



ADDIS ABABA UNIVERSITY

SCHOOL OF BUSINESS AND ECONOMICS

**DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN
MANAGEMENT**

**ASSESSMENT OF WAREHOUSE PERFORMANCE: A CASE OF
ETHIOPIAN TRADING ENTERPRISE**

By: Tewodros Bogale

**ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES**

**Addis Ababa
Ethiopia
June, 2016**

ADDIS ABABA UNIVERSITY

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN
MANAGEMENT

ASSESSMENT OF WAREHOUSE PERFORMANCE: A CASE OF
ETHIOPIAN TRADING ENTERPRISE

By
Tewodros Bogale

A Thesis Submitted to Addis Ababa University School of Business and
Economics in Partial Fulfillment of the Requirements for the Degree of
Masters of Art in Logistics and Supply Chain Management

Advisor
Fesseha Afewerk (Ast. Prof.)

Addis Ababa
Ethiopia
June, 2016

Declaration

I, the under signed, declare that this thesis entitled “*Assessment of Warehouse Performance: A Case of Ethiopian Trading Enterprise*”, is my original work and to the best of my knowledge has not been presented for a degree by any other person, and that all the sources of material used for the thesis have been duly acknowledged.

Declared by:

Tewodros Bogale Sisay

Date & Signature

Statement of Certification

This is to certify that the thesis carried out by **Tewodros Bogale** on the topic entitled: “*Assessment of Warehouse Performance: A Case of Ethiopian Trading Enterprise*” is his original work and is suitable for submission for the award of Masters of Art Degree in Logistics and Supply Chain Management.

Advisor

Fesseha Afework (Ast. Prof.)

Date & Signature

ADDIS ABABA UNIVERSITY
SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

This is to certify that the thesis carried out by **Tewodros Bogale Sisay**, entitled: “*Assessment of Warehouse Performance: A Case of Ethiopian Trading Enterprise*” and submitted in partial fulfillment of the requirements of the Degree of Master of Art in Logistics and Supply Chain Management complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Approved by the Examining Committee:

Fesseha Afewerk (Ast. Prof.)
Advisor

Signature

Solomon M. (PhD)
Internal Examiner

Signature

Temesgen G. (PhD)
External Examiner

Signature

Chairman

Signature

Abstract

In today's challenging and competitive world, success can be hinge on whether a warehouse operation is productive and effective enough to meet the expectations of customers. One way to gauge how effectively the warehouse operations are meeting these expectations is to conduct a warehouse operations assessment. Considering this reality, this particular study explores to investigate the warehouse performance (measured in terms of the most frequently used four dimensions as suggested by Edward Frazelle (2001), namely Quality, response time, total warehouse cost, and productivity in the enterprise called Ethiopian Trading Enterprise. This research study however provide a brief introduction to warehouse management, performance measurement and metrics or key performance indicators based on the most recognized literature. Possessing to the small number of the total population, the study has employed census survey to quantitatively and qualitatively assess the warehouse of the enterprise. Questionnaire was used as the official instrument of data collection. A total of 70 questionnaires were distributed and 61 of them were filled and returned to make the response rate about 87%. The findings of the study suggested that all the dimensions of warehouse performance have statistically significant result. Generally, the study findings have suggested that the levels of warehouse performance is approximately moderate in the case of Ethiopian Trading Enterprise in terms of the four key performance indicators. It has also discovered that, among the four key performance indicator, measurement of the warehouse performance based on dimension of response time is comparatively in a better position in the enterprise warehouse. And also inferred that the perception of the enterprise employee in performance implication of size and type of warehouse is based on the situation and they all have different point of view among the four key performance indicator influence on the overall performance of a warehouse but they believed that quality indicator seems to be most valuable and should be given with high emphasis and response time and cost/financial indicator also important. However their expectation for productivity indicator is less. The study advocated that a lot of emphasis need to be directed to quality and cost indicator in order to achieve significant cost savings from minimized total cost of warehousing and improved quality and also maintain improved response time and improved efficiency or productivity, consequently improving the organizational performance as a whole.

Keywords: Warehouse, Performance, Performance Measurement

Acknowledgements

In the beginning, I thank my Lord Jesus Christ and mother of Jesus Christ the Holy Virgin St. Mary for giving me the strength to accomplish this.

I would like to express my deepest gratitude to my advisor Ass Professor Fesseha Afewerk for his goodwill, support and guidance throughout the research. His continued support led me to the right way.

I would also like to thank my dear Wife, Mahlet Shumete and my son Natnael Tewodros, for their endless patience, understanding and support throughout my graduate program and this study.

I also want to thank all of the respondents for their benevolence during my data collection times. Finally but majorly it is must to pass my deepest appreciation to my friend Sileshi Solomon for his kindness and help throughout this study

Contents

<i>Abstract</i>	i
<i>Acknowledgements</i>	ii
List of Tables	vi
List of Figures	vii
List of Acronyms	viii
CHAPTER ONE	1
INTRODUCTION	1
1.1 Background	1
1.2 General information about Ethiopian Trading Enterprise (ETE).....	3
1.3 Statement of the Problem.....	3
1.4 Research Questions	5
1.5 Objective/Aim of the Study	5
1.5.1 General Objective	5
1.5.2 Specific Objective	5
1.6 Scope of the Study	5
1.7 Significance of the Study	6
1.8 Conceptual Definition of Terms	6
1.9 Organization of the Study	7
CHAPTER TWO	8
LITERATURE REVIEW	8
2.1 Introduction.....	8
2.2 Conceptual Underpinnings.....	8
2.2.1 Defining Performance Measurement	8
2.2.1.1 Performance Measurement Systems and Frameworks.....	9
2.2.1.2 Performance Measures and Metrics	10
2.2.1.3 Challenges in Performance Measurement.....	10
2.2.1.4 Performance Measurement Trends	11
2.2.1.5 Performance Measurement Method	12
2.2.1.6 Characteristics of good measure	13
2.2.2 Defining Warehouse	13

2.2.2.1	Why have a warehouse?.....	14
2.2.2.2	Defining Warehouse Management.....	16
2.2.2.3	Warehouse in Supply/Value chain.....	16
2.2.2.4	Warehouse Activities.....	17
2.2.2.5	Warehouse Types.....	19
2.2.2.6	Challenges in Warehouse Management.....	20
2.2.2.7	Warehouse Management Systems (WMS).....	21
2.2.2.8	Warehouse Management Trends.....	22
2.2.2.9	Warehouse Performance Measurement.....	23
2.2.3	The Concept of Performance Measurement in a Supply Chain Context.....	23
2.3	Empirical Evidences on the Warehouse Performance Measurement.....	25
2.4	Conceptual Framework.....	27
2.4.1	Theoretical Foundation.....	27
2.4.2	The Factors of warehouse Performance.....	28
2.4.3	Warehousing/Storage Performance indicators.....	28
2.4.3.1	Quality.....	29
2.4.3.2	Response Time.....	31
2.4.3.3	Cost/Financial.....	32
2.4.3.4	Productivity.....	33
2.4.4	Conceptual Model.....	34
CHAPTER THREE.....		35
RESEARCH DESIGN AND METHODOLOGY.....		35
3.1	Introduction.....	35
3.2	Research Design.....	35
3.3	Source of Data & Data Gathering Tools.....	36
3.4	Target Population, Unit of Analysis and Respondents.....	37
3.5	Survey Instrument.....	37
3.5.1	Instrument Development.....	37
3.5.2	Instrument Validity.....	38
3.5.3	Instrument Reliability.....	38
3.5.3.1	Reliability Test.....	38
3.6	Variables and Measurement.....	39

3.7	Method of Data Analysis and Presentation.....	40
3.8	Ethical Considerations	40
	CHAPTER FOUR.....	42
	DATA ANALYSIS, RESULT AND DISSCUSION.....	42
4.1	Introduction.....	42
4.2	Respondents' Demographic Information	42
4.3	Descriptive Analysis	44
4.3.1	The First Research Question.....	44
4.3.1.1	Respondents' Perception on Quality Indicator	45
4.3.1.2	Respondents' Perception on Response Time Indicator.....	46
4.3.1.3	Respondents' Perception on Cost\Financial Indicator	47
4.3.1.4	Respondents' Perception on Productivity Indicator.....	48
4.3.2	The Second Research Question.....	48
4.3.2.1	Respondents' Perception on Warehouse Performance.....	49
4.3.3	The Third Research Question	49
4.3.4	The Fourth Research Question.....	50
	CHAPTER FIVE	52
	CONCLUSIONS AND RECOMMENDATIONS	52
5.1.	Conclusions.....	52
5.2.	Recommendations.....	53
5.2.1	Recommendations for the enterprise.....	53
5.2.2	Limitations of the Study.....	54
	Reference	55
	APPENDIX A: Questionnaire	60

List of Tables

Table 2.1 Different metric types and their definition (adopted from Gartner, 2014)	Page 10
Table 2.2 Characteristics of good measure	Page 13
Table 2.3 Warehousing/Storage Performance indicators	Page 29
Table 3.1 Cronbach's alpha	Page 39
Table 3.2 Variables and measurement items	Page 40
Table 4.1 Respondents demographic information	Page 43
Table 4.2 Quality indicator measurement items mean and standard deviation	Page 44
Table 4.3 Response Time Indicator measurement items mean and standard deviation	Page 46
Table 4.4 Cost\Financial Indicator measurement items mean and standard deviation	Page 47
Table 4.5 Productivity Indicator measurement items mean and standard deviation	Page 47
Table 4.6 Composite scores of mean and standard deviation	Page 48
Table 4.7 Analysis of respondents' choice regards to the first qualitative question	Page 50
Table 4.8 Analysis of respondents' choice regards to the second qualitative question	Page 50
Table 4.9 Analysis of respondents' choice regards to the third qualitative question	Page 51

List of Figures

Figure 1 Conceptual frameworks (Own Model)

Page 34

List of Acronyms

ETE	Ethiopian Trading Enterprise
KPIs	Key Performance Indicators
PMS	Performance Measurement System
WMS	Warehouse Management Systems
WCS	Warehouse Control Systems
SKU	Stock Keeping Unit
CSF	Critical Success Factor
SCM	Supply Chain Management
ROA	Return on Asset
ROI	Return on Investment

CHAPTER ONE

INTRODUCTION

This topic begins with a brief background to the research topic, which leads to an introduction of the case company, Ethiopian Trading Enterprise, statement of the problem of the study, question and objective of the study will then be presented.

1.1 Background

Warehouses are a substantial component of logistic operations, and an important contributor to speed and cost in supply chains. While there are widely accepted benchmarks for individual warehouse functions like order picking, little is known about the overall technical efficiency of warehouses. Lacking a general understanding of warehouse efficiency and the associated causal factors limits organizations ability to identify the best opportunities for improving warehouse performance. (Andrew Johnson and Leon Mcginnis, 2010). This study addresses this gap by describing a methodology for assessing warehouse technical efficiency based on empirical data integrating several statistical approaches. This study also identify several opportunities for additional research on warehouse assessment and optimization.

