A theoretical assessment of Warehouse Performance in Manufacturing Industries

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Abstract

In today's competitive market environment, the pressure is on to companies or organizations to find new ways to add value and to deliver goods to customers grow even stronger. The growing demand for companies to compete with its goods globally in terms of costs, proper quality materials and other services has had an increase to the desire to come up with innovative or effective warehousing techniques. Warehousing has become the critical function with the rise of mass production systems, warehouse is where goods are stored, and it is a distribution center for raw and finished goods. Therefore, warehousing and distributions center have similar functions, as goods are stored. They both perform critical functions of storage and movements of products. Warehouse is the core function in any organization, 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 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 competitive markets. Although a number of studies have been conducted in the past two decades to address these issues there is still gab in the current literature review, therefore the aim of this paper is to theoretically assess warehouse performance in manufacturing industry. The results of critical analysis of the current literature clearly demonstrate that there are flaws in the current body language related to warehouse performance.

Keywords
Warehousing, optimization, efficiency

1. Introduction

In today's competitive market environment, the pressure is on to companies or organizations to find new ways to add value and to deliver goods to customers grow even stronger. The growing demand for companies to compete with its goods globally in terms of costs, proper quality materials and other services has had an increase to the desire to come up with innovative or effective warehousing techniques. Warehousing has become the critical function with the rise of mass production systems, warehouse is where goods are stored and it is a distribution center for raw and finished goods. Therefore warehousing and distributions center have similar functions, as goods are stored (Coyle at el, 2003). They both perform critical functions of storage and movements of products (Langevin and Riopel Diana, 2005).

Warehouse is the core function in any organization, 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 an increase in delay of customer service both internally and external. Materials get damaged while in the warehouse. 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 vital role in this challenge, because most employees are reluctant to changes especially using technology as they used to do everything manually. Another vita factor is that there is no area to store small items such as bolts and nuts, pins etc., so this has let to items being missing without a trace or accountability. Cycle count and stock takes are done manually which has let to few discrepancies in the warehouse. There is lack of specified areas to store specialized items, wherever you find a space you can store which is not a good warehouse practice. Racks are not properly named. 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 chapter covers factors influencing importance of warehousing performance. The chapter reviews literature from the past studies, although several researchers have put a lot of efforts to investigate the factors influencing warehouse 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 researchers seek to review the various models that can enhance the performance of modern warehousing 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 explained in many different ways (Cavinato, 1990), Warehouse 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 warehouse is a combination of single operations, culminating at the end as a whole process. (Gunasekaran et al, 1999) believe that the warehouse 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 defined or 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 use 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 significant role and services in any organization, and country's economic growth. Few challenges are as follow: To

fully meet customer ever changing demand: The main challenge 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 key word, the search resulted in 1351 journals before below steps where taken, 30 best studies related to the 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 Gab Identity Table

Authors	SME	LME	Industry type					Methodology		Countries
			Manufacturing	Mining	food	Automotive/ Transportati	Health	Qualitative	Quantitative	
Klaus Moeller,* 2011		x	x						x	Germany
Hokey Min and others 2009	x		x						x	USA
Vaidyanathn Jayaraman 1998		x			x				x	USA
Claudia R. Rosales 2013		x	x						x	USA
Vaidyanathan Jayaraman and Yadong Luo 2007	x		x						x	USA
Nelda Johnson 2001		x					x	x		USA
Arun Sen and others 2006	x		x					x		USA
Katy S. Azoury & Julia Miyaoka 2013	x				x				x	USA
Allen W.Kiefer & Robert A. Novack 1999	x					x		x		USA
Ramaa . A & Others 2012		x			x			x		India
Mohammad Sadegh Hematyar Tabatabaie 2	x		x						x	Turkey
Aleksandar Grubor & others 2018	x		x					x		Serbia
Charles G. Petersen & Others 2005		x	x					x		USA
Frida Claesson & Per Hilletofth 2011		x	x						x	Sweden
Olof Stenius & Others 2017		x				x			x	Sweden

3.2 Critical review of previous studies

Hokey Min (2009) Purpose – This paper seeks to illustrate the successful development of a warehousing decision support system (WDSS) that helped the Buckeye Cable Vision Incorporated (BCV) in making its strategic warehouse expansion and re-warehousing decisions. The WDSS utilized by the BCV can be a blue-print for other companies which would like to improve their warehousing productivity and strengthen the warehousing link to their supply chain.

