical statistics.

Peter Kolarovszki, Juraj Vaculík, *(2013)* - This study explains RFID technology in concurrence with storage management systems. Article also deals with automatic identification and data capture technologies and each process, which are used in storage management system. It explains processes from entering products into production to identification of products and also palletizing, storing, bin transferring and removing goods from storage. Article focuses on using AMP middleware in WMS processes in Nowadays, the identification of products in most storage is carried through barcodes. In this study we want to specify, how can be processes described above identified through RFID technology. All feedbacks are verified by measurement in our AIDC laboratory, which is located at the University of Žilina, and also in Laboratory of Automatic Identification products and Services located in GS1 Slovakia. The results of our research bring the new point of view and indicate the ways using of RFID technology in warehouse management system.

D. du Toit & P.J. Vlok,(2014) - The topic of supply chain management (SCM) is complicated to understand due to its encompasses many different flows of activities, components, functions, and role-players. The literature is scattered across multiple functions, differs in scope, and is often confined to certain components within SCM. This study aims to provide a literature overview of SCM. It is defined with the help of a newly-developed framework of understanding that offers a graphical representation of the term. It unifies and condenses variety of components within SCM and shows the relationship between them. The framework was developed by identifying the main themes in the definitions

for SCM, examining existing categorisations and frameworks in SCM, and analysing frameworks in other disciplines. The outcome of this article can be used as a guide to explain and orientate researchers and practitioners in the field.

Vaidyanathan jayaraman (1998) – The objective of this paper is to clarify and test the distribution system design model and assess its performance with regards to quality of results, model validity and also algorithm performance. This research gives feedback on the development of multiple product storage logistics model. The model is used to forecast on the performance of distributions organizations that typically have to work with costs of products and distributions of each goods from storage to end-user outlet, the level of service given to its end-users and adaptability for each product group and market segment. Qualitative methods should also be considered and also try and use this research on food industry as there are perishable products to consider.

.

Conclusion

The research is aimed at enhancing warehouse performance in picking by sequence optimization, as the travel time covers most part of picking processes in storages, a right order of picking lines in a batch is critical to attain high productivity. For a research at the manufacturer in the electronic devices business segment, the quantitative assessment showed an overall improvement potential of 7.4%, but in disparity to systematically working enquiring for routing, the sequences generated by the LSO may look illogical to the picker - a qualitative evaluation must be considered to identify sequence patterns and to discuss the methodology with the picking Personnel. Consequently, the measurements of warehouse performance have become a buzz word amongst scholars and industry practitioners. Despite the fact that, the concept of warehouse performance is attending higher level of significance in western countries, America, Asia, due to its ability of smoothing the business environment, in Africa, particularly in South Africa the integration and adoption of warehouse performance concept is facing several challenges. To date, over the past decade a number of research have been done in the past decades to address these issues of warehouse performance in manufacturing sector and there is still gab in the current literature review, therefore the objective of this research is to review and assess storage performance in manufacturing industry. The results of critical analysis of the current literature clearly show that there are flaws in the current body language related to storage performance. However very few studies have been conducted from warehouse performance in South Africa, the overall of this study is to fill this gab by means of critically analyzing studies that were developed or conducted in the field of warehousing.

Refferences

Vaidyanathan Jayaraman, 1998, an efficient heuristic procedure for practical-sized capacitated warehouse design and management, International journal of business and economics, pp1

D. du Toit & P.J. Vlok,2014, SUPPLY CHAIN MANAGEMENT: A FRAMEWORK OF UNDERSTANDING, *South African Journal of Industrial Engineering November 2014 Vol 25(3), pp 1*

Peter Kolarovszki, Juraj Vaculík, 2013, WAREHOUSE MANAGEMENT SYSTEM BASED ON SELECTED AUTOMATIC IDENTIFICATION TECHNOLOGY, The 13th International Conference "RELIABILITY and STATISTICS in TRANSPORTATION and COMMUNICATION,pp1

Francielly Hedler Staudta,b,c∗, Gülgün Alpanb,c, Maria Di Mascolob,c and Carlos M. Taboada Rodriguezа,2015, Warehouse performance measurement: a literature review, *International Journal of Production Research*, 2015 Vol. 53, No. 18, 5524–5544, http://dx.doi.org/10.1080/00207543.2015.1030466, pp1

Charles G. Petersen II, 1999, the impact of routing and storage policies on warehouse Efficiency,pp1

Bhavin Shah and Vivek Khanzode, 2016, Storage allocation framework for designing lean buffers in forward-reserve model: a test case, The current issue and full text archive of this journal is available on Emerald Insight at: www.emeraldinsight.com/0959-0552.htm, pp1

Vaidyanathan Jayaraman , Anthony D. Ross & Anurag Agarwal (2008) Role of Information technology and collaboration in reverse logistics supply chains, International Journal of Logistics: Research and Applications, 11:6, 409-425, pp1

Johannes Wollenburg, 2017, Empirical Studies in Multi-Channel and Omni-Channel Retail Operations and Logistics,pp3

ANDREW JOHNSON,∗ and LEON MCGINNIS,2010, Performance measurement in the warehousing industry, pp1

Mark W. Horner, 2010, optimizing hurricane disaster relief goods distribution: model development
And application with respect to planning strategies, pp1

Rui Liu, Shan Liu, Yu-Rong Zeng, Lin Wang, (2015), Optimization model for the new coordinated replenishment and delivery problem with multi-warehouse, The current issue and full text archive of this journal is available on Emerald Insight at: www.emeraldinsight.com/0957-4093.htm, pp 1

Uday Venkatadri, Kasinadhuni Shyama Krishna, and M. Ali Ülkü (2016), On Physical Internet Logistics: Modeling the Impact of Consolidation on Transportation and Inventory Costs,pp 1

H.Y.Lam,K.L.Choy n, G.T.S.Ho,StephenW.Y.Cheng,C.K.M.Lee,2015, A knowledge- based logistics operations planning system for mitigating risk in warehouse order fulfilment, Int. J.ProductionEconomics170(2015)763–779, pp1

Arno Meyer Wesley Niemann, Justin Mackenzie, Jacques Lombaard, 2017, Drivers and barriers of reverse logistics practices: A study of large grocery retailers in South Africa, Journal of Transport and Supply Chain Management ISSN: (Online) 1995-5235, (Print) 2310-8789,pp 1

S.G. Li *, X. Kuo, 2008, the inventory management system for automobile spare parts in
a central warehouse, pp1

Biography

Tshepo Phuti Mabotja is currently conducting PhD Degree in the Faculty of Engineering and the built environment, University of Johannesburg. He holds Masters Degree in Operations Management from University of Johannesburg, South Africa. His research interests involve around warehousing as he discovered challenges that companies face during his long working career in private sector. He's currently a lectures at Cape Peninsular University of Technology.

Ebrahim Parker is currently a Head of Departments, Faculty of Business and the Management Sciences, Cape Peninsula University of Technology, South Africa. He has both industrial and academic experience for more than twenty years. He has specialities in a Petrochemical industry.