In today's challenging and competitive world, success can be hinge on whether a warehouse operation is productive and effective enough to meet expectations of customers. One way to gauge how effectively the warehouse operations are meeting these expectations is to conduct a warehouse operations assessment: a systematic review of the warehouse functions looking for possible improvements in efficiency and service. A good operations assessment takes a quantitative look at the productivity and service levels of a warehouse operation; it enables to measure productivity and service and identify patterns and trends; it tells exactly where companies are and what they need to do to meet their goals. It also allows companies to compare their measurements with their own in-house goals as well as industry benchmarks. (F.Curtis Barry & company/Solution for multi-channel operations & fulfilment 2016)

Remember, if can't measure something, it is difficult to improve it. An operational assessment can help companies to improve productivity; use distribution center space more efficiently;

improve throughput and capacity of orders processed in the warehouse; streamline work-flow by reducing steps; improve service levels, processes and costs; and generally achieve higher profits and lower costs. If these are goals, combining measurement of the various components of the operation with a structured approach to develop improvements is the key to successfully acting on the assessment findings. Once you gather the information and make the comparisons, you'll be able to draft an action plan. (F.Curtis Barry & company/Solution for multi-channel operations & fulfilment 2016)

According to Ilieş Liviu, Turdean Ana-Maria and Crişan Emil Babeş, (2009) – A Case Study on Warehouse Performance Measurement states that Companies could gain cost advantage using their logistics area of the business. Warehouse management is a possible source of cost improvements from logistics that companies could use during this economic crisis.

In their case study they puts best practices used in warehouse performance measurement which lead to performance improvements and also answers questions like What are the warehouse performance indicators? How are they calculated and how are they interpreted? How can a manager use them in order to improve the warehouse performance? And their solution was Warehouse performance measurement refers to the measurement of: optimal use of storage space, customer relations activity, quality level, assets usage and costs.

Conducting warehouse activities is not as such simple as traditionally known sets of warehouse activities like receiving of stocks, hold them and issue when they are needed rather understanding of warehouse efficiency and the associated factors that affects the ability of warehouse performance and meets the maximum service level provided by the company. (Per Axelsson & Jonathan Frankel 2014)

Performance measurement, will give the reader a brief insight to the importance of performance management and performance measurement. (Per Axelsson & Jonathan Frankel 2014)

Warehouse management, explains the meaning of warehousing operations, Warehouse management and warehouse management systems (WMS). It summarizes general warehouse processes, warehouse types, warehouse trade- offs, trends and challenges. The purpose will to provide an understanding about warehousing, Furthermore, it will gives an understanding of

the classification of metrics in warehousing, thereby it also works as a basis for the study as well as the analysis. (Per Axelsson & Jonathan Frankel 2014)

Performing KPIs analysis is very critical in any organization to better understanding their performance and previous decisions accuracy. Unfortunately not many organizations understand its importance and ignore performing this step. Improvement in KPIs due to applying relational analysis and transforming quantitative measure to qualitative indicators which makes senior management understand previous decision taken and how accurate it was, and hence improving future decisions and hence performance results. (Dr. Hanaa El 2013)

1.2 General information about Ethiopian Trading Enterprise (ETE)

Ethiopian Trading Enterprise (ETE) is a public wholesale enterprise whose primary mandate is to increase affordability of goods to consumers, support increased competition and investment in the private sector, and to facilitate the development of a modern trade sector in Ethiopia.

ETE provide food and other fast moving consumer goods through modern “cash and carry” stores operating according to international best practices and consistently offering quality products at affordable prices. ETE aim to develop a commercially viable business, while reducing consumer costs and inflation in the country. ETE’s vision is based on the belief that the community deserves a higher quality of life and a brighter future.

ETE now has seven stores throughout the country. Three stores are in Addis located in Merkato, Megenagna and Kality and the rest four stores are located in Hawassa, Shashemene, Bahirdar and Dessie. And also has three huge warehouse at Kality, Shashemene and Bahirdar. ETE has planned to open 36 stores in 27 cities to supply basic items in Ethiopia.

1.3 Statement of the Problem

Assessing warehouse performance has been largely ignored in research literature (Johnson & McGinnis, 2010). Performance measurement and metrics have also been considered to be a complex matter, and operating the measurements is often inadequately understood followed by weakly formulated definitions of what will be measured (Melnyk, Stewart, & Swink, 2004). However, when it comes to the control of a warehouse, metrics make it possible for the workforce to better evaluate and govern their area of responsibility (Melnyk et.al, 2004) and

thereby solve problems before it's too late (Ilies, Turde, & Crisan, 2009). Performance measurement is also desirable to generate the greatest paybacks (Johnson & McGinnis, 2010).

Since the field of supply chain management specifically modern warehouse (store) management is relatively new to Ethiopia, there is an apparent shortage of documented evidences that sufficiently depict the practice of assessing warehouse performance. Tigist Beyene (2011), more in the case of the wholesales industry. In such a situation of visible shortage, it is very difficult to get adequate reference to examine the status of warehouse measurement practices. On top of this, even some of the existing very limited research works hadn't comprehensively examined those factors of warehouse and its performance implication through the use of explicit dimensions and corresponding measures across a wide range of business entities.

With all the limitations involved, however, the existing works suggest that the practice of assessing warehouse performance is a must for a company in order to improve their warehouse efficiency and firm productivity as a whole in the Ethiopian context (Biniyam Assefa, 2006;). According to Tigist, the most frequently practiced way of warehouse management in the case of Ethiopian wholesale company is following the traditional set of warehousing operation rather than determining performance measurement standards. Tigist Beyene (2011)

Effective assessment of Warehouse performance can potentially affect the overall supply chain activities of the enterprise and directly contributed to the productivity of the company as a whole. However ETE currently is not able to effectively assess the performance of the warehouse to know where to improve it and .to maintain better performance performed by the enterprise.

Warehouse constitutes the most significant part of current supply chain management in the enterprise. Because of the nature of the business and considerable sum of an organization's fund is being committed different products. It is absolutely imperative to manage warehouse effectively so as to avoid unnecessary cost, ensure high level of customer service.

Considering the aforementioned gaps, this study attempted to determine the status of warehouse performance in Ethiopian Trading Enterprise along the four most frequently used warehouse key performance indicators, namely Quality, response time, total warehouse cost/financial, and productivity as suggested by Edward Frazelle (2001)

1.4 Research Questions

In view of the aforementioned problems, this particular study attempted to answer the following basic research questions

1. What is the level of warehouse performance of the enterprise measured in terms of the four key performance indicators?
2. On which key performance indicator the enterprise performs better?
3. What is the perception of the employees of the enterprise on the key performance indicator that can heavily contributed to the overall performance of the warehouse?
4. What is the perception of the employees of the enterprise regarding the performance implication of capacity of warehouse?

1.5 Objective/Aim of the Study

1.5.1 General Objective

The general objective of this study is to examine the status of warehouse Performance in Ethiopian Trading Enterprise (ETE)

1.5.2 Specific Objective

- i. to determine which dimensions of warehouse performance indicators on which the enterprise performs better,
- ii. to identify the major key performance indicator that can heavily contributed to the overall performance of the warehouse
- iii. to determine the implication of capacity of warehouse on performance

1.6 Scope of the Study

This study is meant to assess the status/extent of warehouse Performance of Ethiopian Trading Enterprise. The operationalization and measurement of warehouse performance is made on the bases of four dimensions, namely Quality, response time, total warehouse cost/financial, and productivity. As such, the findings of this particular study are to be generalized Ethiopian Trading Enterprise corresponding to the study period.

1.7 Significance of the Study

This study is conducted to the partial fulfilment of the requirements for the Master of Art in Logistics and Supply chain Management and simultaneously the study provides to expand the body of knowledge in the importance of assessing performance of warehouses and to propose concerned managers of the enterprise to take decision about improving the performance of the warehouse. Moreover the study provides the company to make some change based on the result of this study and to understand how those performance indicators affects warehouse performance and it also provide for researchers, academics and students reliable data about warehouse performance measurement.

1.8 Conceptual Definition of Terms

Supply chain: it is the network of organizations and organizational processes that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services that would be delivered to the ultimate consumer (Christopher, 1992).

Warehouse: is a place where item are received, stocked and dispatched (Aronovich, et al., 2010)

Warehouse management: has been defined as the combination of planning, decision-making and controlling inbound, storage and outbound flows (Faber, 2013).

Performance management: has been defined as a “process by which the company manages its performance in line with its corporate and functional strategies and objectives” (Bititci, et al., 1997).

Warehouse performance measurement: are made to ensure: Good customer service that a philosophy of continuous improvement exists among the staff and that issues are discovered before they harm the operations (Gwynne Richards, p 230).

Quality: is the accuracy of a given set of activity (Aronovich, et al., 2010)

Response Time: the time gap between request and get respond (Aronovich, et al., 2010)

Cost: is an expense to undertake a set of transaction (Aronovich, et al., 2010)

Productivity: is doing things in their possible minimum cost (Efficiency) (Aronovich, et al., 2010)

1.9 Organization of the Study

The study is organized in to five chapters. Chapter-one presents the introductory part of the study that comprises, among others, the background of the study, statement of the problem along with the research questions and objectives of the proposed study. Chapter-two deals with the review of the extant literature related to the topic of inquiry; whereas chapter-three gives detail account of the design and methodological aspects employed. The analysis of the study data, presentation of the results and corresponding discussions are comprised under chapter-four. Chapter-five culminates the thesis by providing brief conclusions and relevant suggestions on the basis of the findings of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews works on Warehouse performance measurement in Ethiopia and other countries in general and Ethiopian Trading Enterprise in particular. Works on performance and dimensions of performance were also reviewed. This is of help to understand the warehouse performance metrics and its implication on warehouse performance. This chapter comprises of three areas, the empirical, theoretical and conceptual foundation of performance measurement of warehouse operation.

2.2 Conceptual Underpinnings

2.2.1 Defining Performance Measurement

When exploring literature on performance management and performance measurement it's clear that this topic has been and still is significant both to researchers and practitioners. Tens of thousands of articles, book chapters and conference journals can be found. This research study however will only provide a brief introduction to performance management, measurement and metrics based on the most recognized literature.

To get a brief understanding about any business term a definition is often a good start. Performance management has been defined as a “process by which the company manages its performance in line with its corporate and functional strategies and objectives” (Bititci, et al., 1997).

More practically performance management can be seen as the process of creating and executing business plans effective and efficient.

This process often starts with the creation of budgets and operational plans that are tied to strategic goals, these initiatives can then be allocated resources by managers based on financial assessments. The next step is to execute these plans and focus on identifying, measuring and developing performance. To develop and inform corporate strategies throughout the organization is therefore an important part of performance management, however the most relevant part to this research is performance measurement.

Performance measurement has had a tremendous impact in management over the last decades according to this research there are three main reasons why performance measurement is essential.