Design/methodology/approach – Warehousing costs make up a significant portion of a company's business expenditures, Thus, many companies are pressured to control warehousing costs by improving their warehousing productivity. However, it is not an easy task to improve warehousing productivity given the increased complexity associated with today's warehousing activities such as value-added services and cross-docking operations.

To cope with such warehousing challenges, a specific decision support system (DSS) that incorporates several computer-based models into the warehouse decision-making process is suggested. These models include: a simulation model based on computer-aided design, an analytic hierarchy process, and a forecasting technique. To demonstrate the usefulness of the proposed DSS and provide practical guidance for other companies that seek the DSS as a powerful decision-aid tool, this paper conducted an in-depth case analysis of the BCV that successfully exploited the WDSS. Findings – Through the BCV's case, it was shown that the WDSS cannot only improve warehousing productivity, but could also improve supply chain visibility. It was also discovered that the WDSS success depend in the company's ability to sustain high data quality by standardizing, cleaning, and updating relevant data on a real-time basis. Originality/value – Since the early 1970s, a DSS has attracted attention from both profit and non-profit organizations. However author has failed to demonstrate which methodology he/she used. Looking at the research quantitative methods was used, but should we try and use qualitative we may get different scenarios.

Arun Sen (2006)—this paper explores all factors influencing perceptions of data reposition method maturity. Knowledge reposition, like software development, may be a method, which may be expressed in terms of elements like artifacts and workflows. In software system engineering, the Capability Maturity Model (CMM) was developed to define totally different levels of software system method maturity. We draw upon the ideas underlying CMM to outline totally different maturity levels for a knowledge reposition method (DWP). supported the literature in software development and maturity, we establish a group of options for characterizing the degree of information reposition method maturity and conduct associate preliminary field study to through empirical observation examine if those indeed area unit factors influencing perceptions of maturity. Quantitative approach and also defining the size of the organization where data was gathered is very vital and not explained fully. Author should have also identified industry type; focus in this paper is on social control perceptions of DWP. Organizations that are aspiring to elevate their knowledge reposition processes to a lot of mature levels. This paper conjointly releases many areas for future analysis, together with instrument development for assessment.

Katy S. Azoury, Julia Miyaoka (2013) This paper is aimed at developing and measure of a modelling approach for creating periodic review of production and distribution choices for supply chain within the processed food trade. The supply chain faces many factors, together with multiple product, multiple warehouses, production constraints, high transportation prices, and restricted storage at the assembly facility. This problem is actuated by the supply chain structure at Amy's room, one amongst the leading producers of natural and organic foods within the u. s. Quantitative method was used though main focus is food industry, it will be logicall to use qualitative methodology especially in manufacturing to have more accurate results. There has been a tendency to develop associate increased myopic two-stage approach for this drawback. The primary stage determines the production set up and uses a heuristic, and also

the second stage determines the warehouse allocation set up and uses a non-linear improvement model. This two-stage approach is recurrent each amount and incorporates look-ahead options to improve its performance in future periods. There has been a tendency to validate the model mistreatment actual information from one mill at Amy's room and compare the performance of our model to it of the particular operation. It is discovered that the model considerably reduces both inventory levels and stockouts relative to those of the particular operation. Additionally, we have a tendency to establish an edge on the total prices for all possible solutions to the matter and live the effectiveness of our model against this lower bound.

ALLEN W. KIEFER ROBERT A. NOVACK (1999) - Supply Chain Management (SCM) is one amongst the foremost standard management ideas to impact business and therefore the supplying construct within the Nineties. Issues facing the construct of SCM embrace the shortage of analysis on what it means that to follow SCM, the way to implement a SCM program, and the way to live the performance of SC. A significant contributing issue to those issues is shaping that processes square measure managed in an exceedingly chain of supply and that corporations, or intermediaries, square measure include ED in an exceedingly supply chain. This analysis can specialize in the deposition element of the provision chain method and, specially, on however corporations live the performance of their warehouse (intermediary) operations. Two sorts of corporations are used for the analysis: those implementing a supply chain orientation and people that aren't. The empirical analysis can provide a comparison between common warehouse performance live moments for SCM-oriented corporations and non-SCM adjusted corporations and supply insight into the relationship between managers' perceptions of warehouse measuring effectiveness and therefore the degree of SCM sophistication, Supply chain is broad the author could have specified that mining or manufacture is used to ensure proper results, and also qualitative methods were used, however it would be logical to also consider quantitative approach.