1. Today's businesses are very complex, which also makes them hard to manage. Performance measurement's purpose is to simplify the reality so that rational decisions can be made. That the reality is transformed to simplified numerical concepts that can be communicated and acted upon is the key to successful management (Lebas, 1995).
2. Performance measures play an important role in success by giving the opportunity to evaluate performance and benchmark the results against similar organizations (Camp, 1989) (Stewart, 1995).
3. Performance measurement plays the role of feedback in one's organization, it facilitates the assessment whether plans were accurate or not and it shows how well the execution was carried out. These processes are of critical importance to effective and efficient performance management (Bititci et al., 1997) (Bongsug, 2009).

The key in all of these statements is that implementing performance measurement in an organization will not improve performance by itself. It will however facilitate decision-making and the control over processes. The business information that is attained through performance measurement is the real value of performance measurement.

2.2.1.1 Performance Measurement Systems and Frameworks

The ideas behind why performance measurement is necessary have stayed the same over time, however the way it's been accomplished has varied. The systems for achieving a well-functioning performance measuring process have been under continuing change. At first organizations often concentrated only on financial measures, which left operations unsuccessful, (Kaplan and Norton, 1996) in later years especially after the implementation of the more holistic supply chain thinking internal processes, customers, and innovations started to get more attention.

The structure of the systems has also differed a lot. With increased complexity more structure has become important to get a grip over what's really important. Measures have been divided into classifications both horizontally so that each department easy can find metrics valuable to

their processes and vertically into different levels of management strategic, tactical, and operational (Patel, Gunasekaran, and Tirtiroglu, 2001).

The different performance measurement systems (PMS) that have been developed to help manage performance and provide feedback from the processes and the activities performed are from an operational point of view all a set of metrics used to quantify the efficiency and effectiveness of actions

(Neely et al., 1995).

2.2.1.2 Performance Measures and Metrics

This subsequently leads us to performance metrics, metrics are used to define the measure in terms of scope and content. There are often mix-ups between different types of metrics to clarify Gartner have put together a compilation of commonly used metrics and their definitions, shown in Table 2.1.

Table 2.1 Different metric types and their definition

Metric	Definition
Performance Indicator	What you need to do (predictive measure)
Result Indicator	What you have done (historical measure)
Key Performance Indicator (KPI)	What you need to improve significantly
Key Result Indicator (KRI)	What significant things have been accomplished
Critical Success Factor (CSF)	What must be done in order to drive strategic business outcomes

Source (adopted from Gartner, 2014)

2.2.1.3 Challenges in Performance Measurement

Even though performance measurement is a stated factor for successful management many companies are not engaged in it, and there are issues that speaks against it.

1. Measuring is often put in negative terms because people think of surveillance and pressure to perform.
2. To develop a measurement system, or a set of KPIs can be very challenging and time craving.

3. Even if a measurement system is in place it has to be continuously updated to stay relevant and it's easy that the system keeps expanding and the meaning of having a few powerful KPIs are lost.

“It's easy to forget that performance measurement and monitoring can be better addressed using trivial few which are not really trivial in reality but instead are those few areas most critical to success.” (Thakkar, 2009)

2.2.1.4 Performance Measurement Trends

The development of information technology has changed business environment almost entirely. And IT has of course been very influential in performance measurements. Almost all processes today are in some way in touch with IT so it has become much easier to measure. Three main trends in performance management have been found

Real-time

The current highly competitive markets have created the demand for both businesses and products to be able to change fast and dynamically. The company that meets consumers' demands fastest is the one that survives. To be able to be flexible and develop winning strategies for the future it's important for managers to have meaningful performance information to avoid becoming lost in a sea of data (Elrod, 2013).

Mobility

The ability to change fast and dynamically also means that decisions must be able to make wherever you are. Mobility is therefore a large trend within performance management. Even if the logistics manager is away from site he wants to be able to manage the warehouse like normal. And with modern technology this is becoming more and more standard. 24-7 Internet connectivity, cloud solutions, smartphone support these are all much more common in warehouses today than ten years ago.

Visibility

To create a system so that critical business information can be attained, analyzed and acted upon has become almost as important as performance measurement itself. The increased willingness to measure together with increasing number of processes measured and the increased possibilities to automated measuring thanks to IT and ERPs, these have created massive opportunities to support decisions. However there is also a great risk to get lost in the large amount of data that is gathered in today's businesses. A critical success factor is therefore to make important metrics more visible and, if possible, display them in a dashboard that provides the relevant metrics. (Searle, Dixon, 2013)

2.2.1.5 Performance Measurement Method

The method that was found to be the best match for a company who decides to upgrade its supply chain performance measurement is described in a research paper from Gartner.

The method that Gartner suggest is a three-step action plan.

1. First, identify where you currently are.
2. next, define the desired metrics; what should the future state look like?
3. Finally, develop a migration plan to move from the "as is" to the "to be." (Gartner, 2012)

For the future state, three levels of aligned metrics are recommended: the executive level, a midlevel for the end-to-end supply chain and a third level with deeper functional metrics (Gartner 2012). This model is however directed towards companies that work with global supply chain management from an end-to-end point of view. Something to have in mind is that most of the information can't be acquired from a WMS alone and consequently this model will not be used fully. Warehouse management is strongly focusing on operational measurements (metrics on executive level are often more financial), which is why focus will be on deeper functional metrics.

2.2.1.6 Characteristics of good measure

Table 2.2 Characteristics of good measure

A good Measure	Description
Is quantitative	The measure can be expressed as an objective value
Is easy to understand	The measure conveys at a glance what it is measuring, and how it is derived
Encourages appropriate behavior	The measure is balanced to reward productive behavior and discourages "game playing"
Is visible	The effects of the measure are readily apparent to all involved in the process being measured
Is defined and mutually understood	The measure has been defined by and/or agreed to by all key process participants (internally and externally)
Encompasses both outputs and inputs	The measure integrates factor from all aspects of the process measured
Measures only what is important	The measure focuses on a key performance indicator that is of real value to managing the process
Is multidimensional	The measure is properly balanced between utilization, productivity, and performance and shows the trade-offs
Uses economies of effort	The benefit of the measure outweigh the costs of collection and analysis
Facilitates trust	The measure validates the participation among the various parties

Source: Aronovich, Dana, Marie Tien, Ethan Collins, Adriano Sommerlatte, and Linda Allain. 2010

2.2.2 Defining Warehouse

The warehouse has been viewed in many different ways and has many definitions. (Cavinato, 1990) views the warehouse as the place to hold, move, sort, transfer and change the form of inventories. Whereas, (Spencer, 1993) argues that the warehouse is a production system. He states that the 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 both physical processes of material handling and methodologies such as inventory control and production control.

2.2.2.1 Why have a warehouse?

According to (John J. Bartholdi, Iii and Steven T. Hackman, 2011) a **warehouse rationale** discussed below:

Why have a warehouse at all? A warehouse requires labor, capital (land and storage and-handling equipment) and information systems, all of which are expensive. Is there some way to avoid the expense? For most operations the answer is no. Warehouses, or their various cousins, provide useful services that are unlikely to vanish under the current economic scene. Here are some of their uses:

To better match supply with customer demand: One of the major challenges in managing a supply chain is that demand can change quickly, but supply takes longer to change. Surges in demand, such as seasonality's strain the capacity of a supply chain. Retail stores in particular face seasonality's that are so severe that it would be impossible to respond without having stockpiled product. For example, Toys R Us does, by far, most of its business in November and December. During this time, their warehouses ship product at a prodigious rate (some conveyors within their warehouses move at up to 35 miles per hour). After the selling season their warehouses spend most of their time building inventory again for the following year. Similarly, warehouses can buffer the supply chain against collapsing demand by providing space in which to slow or hold inventory back from the market.

In both cases, warehouses allow us to respond quickly when demand changes. Response-time may also be a problem when transportation is unreliable. In many parts of the world, the transportation infrastructure is relatively undeveloped or congested. Imagine, for example, sourcing product from a factory in Wuhan, China for retail sale within the US. After manufacture, the product may travel by truck, then by rail, by truck again, and then be loaded at a busy port; and it may repeat the sequence of steps (in reverse order) within the US. At each stage the schedule may be delayed by congestion, bureaucracy, weather, road conditions, and so on. The result is that lead time is long and variable. If product could be warehoused in Los Angeles, closer to the customer, it could be shipped more quickly, with less variance in lead time, and so provide better customer service.

Warehouses can also buffer against sudden changes in supply. Vendors may give a price break to bulk purchases and the savings may offset the expense of storing the product. Similarly, the

economics of manufacturing may dictate large batch sizes to amortize large setup costs, so that excess product must be stored. Similarly, warehouses provide a place to store a buffer against unreliable demand or price increases.

To consolidate product to reduce transportation costs and to provide customer service. There is a fixed cost any time product is transported. This is especially high when the carrier is ship or plane or train; and to amortize this fixed cost it is necessary to fill the carrier to capacity. Consequently, a distributor may consolidate shipments from vendors into large shipments for downstream customers. Similarly, when shipments are consolidated, then it is easier to receive downstream. Trucks can be scheduled into a limited number of dock doors and so drivers do not have to wait. The results are savings for everyone. Consider, for example, Home Depot, where more than a thousand stores are supplied by several thousands of vendors. Because shipments are frequent, no one vendor ships very much volume to any one store. If shipments were sent direct, each vendor would have to send hundreds of trailers, each one mostly empty; or else the freight would have to travel by less-than-truckload (LTL) carrier, which is relatively expensive but there is enough volume leaving each vendor to fill trailers to an intermediate cross dock. And each cross dock receives product from many vendors, sorts it, and prepares loads for each store, so that the total freight bound for each store is typically sufficient to fill a trailer. The result is that vendors send fewer shipments and stores receive fewer shipments. Moreover, the freight is more likely to travel by full truck-load (TL) and so pay significantly less transportation costs

A warehouse also provides opportunities to postpone product differentiation by enabling generic product to be configured close to the customer. Manufacturers of consumer electronics are especially adept at this. Country-specific parts, such as keyboards, plugs, and documentation, are held at a warehouse and assembled quickly in response to customer order. This enables the manufacturer to satisfy many types of customer demand from a limited set of generic items, which therefore experience a greater aggregate demand, which can be forecast more accurately. Consequently safety stocks can be lower. In addition, overall inventory levels are lower because each item moves faster.

Another example is in pricing and labeling. The state of New York requires that all drug stores label each individual item with a price. It is more economical to do this in a few warehouses, where the product must be handled anyway, than in a thousand retail stores, where this could distract the workers from serving the customer.

2.2.2.2 Defining Warehouse Management

Warehouse management has been defined as the combination of planning, decision-making and controlling inbound, storage and outbound flows (Faber, 2013). While this thesis essentially focuses on the control and the decision making aspects of warehousing, one can find more relevant research about planning in N. Faber's dissertation.