Ramaa. A (2012) - In supply chain, storage duties is extremely vital because it acts as a node in linking the fabric flows between the provider and client. In today's competitive market atmosphere firms are compelled or forced to enhance their storage operations. Several firms have additionally customised their worth proposition to extend their client service levels, that has diode to changes within the role of warehouses. This paper highlights the findings of the study administered to judge performance levels and enhance productivity of the manual warehouses by developing a WMS framework and value profit analysis. Quantitative approach was used instead of qualitative; it will be wise also to consider other firms such as food industry

Mohammad Sadegh Hematyar Tabatabaie (2016) -Innovation is one in every of the elements that change the organization to realize the competitive advantage. Innovation within the field of supplying has appreciable blessings for the businesses. Blessings like accelerating the method of procure, reducing the price of deposition or transportation, on time procurement of products or materials, requiring less men, increasing the protection and accuracy so on that all are achieved through continuous improvement of processes and supplying functions. The aim of this study was to analyse the factors influencing the development of supplying innovation in terms of structure. In terms of purpose,

this study is AN applied one, where the descriptive-survey technique with the kind of correlation was wont to collect the info. the foremost vital data assortment tool was a form that was written supported the Likert spectrum. Research community enclosed all specialists and authorities associated with supplying, deposition and procure in active construction firms in capital of Iran that among them, 197 folks were every which way elite. The collected data was analysed by regression technique and path analysis whereby qualitative methods were used. This study has been consisted of 4 hypotheses that these hypotheses justify the connection among the varied elements of the structure and supplying innovation. Quantitative methods should follow to ensure accurate results. The results indicated that the third hypothesis is confirmed. Thus, the structure particularly the shortage of focus and specialization on effective logistics innovation were according and solely recognition had no vital result on supplying innovation. Also supplying innovation was recognized joined of the factors poignant market performance.

Aleksandra Anđelković (2018) -The main aim of this study is for timely response to requests of any participant within the chain of supply, as associate degree integral a part of every provision system, warehouse are often found at anywhere within the provide chain, between suppliers and customers. In that sense, warehouse management involves the management and improvement of the complicated warehouse and distribution system. it would be aforementioned that reposition and inventory management represent support to the assembly method and try to finish coordination in relations with all functions, like selling, finance, human resources etc. Therefore, any disruption in coordination will cause serious issues throughout the full business methods. When there's a requirement for achieving operational potency and price savings, warehouse management and warehouse operations area unit acceptable areas, in terms of achieving savings which cannot jeopardize the standard of product and services. Especially, order-picking, as a part of the reposition method, is one among the foremost important. Products from a particular location within the warehouse, therefore on reply to needs of production and/or customers. it's calculable that values the prices} of order-picking participate with fifty fifth within the total cost of reposition. However, elimination of this activity will increase the extent of discontentment of partners within the provide chain, and, in this means, increase the price of lost sales. during this regard, one shouldn't contemplate elimination of order picking from the reposition method as associate degree choice, however rather notice how to extend its potency. Due to their flexibility within the order-picking method, individuals cannot be totally replaced by machines and technologies. However, instrumentality of order-picking method by the adequate technology may increase potency of process and productivity of workers within the warehouse. In this sense, warehouse management system (WMS) is associate degree data technology whose implementation has the aim to extend potency of processes performed in warehouse. Therefore, the aim of the paper is to emphasise the importance of implementing a warehouse management system for rising the order-picking method, as warehouse activity. So as to accomplish this aim, research has been conducted. A random sample of corporations specialised for performing distribution activities has been chosen. The authors of the paper have analysed that phase of order-picking method are able to do most advantages from implementation of this technology, but also whether there area unit any limitations in terms of implementation of WMS. Supported the applied math ways (descriptive statistics and cluster analyses), through the SPSS package package, the results given within the paper indicate the

segments of order-picking method that area unit principally improved by implementing the WMS. Author should have used qualitative methods to enhance and further research.