Warehouses have always been paid a great deal of attention from managers due to the large potential impact it can have in creating customer value. Like most areas the key objectives for managing warehouses have changed over time to create additional competitiveness. The first objectives within warehousing related to maximizing the utilization of resources within the warehouse. The more expanded concept inventory control aimed to maximize profits while providing good customer service (Tompkins & Smith, 1998). The objective of present warehouse management is to efficiently and effectively organize the processes in a warehouse (Faber, 2013), i.e. it encompasses both the objectives of inventory control and warehousing.

Several sources imply that keeping good control over a corporation's warehouses is of great importance. As an example, the competitive power of an entire company as well as the complete supply chain may be derived from outstanding performance within the warehouse or distribution center (Van Den Berg, 2012). In a broader context, a company's warehouse operations can influence the firm's corporate performance in manners such as logistics costs, customer service and business alignment (Van Den Berg, 2012).

Warehousing is however a correlation between logistics cost and good customer service; the higher customer service a company aims for, the greater logistics costs one can expect, which is one of the greatest trade-offs companies face in warehouse management (Van Den Berg, 2012). Similar reasoning is presented by (Gwynee Richards, 2011) in his illustration of warehouse management trade-offs.

2.2.2.3 Warehouse in Supply/Value chain

Warehouses function as node points in the supply (value) chain linking the material flows between the supplier and the customer. As a result of the highly competitive market environment companies are continuously forced to improve their warehousing operations. Many companies have also customized their value proposition to better meet customer demands, which has led to

changes in the role of warehouses. In such conditions improvement of order processing and materials handling can bring significant cost savings and at the same time increase customer value. (Tommy Blomqvist, 2010)

2.2.2.4 Warehouse Activities

In order for the reader to get an insight of this thesis area of research, following will describe basics behind warehouse activities. The theory in this section follows general warehouse philosophy and is similar to several renowned publications in the field of warehousing, both old and new.

(Bartholdi & Hackman, 2011) illustrates the normal physical activities and flows in a warehouse. The inbound processes are represented by receiving and put-away whilst the outbound processes includes picking, packing and shipping.

In the following section, brief descriptions of (Bartholdi & Hackman's, 2011) different activities in the inbound and outbound processes are presented, as well as other descriptions that are relevant to the topic.

Receive

Receiving is the first activity that is managed in a warehouse. The activity may start with a notification of incoming goods, which allows the workers to arrange coordinated unloading of the incoming goods. Normally the goods is also scanned and registered in the company's WMS. Receiving represents about 10 % of the cost in a normal warehouse.

Put-away

Prior to the put-away of a stock keeping unit (SKU) is being made, it's important that a (convenient) storage location is selected for storage. The reason for this is because the storage location many time reflects how quickly and how cost-efficient it later on will be retrieved for a customer. To do this, the warehouse staff needs to be able to control the inventory, i.e. the storage locations. Workers and managers need support to able to quickly access information about available storage locations, things to consider can be, how much weight a storage location tolerate, how spacious they are, how easily they are accessed etc. The put-away can then be realized with the help of various equipment such as forklifts, roll trolleys or conveyers.

Put-away usually corresponds to about 15 % of warehousing operating payments.

Storage

There are two main storage types, dedicated storage and shared storage. In general, a unique address is assigned to every single location in a warehouse, regardless if it's dedicated or shared location. A dedicated location is a storage, which is reserved for a specific and allocated SKU. In this manner, high frequent SKUs are assigned to more convenient locations, which streamlines order picking. However, a consequent of dedicated storage is often that volume utilization becomes insufficient.

The other type of storage, shared storage, can on the other hand be used to improve space utilization. Here, SKUs can be assigned to several locations. Once such a location becomes empty, another SKU can be assigned to this specific location. Consequently, the utilization of the inventory will be higher, the tradeoff is of course that a SKU can be located in many different locations and can thus be harder to find without good systems in place.

Pick

Normally, order-picking (retrieving a SKU from storage location) represents about 55 % of total warehouse operating costs. But it can also be further broken down to traveling, searching, extracting and paperwork and other activities. As a mean to get the right information to the order pickers, pick-lines are used, which contain instructions on what to pick, in what quantity and in what units of measure. Each pick-line corresponds to a specific location in the warehouse. It should further be notable that a pick-line may consist of several picks from the same location. Of course picking have been of large interest for automating due to high operating cost and manual handling.

Pack/Ship

Packing is also a quite labor-intensive activity because of the magnitude of orders (and SKUs) that are handled, often inspections take place at this stage as well. The inspections are performed to control that the orders are complete and accurate, order accuracy is a crucial measure and important to create good service to customers. Inaccurate orders can generate both expensive returns and poor reputation.

In general, the numbers of units that are handled in the shipping dock are lower compared to that of picking. The reason for this is because customers' ask for consolidated shipments, which means that orders are packed together on a single carrier (e.g. pallet or case), which enables economics of scale benefits due to lowered shipping and handling expenses. However, there are

customers, e.g. e-commerce actors such as Amazon, who are more likely to ship goods separately, even though one customer buys two books just a quarter of an hour apart from each other. In this case, rapid response is more important, and shipments can be sent separately because it's not a concern for customers.

Cross-dock

Cross docking is referred to the activity when goods are not stored in the warehouse. It is instead directly transferred, after receipt in receiving, to the shipping dock where an aggregation with other goods will be coordinated into a truck (Van Den Berg, 2012).

Returns

The return flow is the reversed movement in warehousing, and as e-commerce is growing (Kripashankar et al., 2013), returns will likely become a larger function in most warehouses. In general, the amount of returns in the e-commerce industry is about 25-30 % states (Bartholdi & Hackman, 2011).

2.2.2.5 Warehouse Types

The warehouse is the most common type of storage though other forms do exist (e.g., storage tanks, computer server farms). Some warehouses are massive structures that simultaneously support the unloading of numerous in-bound trucks and railroad cars containing suppliers' products while at the same time loading multiple trucks for shipment to customers. **Cite:** Types of Warehouses (2016). From Managing Product Movement Tutorial. KnowThis.com. Retrieved March 25, 2016 from www.knowthis.com/managing-product-movement/types-of-warehouses. The five types of warehouses are:

Private Warehouse

This type of warehouse is owned and operated by channel suppliers and resellers and used in their own distribution activity. For instance, a major retail chain may have several regional warehouses supplying their stores or a wholesaler will operate a warehouse at which it receives and distributes products.

Public Warehouse

The public warehouse is essentially space that can be leased to solve short-term distribution needs. Retailers that operate their own private warehouses may occasionally seek additional

storage space if their facilities have reached capacity or if they are making a special, large purchase of products. For example, retailers may order extra merchandise to prepare for in-store sales or order a large volume of a product that is offered at a low promotional price by a supplier.

Automated Warehouse

With advances in computer and robotics technology many warehouses now have automated capabilities. The level of automation ranges from a small conveyor belt transporting products in a small area all the way up to a fully automated facility where only a few people are needed to handle storage activity for thousands of pounds/kilograms of product. In fact, many warehouses use machines to handle nearly all physical distribution activities such as moving product-filled pallets (i.e., platforms that hold large amounts of product) around buildings that may be several stories tall and the length of two or more football fields.

Climate-Controlled Warehouse

Warehouses handle storage of many types of products including those that need special handling conditions such as freezers for storing frozen products, humidity-controlled environments for delicate products, such as produce or flowers, and dirt-free facilities for handling highly sensitive computer products.

Distribution Center

There are some warehouses where product storage is considered a very temporary activity. These warehouses serve as points in the distribution system at which products are received from many suppliers and quickly shipped out to many customers. In some cases, such as with distribution centers handling perishable food (e.g., produce), most of the product enters in the early morning and is distributed by the end of the day.

2.2.2.6 Challenges in Warehouse Management

With the trade-offs mentioned already and the imminent pressure on companies to reduce costs in all functions it's obvious that there are extensive challenges in warehouse management. Gwynne Richards have created a list on what he believes to be the main challenges within warehousing, the ones mentioned below are perceived to be the most relevant to this study and to the scope of this thesis.

1. Pressure to balance cost and customer service. Here, warehouse managers have to face the struggle with lowering operating costs and at the same time try to improve service towards customers.
2. Achieving the perfect order, the manager has to fight each and every aspect which can lead to that an order would be imperfect.
3. Data and information transfer. The mastery of data is one of the major dares in warehouse management, and the warehouse manager is the one that is responsible for processing it successfully. This also means that continuous updates of the data need to be performed and that the data needs to be transferred to correct location in order to use the data effectively and thereby enable the control of the warehouse.

2.2.2.7 Warehouse Management Systems (WMS)

Even though the WMS market is becoming mature, it does still play a significant part of the ever-changing shipping and distribution environment (McCrea, 2014), but what is a WMS actually?

A WMS is a software system that enables one to control different activities in a warehouse or a distribution center. It regulates the tasks that need to be accomplished, by sending commands to the staff's hardware devices or the automated material control systems. (Van Den Berg, 2012). A WMS provides real time communication by conveying activities for staff and machines to perform.

There are very many different functions in a WMS, ranging from receiving and quality assurance to packing and shipping. In some, there are more high-end functions, which cover for example forklift travel optimization, support for forward pick areas (FPA) and automated replenishments. The most important capabilities of a WMS are apart from controlling the warehouse, of course to handle all main activities from the receiving to the shipping. (Van den Berg, 2012)

WMS Receive and ship: A WMS's most central capabilities are to register receipt of inventory into the warehouse and register its shipments out of the warehouse. The key link here is that such capabilities are required for the creation and documentation of financial transactions both upstream to suppliers and downstream to the recipient. (Bartholdi & Hackman, 2011)

WMS Stock Locating System: The succeeding functionality of a WMS is to manage the inventory of storage locations. With such a feature, a software system can achieve more than just handle transactions of financial nature, it can also support warehouse operations such as give directions on warehouse activities from and to storing locations, respectively. (Bartholdi & Hackman, 2011)

2.2.2.8 Warehouse Management Trends

Even though the fundamental processes of warehousing: receive, put-away, pick, pack and ship, remains the same, it's what happens outside the walls of warehouses that drive how these processes will be executed (Terry, 2013). In addition, in addressing this statement, saying that customers expect providers of warehouse management software to be more oriented towards end-to-end solutions and therefore best of-breeds suppliers in warehousing need to put emphasis on the bigger picture. This essentially means that a WMS vendor must stay innovative in today's dynamic business environment (McCrea, 2014). Following trends have been identified in this research.

Visibility: Collecting more data on inventory management, and across the entire network of the supply chain, making it available in real-time is a strong trend within warehousing. This also includes being able to use data warehouses and analyze big data in a better way. Strong communications, deeper integration and increased collection points, are some of the prerequisites. (Terry, 2013)

Integration of warehouse control systems (WCS) with WMS: WCS is the software that traditionally is used to control automated materials handling equipment (McCrea, 2014).

Consumerization: The use of consumer devices and operating systems is being recognized in warehouses today. Younger IT tech firms are seeking to utilize consumer phones and tablets in the warehouse (Terry, 2013),

Software as a Service & Cloud

Cloud computing has a substantial impact on the supply market (Schramm, Wright, Seng, & Jones, 2010), and several WMS developers offers it, but it seems to be few warehouse managers however who are willing to take the risk of data insecurity and downed Internet to get the cost and software benefits with cloud (Terry, 2013).

2.2.2.9 Warehouse Performance Measurement

Assessing warehouse performance has been largely ignored in research literature (Johnson & McGinnis, 2010). Performance measurement and metrics have also been considered to be a complex matter, and operating the measurements is often inadequately understood followed by weakly formulated definitions of what will be measured (Melnyk, Stewart, & Swink, 2004). However, when it comes to the control of a warehouse, metrics make it possible for the workforce to better evaluate and govern their area of responsibility (Melnyk et.al, 2004) and thereby solve problems before it's too late (Ilies, Turde, & Crisan, 2009).

Performance measurement is also desirable to generate the greatest paybacks (Johnson & McGinnis, 2010).

To simplify, warehouse performance measurements are made to ensure: Good customer service that a philosophy of continuous improvement exists among the staff and that issues are discovered before they harm the operations (Gwynne Richards, p 230). One way to deal with these objectives is to work with one of the most common warehouse performance metrics of today called "Perfect Order Fulfillment". Blanchard Dave (2008) examines the perfect order, which comprises four main factors, namely:

1. Delivered on time (orders that arrive upon agreed time between the stakeholders at the correct location);
2. Shipped complete (orders which are called off with all units and lines, i.e. in full);
3. Shipped damage free (shipped in correct condition);
4. Correct documentation (orders received by customer of which are accurate in terms of required documentation including invoicing)

By focusing on perfect order performance, one can foresee operational efficiencies, increased sales and market share and conclusively growth in the bottom line (Casey, 2011). One should however pay attention to, that achieving the perfect order isn't easy. If every single factor achieves a score of 95 %, the overall percentage is only 81.4 % (Blanchard, 2008).

2.2.3 The Concept of Performance Measurement in a Supply Chain Context

Performance measurement is generally defined as the process of quantifying the efficiency and effectiveness of action, where effectiveness is meant to gauge the extent to which customer's requirements are met, while efficiency measures how economically firm's resources are utilized

to achieve a predetermined level of customer satisfaction (Neely et al., 1995) on Agami, Saleh and Rasmy, 2012). However, firm performance is a multi-dimensional concept that involves many aspects in its measurement. (Akyuz & Erkan, 2010) argued that despite the large number of works done on performance measurement, the existing literature lacks a unified definition of what is included and excluded. However, it has been also asserted that performance concept includes both financial and non-financial (operational) aspects and related measures wherein the financial aspect supposed to include sales, profitability and Return on Investment (ROI) as pertinent measures among others, whereas the non-financial aspect, on the other hand, supposed to include measures like inventory performance and cycle time to mention few (Martin and Patterson, 2009).

Particular to supply chain management, (Thakkar, Kanda, and Deshmukh, 2009) suggested that since it is affected by, and in turn affects, many aspects of the firm's operations, and environment, the supply chain performance measurement is a difficult proposition. In a similar fashion, Otto and (Kotzab, 2003) asserted that performance in a supply chain context and its measurement is dependent on the unique notions and problems, which can be identified beyond the perspectives available to be considered, and hence, none of the available alternatives is an optimal approach for all contexts; instead, from the SCM holistic requirements, different performance metrics should be combined. (Thakkar et al., 2009) also suggested, in this respect, that performance measurement metrics should have the capability to capture the essence of organizational performance, ensure an appropriate assignment of metrics to the areas where they would be most appropriate, minimize the deviation that exist between the organizational goals and measurement goals, and measures, and reflect their clear linkages with various levels of decision-making such as strategic, tactical, and operational.

Regarding the application of specific performance metrics in the supply chain management context, some studies suggest the blended and balanced use of both financial, i.e. Revenue, profit, ROA and ROI... etc, and non-financial/operational, i.e. inventory reduction, improved delivery service, decreased order cycle times and greater product availability...etc, metrics (e.g. (Thakkar, Kanda, and Deshmukh, 2009; Li, Ragu-Nathanb, Ragu-Nathanb, and Raob, 2006; Gunasekaran, Patel, and Macgraughey, 2004). Through a structured literature review on warehouse performance, (Ilieş Liviu, Turdean Ana-Maria and Crişan Emil Babeş, 2009)

reinforced this claim by revealing that the majority of literatures they reviewed have examined the effect of supply chain management on combination of overall measures.

However, (Van der Vaart and van Donk, 2008) also argued that it would be very difficult to attribute total supply chain or firm performance to particular supply chain factors especially when performance is measured in overall terms such as market share, ROI and profitability since with these general measures, there are many other (both economic and managerial) variables that impact on performance items (Rodriguez, 2009; Van der Vaart and van Donk, 2008). Similarly, (Huoet al., 2014) stressed that though financial performance has been widely used as a key output measure of firm performance; numerous studies have pinpointed the limitations in relying on financial performance measures in supply chain studies.

2.3 Empirical Evidences on the Warehouse Performance Measurement

According to (Ilieş Liviu, Turdean Ana-Maria and Crişan Emil Babeş, 2009) – A Case Study on Warehouse Performance Measurement states that Companies could gain cost advantage using their logistics area of the business. Warehouse management is a possible source of cost improvements from logistics that companies could use during this economic crisis.

In their case study they puts best practices used in warehouse performance measurement which lead to performance improvements and also answers questions like What are the warehouse performance indicators? How are they calculated and how are they interpreted? How can a manager use them in order to improve the warehouse performance? And their solution was Warehouse performance measurement refers to the measurement of: optimal use of storage space, customer relations activity, quality level, assets usage and costs.

According to (Ilieş Liviu, Turdean Ana-Maria and Crişan Emil Babeş 2009), Performance refers to the way in which work is done. There can be a good performance or a poor one. But what is performance measurement? (Neely et al., 1995) defined it as the process of quantifying the efficiency and effectiveness of an action or activity. The purpose of performance measurement is to find out whether things are going the right way and, if not, to find what the causes that generated a poor performance were. After this step, there have to be found solutions for improving performance. There are several reasons for measuring performance: for improving performance, for avoiding inconveniences before it's too late, for monitoring customer relations,

for process and cost control and for maintaining quality (Ackerman, 2003: 1). The main instruments for assessing performance are performance indicators, also named key performance indicators. They are specific characteristics of the process which are measured in order to describe if the process is realized according to pre-established standards. The best way to use indicators is to compare process values with normal, standard values. If there are poor results, poor performance, in reality, improvements for the process have to be made. Indicators are used basically for comparison with expected values. They are the control system of the studied process.

(Ilieş Liviu, Turdean Ana-Maria and Crişan Emil Babeş, 2009) in their case, setting an indicator system for warehousing activity is the key for performance improvements, as it shall be presented in the example. They presented here some key indicators that are used around the world to measure warehouse performance:

- (Colson and Dorigo,2004) present a software tool which allows selecting public warehouses according to the following criteria: storage surface and volume; dangerous items; possibility for temperature control; separation of storage areas; geographical distance to highway connection, train, waterways; certification; opening hours; assistance with customs; use of technology; handling equipment; number and characteristics of docks etc;
- (Krauth et al., 2005) classify around 130 indicators used for assessing warehouse performance, such as storage surface, storage volume, storage racks, number and characteristics of docks, pallets per hour, pallets per square meter, opening hours, and assistance with customs;
- (John M. Hill, 2007) uses three types of indicators: order fulfilment, inventory management and warehouse performance. Some of the indicators proposed by John M.

More recent work includes (Collins et al., 2006), which described the collection of warehouse metrics; i.e., picking and inventory accuracy, storage speed, and order cycle time,

Performance measurement in the warehouse industry traditionally employs a set of single factor productivity measures that compare one output to one resource (or input). This is sometimes called the ratio method see (Tompkins et al. 2003, Chen and McGinnis 2007). However, using a set of ratio measures can lead to confusion if some measures are good and some are poor, is the warehouse performing well? Thus it is more useful to employ a measure that considers simultaneously all of the significant inputs and outputs. Warehouse performance has been

measured with each indicator separately, however, this traditional measurement has some limitations that it cannot compare the performance over time regarding the unknown relative values between indicators (McGinnis et al., 2002).

2.4 Conceptual Framework

2.4.1 Theoretical Foundation

Several types of indicators have been developed to measure many supply chain and logistics activities. Choosing the type of indicator to measure can be daunting, and it could be dangerous to simply focus attention on one area. For example, focusing only on cost containment could improve one area but not affect the overall performance of the supply chain. For this reason, I adapted a model developed by (Edward Frazelle, 2001) that is more holistic and consists of four types of indicators: quality, time, financial, and productivity. To complete the analysis, all indicator types need to be considered, and they need to work together.

Quality: These indicators are often the simplest to implement and measure. Typically, they tell you how well you are performing a specific activity a common logistics indicator in this classification is accuracy including order accuracy, inventory accuracy, picking accuracy, etc.

Time: These indicators focus on the time it takes to complete specific activities. They show where saving time during specific activities can improve the overall supply chain performance.

Financial: These indicators help managers identify the supply chain cost drivers and help move toward a more efficiently managed supply chain.

Productivity: These indicators examine how well resources are used. For example, filling vehicles to their capacity, instead of sending out vehicles half-full, could reduce costs and improve efficiency. As stated earlier, focusing on only one type of indicator may actually have a negative impact on product availability. For instance, a decision to send vehicles on a distribution run only when they are filled to capacity could cause stock outs at the next level down unless inventory policies are adjusted to compensate for reducing ad hoc shipments. It is very important to view these indicators holistically to make sure they are harmonized and not

working against each other and to identify the tradeoffs required to strategically improve overall supply chain performance. So the theoretical foundation of this study, is therefore, based on this theory.

2.4.2 The Factors of warehouse Performance

Different factors have been employed by various researchers to operationalize warehouse performance with a visible repetition in the use of some of these factors (John M. Hill's, 2007), indicators to assess the performance of the warehouse, grouped into three categories, (Aronovich, Dana, Marie Tien, Ethan Collins, Adriano Sommerlatte, and Linda Allain. 2010), (Per Axelsson & Jonathan Frankel, 2014) and (Ilie Liviu, Turdean Ana-Maria and Crisan Emil, 2009)

The use of one or another factor by these research works have been justified by the respective contexts considered for particular assessments. This study would adopt four of the most commonly used factors in the literature, namely Quality, response time, total warehouse cost, and productivity so as to operationalize warehouse performance metrics

2.4.3 Warehousing/Storage Performance indicators

For describing the warehouse performance and improvement we should have to perform a process mapping. It is a useful way for depicting all activities that take place in the warehouse.

Generally, a company's warehouse operations can influence the firm's corporate performance in manners such as receiving, storage and shipping (dispatching) in relation with quality, Cost, Speed and productivity.

Receiving, Storage as well as picking and shipping has their own cost, quality such as perfect order fulfilment incorporating accuracy and response time as a speed should be measured and continuously improved.