Klaus Moeller (2011) conducted the study that aimed at Increasing warehouse order picking performance by sequence optimization, as the travel time covers most part of picking processes in storages, a suitable order of picking lines in a batch is important to attain high efficiency. In their study they argued that routing enquiry for line series in picking of order batches are well investigated, record and implemented in Warehouse Management Systems (WMS). Further, they stated that storage areas in practice where routing heuristics could hardly be applied, an optimisation routine could be an alternative. Based on a digitised network, the Line Sequence Optimisation (LSO) calculates the line sequence for a given batch with the minimum travel time. For a case study at a distributor in the electronic devices business segment, the quantitative evaluation showed an overall improvement potential of 7,4%. But in contrast to systematically working enquiring for routing, the sequences generated by the LSO may look illogical to the picker - a qualitative evaluation needs to follow to identify sequence patterns and to discuss the methodology with the picking Personnel.

Charles G Petersen (2005) Objective of this paper is to check the resent need of all aspect of chain of supply and demand of storage have changed and increased drastically over few years past years, with the need to meet the end user ever changing demands storages have become concerned with slotting warehouse methods. This research is looking to evaluate slotting measurements and warehouse storage techniques. Quantitative approach will be more relevant considering the size of the organization being investigated.

Frida Claesson and Per Hilletofth (2011) Distribution has become a key factor in today's logistics system due to companies' desires to achieve considerable economies of scale in production, achieved by focused factories, as well as customers' demands for shorter lead-times and customer adapted products. The purpose of this research is to investigate if the in-transit distribution strategy may offer companies a competitive advantage and may be used as a complement to the centralised distribution strategy and/or the decentralised distribution strategy. This study shows that the in-transit distribution strategy can give major competitive advantages by offering rather short lead-times for customers without having to store products locally in warehouses. Quantitative approach was used however it would be fair to also consider qualitative methods and results may differ. This, in turn, gives lower warehousing costs, lower tied-up capital, a less interrupted manufacturing, and steady and continuous production volumes. In order to be successful with this strategy, it takes good planning, working closely with customers, good market knowledge, and an enterprise resource planning (ERP) system that is able to support the strategy sufficiently. Among these factors, low variation in demand as well as manufacturing output is required, and furthermore distribution lead time needs to be predictable.

Olof Stenius, Johan Marklund ∗, Sven Axsäter (2017)This paper provides exact analysis of a model for sustainable control of a one-warehouse-N-retailer in- ventory system with time based shipment consolidation. The model is

motivated by discussions with industry, and involves the possibility to reserve intermodal transportation capacity in combination with truck transports available on demand. Inventories are reviewed continuously while shipments from the warehouse are consolidated for groups of retailers and dispatched periodically. A key result is the deriva- tion of the probability mass functions for the number of units on each shipment. This allows for realistic volume dependent freight cost structures and transportation emissions to be included in the model. We show how to jointly optimize the reorder levels, shipment intervals and capacity reservation quantities to minimize the total expected costs. Transportation emissions are taken into consideration by use of a side constraint or by introducing emissions costs. A numerical example illustrates how the model can be used for evaluating the cost impact of reducing transportation emissions. The analysis is applicable to both single- and multi-item systems but there was no clear indication of which research methods were used, however it was discovered that quantitative was used though more analysis of qualitative would be ideal.

S.G. Li *, X. Kuo (2008) Because of the complex structure of spare parts supply chain, the conventional approaches, which do not consider the relationships between decision factors globally, cannot achieve the optimal performance. Therefore, this paper aims to develop an enhanced fuzzy neural network (EFNN) based decision support system for managing automobile spares inventory in a central warehouse. In this system, the EFNN is utilized for forecasting the demand for spare parts. However, without considering relevant domain knowledge, traditional neural networks are found to be suffered from the problem of low accuracy of forecasting unseen examples. Therefore, in our EFNN, the following improvement is made: First, it assigns connection weights based on the fuzzy analytic hierarchy process (AHP) method without painstakingly turning them. Second, by generating and refining activation functions according to genetic algorithm, our EFNN can provide comprehensive and accurate activation functions and fit a wider range of nonlinear models. Last, but not least, an adaptive input variable is introduced to decrease the impact of the bullwhip effect on the forecasting accuracy. The proposed system is evaluated with the real word data and experimental results indicate that our EFNN outperforms other five

models in fill rate and stock cost measures and there was no size of organization defined.

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.