To narrate Warehouse activities performance with performance indicators the below table explains the relation

Table 2.3 Warehousing/Storage Performance indicators

Quality Indicators	Response Time Indicators	Cost/Financial Indicators	Productivity Indicators
Inventory Accuracy Rate	Warehouse Order Processing Time	Total Warehousing Cost	Storage Space Utilization
Put-Away Accuracy	Customs Clearance Cycle	Value of Product Damaged in the Warehouse	Units Moved Per Person Hour
Picking Accuracy Rate	Put-Away Time		% of Storage Space Dedicated for Handling
Warehouse Accident Rate			
Defined Security Measures			

Source: a modified adoption from Aronovich, Dana, Marie Tien, Ethan Collins, Adriano Sommerlatte, and Linda Allain. 2010.)

2.4.3.1 Quality

A. Inventory Accuracy Rate

This indicator measures the percentage of warehouse or storage locations that had no inventory discrepancies when stock cards were compared to a physical inventory count out of the total number of locations under review, during a defined period of time. Alternatively, this indicator can be calculated for a single facility as the percentage of months or quarters with no inventory discrepancies out of the total number of months or quarters in the review period (e.g., annual).

The inventory accuracy rate can be used to assess overall inventory control performance for a group of storage facilities or for one storage facility over a set of review periods. Inventory accuracy is critical for managers to know how much they have in stock at any given point in time and to know when a new order must be placed to replenish stock. This discrepancy analysis can help managers identify storage locations that are having problems with inventory management; the analysis can lead to opportunities for improvement.

B. Put-Away Accuracy

This indicator is the percentage of items placed in the correct location or bin in a warehouse or storage area.

This indicator measures a facility's ability to stock items in the correct location so they can be quickly and easily located. This can provide an indication of whether staff is practicing good warehousing practices and guidelines. This indicator can be measured during a site visit or by making periodic checks at the facility over a specified length of time. For example, during a quarterly period, the number of times items were found in the wrong location.

C. Picking Accuracy Rate

This indicator is defined as the percentage of items or lines picked accurately (i.e., the correct items and quantities) from storage based on a request or packing list, and then placed into the appropriate container.

This indicator measures whether items are accurately selected from storage and placed into a container to be shipped to the requesting facility. It can reveal the ability of the facility to pick requests correctly in terms of quantity and item. Errors can result in stockouts or overstocks at the ordering facility. To collect data for this indicator, a review of items just before they are loaded for transporting can be conducted to determine the accuracy of picked items compared against an invoice or requisition form. It can be calculated for a single order or for all orders during a defined period of time.

D. Warehouse Accident Rate

This indicator measures the total number of accidents occurring in a warehouse or other storage facility during a defined period of time.

This indicator can reveal poor warehouse management and practices, untrained staff, unclear safety guidelines, faulty equipment, or poor conditions. It can help pinpoint areas needing improvement by determining the cause of the accidents because of human error or other reasons. With intervention, accidents should decrease in frequency.

E. Defined Security Measures

This indicator measures whether there are guidelines or standard operating procedures (SOP) in place that provide instructions to prevent theft or leakage at a given storage location.

Implementing proper security measures at storage facilities will help prevent theft and leakage of products, thus saving money and increasing the availability of commodities. The program should

have defined and detailed instructions for facilities to follow to ensure that the facility is secure and the products protected. Evaluators should also assess the quality or thoroughness of these guidelines or SOPs and the level of adherence by the facilities.

2.4.3.2 Response Time

A. Warehouse Order Processing Time

This indicator measures the average amount of time (e.g., minutes, hours, days, weeks) from the moment an order is received at the storage facility until the time the order is actually shipped to the client. The order processing time can be calculated for a specific shipping facility averaged across orders or on average for orders to a specific client or for a specific product.

This indicator helps monitor the order processing performance and the efficiency of a shipping facility. It also helps identify opportunities for improving staff performance in order management and a facility's response time.

B. Customs Clearance Cycle

This indicator measures the amount of time (e.g., minutes, hours, days, and weeks) from the moment the cargo arrives in the port or airport until the moment that it clears customs, arrives at the warehouse, and is ready to be put away. This indicator can be calculated by product or supplier, or the average across products or suppliers, during a specified period of time. If other factors affect getting the product from the port to the warehouse, such as a lack of equipment at the port facility, evaluators can scale this calculation down to the specific amount of time that the products were sent to the customs office until the customs office cleared and released them.

The indicator can help identify delays in customs clearance and, with additional research, the causes involved—such as incomplete paperwork, poor material description, missed certificate of origin, etc. Based on that, opportunities for improvement can be identified and actions taken to minimize the amount of time required for products to clear customs and to be made available at the warehouse.

C. Put-Away Time

This indicator measures the amount of time it takes from when a product(s) has been unloaded from a truck after arriving at a warehouse or other storage location to when it is stored in its designated place and is ready for picking. This indicator can be calculated by product, or by shipment, or as an average across products or shipments, during a specified period of time.

Measuring the put-away time can help improve productivity by monitoring the efficiency of the put-away processes and the staff responsible for the task. It can help managers identify work conditions or processes that need improvement, as well as the need for staff training.

2.4.3.3 Cost/Financial

A. Total Warehousing Cost

The total warehousing costs collect all costs related to warehousing, such as labor costs and warehouse rent; or mortgage payments, utility bills, equipment, material- and information-handling systems, etc. It also includes costs related to systems, supplies, and any other material with specific use in warehousing. This indicator is usually measured annually.

This indicator can also be calculated as the total warehousing cost per piece/SKU/product/line by dividing the total warehousing cost by the quantity of stocked units or by the volume of stocked items in cubic meters (m³), per storage area (m²), or program.

Using this indicator, managers can monitor the costs of different components in a warehouse, as well as compare costs between different warehouses. It can help identify the most cost-effective warehouses, and can also lead to an analysis of best practices.

Dividing total warehousing costs by units or area can also indicate storage usage, cost-effectiveness, etc. By dividing the warehousing costs per SKU, this indicator provides the management team with excellent detailed cost visibility.

B. Value of Product Damaged in the Warehouse

This indicator calculates the value of products damaged, during a defined period of time (usually one year), in the warehouse as a percentage of the value of all shipped products during that period.

Inappropriate warehousing conditions or handling of products can lead to inventory damage. This indicator can help put the value of products damaged into perspective and can be used to help identify the causes, as well as, the actions needed to avoid such damages, including better infrastructure, manpower, training, etc.

2.4.3.4 Productivity

A. Storage Space Utilization

Storage space utilization indicates the percentage of the total storage space actually being used out of the total storage space available.

Based on this indicator, managers can monitor storage capacity and utilization at a warehouse. By assessing storage space utilization, managers can look for opportunities to improve storage capacity (e.g., remove expired products, de junking, reorganizing) and maximize the use of the storage space, or request a re-evaluation of layout, material flow, shelves disposition, etc.

B. Units Moved Per Person-Hour

This indicator measures the number of units (e.g., boxes, pallets) or weight moved during a defined period of time, per person-hour, for each person working during that period. It can be considered both when receiving and shipping inventory.

This indicator helps measure material handling productivity for a period of time (hours, days, or months). It helps compare productivity levels in different working shifts or different warehousing locations. It can be a source for identifying needs for training and measuring its effectiveness

C. Percentage of Storage Space Dedicated to Product Handling

This indicator measures the percentage of total storage area that is dedicated specifically to product handling (receiving, unloading, packing, loading, and dispatching).

It is recommended that a certain percentage of the storage area be dedicated specifically to product handling for an average volume of products. The amount of handling space needed depends on the volume of product moved through the storage area and the equipment required to move those products. This dedicated area is critical for the efficient operations of the storage facility to allow for organized and efficient receiving, unloading, packing, loading, and dispatching of products; and to protect products from the elements during receiving and packing.

2.4.4 Conceptual Model

On the basis of the above arguments pertaining to the claimed the dimensions/factors of warehouse performance, and with reference to the suggestions of the extant literature, this study spelled out the following conceptual framework that it would pursue in the course of the preceding parts. The conceptual framework is a combined modification of the conceptual frameworks developed by prior studies (i.e. Aronovich, Dana, Marie Tien, Ethan Collins, Adriano Sommerlatte, and Linda Allain. 2010).

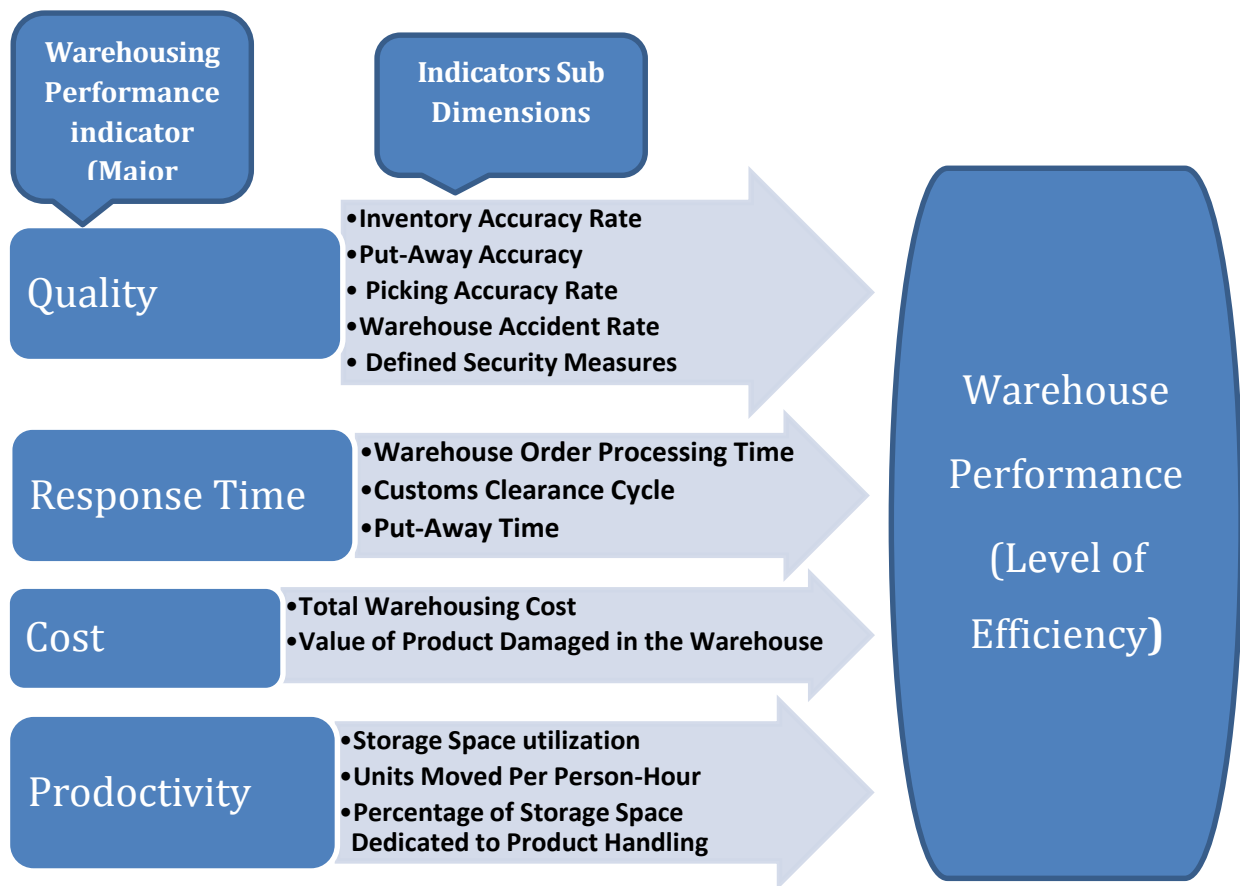


Figure 2.1 Conceptual frameworks (Own Model) (a modified adoption from Aronovich, Dana, Marie Tien, Ethan Collins, Adriano Sommerlatte, and Linda Allain. 2010).