Claudia R Rosales (2013) - We contemplate supply chain form with shipments from outside storage directly to retailers and compare improvement options: expensive transportation among retailers once demand has been complete vs. cost-free allocation to the retailers from the development of a centralized depot. Random programming models square

measure developed for both the transportation and allocation structures. We study the impact of value parameters and demand constant of variation on each system structures. The results show an increase in relationship between average prices and demand, and what is more is that this increase is more pronounced for the allocation structure. However author doesn't show the industry type as to where the research was done and which methodology was used. Quantitative method will be more suitable and also try using the search in a food industry. Employment simulation and non-linear search techniques to computationally compare the price performance of allocation and transportation structures underneath a large vary of system parameters like demand uncertainty and correlation. Lead times from external transportation approach are found to outperform allocation for a broad vary of parameters.

Vaidyanathan Jayaraman and others (2007) – conducted a research aimed at customer returns and on how this impacts the warehouse as well as logistics expenditure of the company. End-users on an average return about six percent of everything they bought and organizations and organizations must see this as an opportunity to reuse the returned product and give it another life. However many organizations do not see this as an opportunity they just throw away products and see them as waste though they may have value in them, this research we look at presenting redefined value of such products, though large medium enterprise were used, it would be rather wise to focus on small medium enterprise and also focus more on qualitative methods to get an idea for further studies related to this research.

Nelda Johnson (2001) – Health care industry have took advantages of technology equipment such as laptops/ computers to efficiently run production or operational processes although intergrading data has not gone according to plan currently. Patience information along with other related info will improve data accuracy and availability should all data be gathered accordingly, this will ensure reliable data is readily available. It will be also easy to generate reports and this will lead to better and quality results of health care should one need to do research in future, DM (Data Management) is one of the main focal point in health care industry and administration of it is critical in any way you may see fit. This will also ensure that quality is improved; data can be achieved for future purposes. Though the author only focus on health care and relying on quantitative approach, qualitative will be logical so that more question and study analysis can be raised, computers are vital in any organization and storage of data can be vital even in mining or any other industry.

Conclusion

These study is aimed at Increasing warehouse order picking performance by sequence optimization, as the travel time covers most part of picking processes in storages, a suitable order of picking lines in a batch is important to attain high efficiency. In their study they argued that routing enquiry for line series in picking of order batches are well investigated, recorded and implemented in Warehouse Management Systems (WMS). Further, they stated that storage areas in practice where routing heuristics could hardly be applied, an optimisation routine could be an alternative. Based on a digitised network, the Line Sequence Optimisation (LSO) calculates the line sequence for a given batch with the minimum travel time. For a case study at a distributor in the electronic devices business segment, the quantitative evaluation showed an overall improvement potential of 7,4%. But in contrast to systematically working

enquiring for routing, the sequences generated by the LSO may look illogical to the picker - a qualitative evaluation needs to follow to identify sequence patterns and to discuss the methodology with the picking Personnel. Although a number of studies have been conducted in the past two decades to address these issues there is still gab in the current literature review, therefore the aim of this paper is to theoretically assess warehouse performance in manufacturing industry. The results of critical analysis of the current literature clearly demonstrate that there are flaws in the current body language related to warehouse performance.

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Biography

Tshepo Phuti Mabotja is currently conducting Masters degree in the Faculty of Engineering and the built environment, University of Johannesburg. He holds B-Tech Degree in Logistics Management from Vaal University of Technology, South Africa. His research interests involve around warehousing as he discovered challenges that companies face during his long working career in private sector.

Ndala Yves Mulongo is a PhD candidate degree in the Faculty of Engineering and the built environment, University of Johannesburg. He holds bachelor of engineering in extraction metallurgy and master of engineering in engineering management from University of Johannesburg, South Africa. His research interests involve life cycle approach, cost of electricity production, energy efficiency measures, green supply chain management, impact of mining operations on environment, mineral processing, manufacturing processes.

Dr Pule Kholopane is currently a Senior Lecturer and Head of Department in the Department of Quality and Operations Management, Faculty of Engineering and the Built Environment, University of Johannesburg, South Africa. He has both industrial and academic experience for more than twenty years. He has got a Doctor of Engineering Management degree from the University of Johannesburg where he has been supervising masters and PhD students during the current decade. He has published several journal and conference research papers. His research areas include project management, process optimizations, manufacturing processes, supply chain management, sustainability, production planning, energy efficiency, waste reduction, product development and marketing, product quality related issues, cost analysis, etc.