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The designing and methodological aspect of a particular study is the roadmap that the study should follow in its pursuit of the desired outcome. Hence, due care shall be given while spelling out these roadmap. In view of that, a detailed account has been given to the description of the particular design the research would employ; the data sources and methods of collection; the target population, unit of analysis and respondents; the types of instruments and their development procedure; the dimensions and corresponding measurement items; and data processing, analysis and presentation procedures.

3.2 Research Design

Research design is the blueprint for fulfilling research objectives and answering research questions (John A.H. et al., 2007). In other words, it is a master plan specifying the methods and procedures for collecting and analysing the needed information. It ensures that the study will be relevant to the problem and that it uses economical procedures. The same authors discusses three types of research design, namely exploratory (emphasizes discovery of ideas and insights), descriptive (concerned with determining the frequency with which an event occurs or relationship between variables) and explanatory (concerned with determining the cause and effect relationships).

This particular study adopted a cross-sectional census survey design to quantitatively and qualitatively assess the Warehouse performance of the enterprise.

This research decided to employ a combination of qualitative and quantitative approaches of doing research, which has been practiced, as recommended by (Creswell, 2009). According to (Mark et al., 2009) mixing qualitative and quantitative approaches gives the potential to cover each method's weaknesses with strengths from the other method.

The survey method can be used for three types of research, namely descriptive (which focuses on the determination of the frequency with which an event occurs and how variables are related/associated in a particular context), exploratory (which emphasizes on the discovery of

ideas and insights), and explanatory (concerned with determining the impact and cause and effect relationships among variables), (Bhattacharjee, 2012; Adams, Khan, Raeside, and White, 2007).

Therefore, the types of research employed under this study is descriptive research. The major purpose of descriptive research is description of the state of affairs as it exists at present. Then this study describes and critically assesses the factors of the performance of warehouse in the enterprise. Moreover, obtaining information from a cross-section of a population at a single point in time is a reasonable strategy for pursuing many descriptive researches (Ruane, 2006), hence justifying the use of a cross-section analysis in this particular study. The finding and conclusion of the study is depend on the utilization of statistical data collection and analysis.

3.3 Source of Data & Data Gathering Tools

Both primary and secondary sources of data/information are used for the purpose of conducting this particular research. Primary data is the information that the researcher finds out by himself/herself regarding a specific topic having the likely advantage that the data is collected with the research's purpose in mind, whereby ensuring the resulting consistency of the information with the research questions and purpose (Biggam, 2008).

The primary data was gathered through a well-developed questionnaire from the entire population of the enterprise. The questionnaire is designed in a way that enabled to capture the demographic information of respondents, on the one hand, and their evaluation of warehouse performance, on the other hand. Regarding the secondary source, journals, procedures, policies and guidelines produced by the enterprise as well as any other concerned bodies are used to extract any sort of essential information to strengthen the study findings.

As far as the procedure of data collection is concerned, contacts had been initially made to respondents to explain the purpose and nature of the study so as to achieve the desired response rate. Subsequently, the questionnaire was distributed to and collected physically from the potential respondents at their site by the researcher.

The layout of the questionnaire is kept very simple to encourage meaningful participation by the respondents. The questions is kept as concise as possible with care taken to the actual wording and phrasing of the questions. The reason for the appearance and layout of the questionnaire are

of great importance in any study where the questionnaire is to be completed by the respondent (John A. et al., 2007).

Moreover In order to improve my study and strength my findings, I were referred articles, academic journals, and useful texts through different sources, such as library, journals, academic books and relevant documents from the enterprise.

3.4 Target Population, Unit of Analysis and Respondents

All warehouse personnel and others department which has direct relation with warehouse like inventory, fleet, store, and sourcing are taken to constitute the study population. Due to the very small number of the target population, which was 70 in number, it has been decided to consider the entire population in the study, i.e. to conduct census survey, rather than sampling from the population. This is on the basis of the suggestion that if the target population is smaller (e.g. 100 or less) census survey is very appropriate and effective since virtually all population would have to be sampled in small populations to achieve a desirable level of precision (Israel, 2013).

As far as the unit of analysis is concerned, the warehouses of the enterprise, was taken to be the unit of analysis for this particular study. And every warehouse personnel's and employee of other related department (internal customers) of the enterprise was the pertinent respondents for the study. Warehouse personnel and related department was chosen because of the fact that they are most accustomed with and have the relevant information pertaining to the warehouse activities of the enterprise.

3.5 Survey Instrument

3.5.1 Instrument Development

As tried to be mentioned on the preceding part, questionnaire is employed as the instrument of data collection. Multi-item scales that were meant to capture factors/dimensions of the theoretical constructs, namely Quality, response time, total warehouse cost, productivity are developed on the basis of an extensive review of the extant literature. The items were measured on five point Likert scale that range from strongly disagree to strongly agree and also some additional qualitative questions related to the study objective and questions. Respondents were

requested to allocate/select scores for each of the items on the instrument by taking their knowledge and actual situation in mind.

Basically, the instruments was developed based on the objectives of the study and research questions. The principles of questionnaires such as, use simple and clear languages, statements should not be too long and use of appropriate punctuations also considered when developing the instrument.

3.5.2 Instrument Validity

Validity is the degree to which a test measures what it purports to measure (Creswell, 2009). Validity defined as the accuracy and meaningfulness of the inferences which are based on the research results. It is the degree to which results obtained from the analysis of the data actually represents the phenomena under study. He contends that the validity of the questionnaire data depends on a crucial way the ability and willingness of the respondents to provide the information requested.

A pilot study were conducted to refine the methodology and test instrument such as a questionnaire before administering the final phase. Questionnaires was tested on potential respondents to make the data collecting instruments objective, relevant, suitable to the problem and reliable as recommended by (John Adams et al., 2007). Issues raises by respondents was gathered and questionnaires was refined accordingly. Besides, proper detection by an advisor and subject matter expert was also taken to ensure the content validity of the instruments. Finally, the improved version of the questionnaires was printed, duplicated and dispatched.

3.5.3 Instrument Reliability

3.5.3.1 Reliability Test

Internal consistency of the items constituting the items of the dimensions was checked by using Cronbach's alpha. Accordingly, the reliability of the study instrument has been determined by evaluating the average correlation among items in the scales of the respective dimensions suggested by (Chen et al., 2004). The resulting Cronbach's alpha values of the dimensions are presented in the subsequent table.

Table 3.1 Cronbach's alpha

Dimension/Scale	No. of Items	Cronbach's Alpha
Quality Indicators	5	0.83
Response Time Indicators	3	0.75
Cost/Financial Indicators	2	0.79
Productivity Indicators	3	0.75

Source: Survey Result, 2016

A scan at the above table implies that all alpha values for the respective dimensions were well above the suggested cut-off value of 0.7 (Cronbach, 1951), hence implying the reliability of the instrument that measures the study constructs, i.e. the items under the respective scales could properly measure the dimension of concern. The lowest alpha value was 0.75 and it was in the case of both response time and productivity indicator, whereas the highest was for quality indicator with the alpha value of 0.83.

3.6 Variables and Measurement

As far as the study dimensions are concerned, this particular study has involved four key performance indicators to measure the main construct of warehouse performance and these key performance indicators are Quality, response time, total warehouse cost, and productivity; Accordingly, after a comprehensive review of related literature five items are identified to measure Quality; Response time and total warehouse cost are designated to be measured through three and two items each, with additional three items set aside for the measurement of productivity.

Table 3.2 Variables and measurement items

Dimensions/Factor	Measurement Items	Adopted From
Quality Indicators	Inventory Accuracy Rate, Put-Away Accuracy , Picking Accuracy Rate, Warehouse Accident Rate and Defined Security Measures	Aronovich, Dana, Marie Tien, Ethan Collins, Adriano Sommerlatte, and Linda Allain. 2010.
Response Time Indicators	Warehouse Order Processing Time, Customs Clearance Cycle and Put-Away Time	Aronovich, Dana, Marie Tien, Ethan Collins, Adriano Sommerlatte, and Linda Allain. 2010.
Cost/ Financial Indicators	Total Warehousing Cost and Value of Product Damaged in the Warehouse	Edward Frazelle (2001)
Productivity Indicators	Storage Space Utilization, Units Moved Per Person Hour and % of Storage Space Dedicated for Handling	Edward Frazelle (2001)

3.7 Method of Data Analysis and Presentation

The study data were analyzed using Statistical Package for the Social Science (SPSS) version 20.0. Frequency tables and percentages were used to summarize the demographic information of respondents; whereas, descriptive statistics such as mean and standard deviations of the respondents' scores on all the dimensions were assessed in order to determine the extent of Warehouse performance in the enterprise. Finally, detail interpretation and discussion of the results of the statistical analysis was provided.

3.8 Ethical Considerations

Ethical considerations are of utmost importance while trying to advance knowledge through scientific inquiry. This is due to the fact that scientific studies usually involve human participants and, hence, if due care is not given to the manner as to how information is obtained from these participants and while disclosing such information, some sort of damage might be inflicted on

the study participants. Considering this reality, the study has attempted all the necessary precautions to protect the study participant's form such sort of problematic encounters by applying certain measures. Accordingly, the respondents were notified not to mention their identity, particularly their names while filling questionnaire. Moreover, they have been assured that no meaningful damage would be inflicted on them because of their participation in this particular study by boldly explaining to them the apparent purpose of the study (which is actually for academic purpose) and ensuring the confidentiality of their identity and whole part of the information they provided for the purpose of undertaking this study.

CHAPTER FOUR

DATA ANALYSIS, RESULT AND DISSCUSION

4.1 Introduction

The data analysis, presentation and discussion mainly focused on finding the answers to the research questions and following statistical procedures, emphasis was therefore put on Three things, First demographic information of respondents followed by presentation of descriptive statistics to answer the first two research questions and analysis of the closed indicator questions to answer the last two research questions and finally a summary of the analysis will be presented.

4.2 Respondents' Demographic Information

As inferred in the preceding part of this study, the entire population of the enterprise in Ethiopia was considered in the study. Including all the stakeholder of the phenomena, hence making the total number of respondents 70. However, only 61 respondents have filled and returned the questionnaire, which essentially made the response rate about 87%. The demographic information of the respondents who have filled and returned the questionnaire is presented on Table 4.2.

As depicted on the below table, males dominate the respondents' list registering about 72.1% of the total respondent with females taking the remaining 27.9% of the respondents. As far as respondents' age is concerned, the majority of the respondents (59%) were aged between 26 to 35 years followed by the age categories of 18 to 25 years, 36 to 45 years and above 45 years respectively with percentage scores of 26.2%, 9.8% and 4.9% in that order.

With regard to educational qualification, significantly higher percentage of the respondents (57.4%) were first degree holders, whereas those having diploma and post graduate degree stand second and third in the ladder of educational qualification accounting for 24.6% and 13.1% of the total number of respondents and below college diploma of 4.9% . On the other hand, being an important element of the profile of the respondents, years of service under the relevant job positions was also assessed and it has been revealed that those who have served 1 to 2 years dominate the list by taking 55.3% of the entire respondents. Those who have served below a year on the positions of concern came second on the ladder followed by the category of

respondents who have served 2 to 3 years respectively with the corresponding percentage scores of about 26.2% and 18%. Considering the fact that respondents' relative work experience in the job positions of concern has a direct bearing on the quality of response that might be provided, it seems very desirable to have the lines share of respondents (73.3%) having served 1 to 3 years on the positions of concern as a youngest enterprise aged only three years.

Table 4.1 Respondents demographic information

Variable	Choice	Frequency	Percent
Gender	Female	17	27.9
	Male	44	72.1
	Total	61	100.00
Age	18-25 Years	16	26.2
	26-35 Years	36	59.0
	36-45 Years	6	9.8
	Above 45 Years	3	4.9
	Total	61	100.0
Educational Qualification	Below college diploma	3	4.9
	College Diploma	15	24.6
	First Degree (BSc, BA)	35	57.4
	Second Degree (MSc, MA)	8	13.1
	Total	61	100.0
Service Year on the Current Position	Below one year	16	26.2
	1 to 2 years	34	55.7
	2 to 3 years	11	18.0
	Total	61	100.0

Source: Survey Result, 2016

4.3 Descriptive Analysis

Descriptive statistics was assessed in an effort to examine the mean scores and the corresponding standard deviations under the respective scales of each of the measurement items of the dimensions. Hence, this particular attempt has the importance of answering some of the research questions on the basis of the perceptions of the respondents on the level of warehouse performance of their company and also to answer on which key performance indicator the company performs better.

4.3.1 The First Research Question

What is the level of warehouse performance of the company measured in terms of the four key performance indicators?

Table 4.2 Quality indicator measurement items mean and standard deviation

Measurement Items (Quality Indicator)	Mean	Standard Deviation
Most of the time Our warehouse or storage locations has no inventory discrepancies when bin cards were compared to a physical inventory count.	2.93	1.078
Most of the time in our warehouse, items are placed in the correct location or bin	2.92	1.242
Most of the time in our warehouse items or lines are picked accurately (i.e., the correct items and quantities) from storage based on a request, and then placed into the appropriate truck.	3.05	1.146
Most of the time accidents are not occurred in our warehouse like physical accident on daily laborers, warehouse personnel, and also on equipment's	2.72	1.127
In our warehouse there are guidelines or standard operating procedures (SOP) in place that provide instructions to prevent theft, deterioration or leakage at a given storage location.	2.79	1.018

Source: Survey Result, 2016

4.3.1.1 Respondents' Perception on Quality Indicator

The mean values of each of the measurement items of quality indicator were calculated between 2.72 and 3.05 with almost comparable standard deviations that range between 1.01 and 1.24. The lowest mean value is registered in the case of warehouse accident rate and defined security measures in the second place followed by the mean score for put-away accuracy and inventory accuracy rate which is very comparably close mean values of 2.92 and 2.93 respectively; while picking accuracy rate, comes last in the ascending order.

The noticeably represented mean scores of the measurement items of quality indicator suggest that respondents in the enterprise believe that lower efforts have been made by their respective companies to enhance warehouse performance in the case of quality except in the case of picking accuracy in which case the score is moderate suggesting that relatively moderate efforts have been exerted. This implies the fact that the attempts made by the enterprise are not as such substantial pertaining to protecting accidents in the warehouse, maintaining warehouse guide line or procedure, holding or storing items in their right place in the warehouse, following the right way concerning warehouse documentation and/or bin card posting and also picking the right requested item in the warehouse.

Concerning standard deviation of values of each of the measurement items of quality indicator, as well as on the other indicator except in the case of response time indicator, it indicates that the perception of the respondents' on the issue are in the unlike poles on all of the case. However, this is acceptable as the study utilized all population and also it is believed that the standard error is relatively very low (between 0.13 and 0.15). In fact, the standard error is an indication of the reliability of the mean. A small SE is an indication that the sample mean is a more accurate reflection of the actual population mean. A larger sample size will normally result in a smaller SE (while SD is not directly affected by sample size) as this study used.

Table 4.3 Response Time Indicator measurement items mean and standard deviation

Measurement Items (Response Time Indicator)	Mean	Standard Deviation
Most of the time our warehouse personnel serve our customer on the reasonable time i.e. From the moment an order is received at the storage facility until the time the order is actually shipped to the client.	3.67	.831
Most of the time our company makes product available for customer i.e. From the moment the cargo arrives in the port or airport until the moment that it clears customs, arrives at the warehouse, and is ready to be put away.	3.48	.993
Most of the time our warehouse personnel serve our supplier and makes product ready for shipment on the reasonable time i.e. the amount of time it takes From when a product(s) has been unloaded from a truck after arriving at a warehouse or other storage	3.43	.921

Source: Survey Result, 2016

4.3.1.2 Respondents' Perception on Response Time Indicator

The mean values of each of the measurement items of response time indicator were calculated between 3.43 and 3.67 with almost comparable standard deviations that range between 0.83 and 0.99. The lowest mean value is registered in the case of put-away time and followed by customs clearance cycle and then mean score for warehouse order processing time.

The scores of the scale of response time indicator which is very comparably close mean values of 3.43, 3.48 and 3.67 as depicted on the aforementioned table. So they suggests that respondents are rating their respective enterprise warehouse performance as moderate or a little bit above, as in the case of their evaluation regarding response time.

Table 4.4 Cost\Financial Indicator measurement items mean and standard deviation

Measurement Items (Cost\Financial Indicator)	Mean	Standard Deviation
We are successful in minimizing total carrying/holding cost	2.98	1.057
We are successful in minimizing total product damage in the warehouse like product deterioration, breakage, leakage etc.	2.95	1.244

Source: Survey Result, 2016

4.3.1.3 Respondents' Perception on Cost\Financial Indicator

The mean values of the measurement items of cost indicator which are value of product damaged in the warehouse and total warehousing cost were calculated and found that 2.95 and 2.98 with a standard deviations of 1.06 and 1.2 respectively. The respondents suggests that their warehouse performance is hampered concerning cost reduction in both cost of damaged goods and also cost associated with carrying or holding a product.

Table 4.5 Productivity Indicator measurement items mean and standard deviation

Measurement Items (Response Time Indicator)	Mean	Standard Deviation
Most of the time our warehouse personnel utilizes warehouse spaces properly i.e. the total storage space actually being used out of the total storage space available.	3.38	1.098
Most of the time our daily laborer are not idle i.e. the number of units (e.g., boxes, pallets) or weight moved during a defined period of time, per person-hour, for each person working during that period. It can be considered both when receiving and ship	3.21	1.127
Most of the time our warehouse personnel utilizes a reasonable warehouse spaces for product handling i.e. the total storage area that is dedicated specifically to product handling (receiving, unloading, packing, loading, and dispatching)..	2.90	1.060

Source: Survey Result, 2016

4.3.1.4 Respondents' Perception on Productivity Indicator

The mean values of each of the measurement items of productivity indicator were calculated between 2.90 and 3.38 with almost comparable standard deviations that range between 1.06 and 1.12. The lowest mean value is registered in the case of percentage of storage space dedicated for handling and followed by units moved per person hour and then mean score for Storage Space Utilization.

The scores of the scale of productivity indicator for units moved per person hour and Storage Space Utilization. Which has very comparably close mean values of 3.21 and 3.38 as depicted on the aforementioned table. So they suggests that respondents are rating their respective enterprise warehouse performance as moderate or a little bit above, as in the case of their evaluation regarding the warehouse space and labor hour utilization whereas regarding space utilization for product handling is a little bit lower effort is exerted.

4.3.2 The Second Research Question

On which key performance indicator the company performs better?

The Composite scores of mean and standard deviation were also calculated for the four scales of warehouse performance indicators (dimensions), namely quality indicator, response time indicator, cost/financial indicator and productivity indicator. The resulting composite scores of mean and standard deviation are presented on Table 4.7 as follows.

Table 4.6 Composite scores of mean and standard deviation

Dimension/Scale	Mean	Standard Deviation
Quality indicator	2.88	.87
Response Time indicator	3.52	.75
Cost/Financial indicator	2.96	1.04
Productivity indicator	3.16	.89

Source: Survey Result, 2016

4.3.2.1 Respondents' Perception on Warehouse Performance

The mean values of each of the scales of warehouse performance were calculated between 2.88 and 3.52 with almost comparable standard deviations that range between 0.75 and 1.04 and also a standard error between 0.09 and 0.13. The lowest mean value is registered in the case of quality indicator followed by the mean score for cost\financial indicator; while productivity indicator and response time indicator scored comparably close mean values of 3.16 and 3.52 respectively.

The mean score of the scale of warehouse performance in the case of response time indicator is 3.52 as depicted on the aforementioned table with the lowest standard deviation of 0.75 and standard error of 0.09. This score is very marginally higher relative to the mean scores of the other dimensions. However, the fact that the composite mean score is only 3.52 suggests that respondents are rating their enterprise warehouse performance as moderate and a little bit above as measured by this key performance indicator. The same is true in productivity indicator, it is also in a moderate level whereas in the case of cost/financial indicator low effort have been exerted by the enterprise and quality indicator in which case the score is even lower come in the bottom level.

4.3.3 The Third Research Question

What is the perception of the employees of the enterprise on the key performance indicator that can heavily contributed to the overall performance of the warehouse?

To begin analyze the survey, Respondents were select their choice for each of the dimensions on the question by taking their knowledge and actual situation in mind. And their choice were summarized in excel-sheets and an excel-commando "filter" was used for analyzed the closed (qualitative) questions.

In order to answer what is the perception of the employees of the enterprise on the key performance indicator that can heavily contributed to the overall performance of the warehouse, their choice was first summarized in table, which can be found below Table 4.7, showed how many of the respondents that answered to the closed questions regarding the question that were asked for in the questionnaire.

Table 4.7 Analysis of respondents' choice regards to the first qualitative question

Choice	No. of Respondents	Percentage of Respondents
Quality indicator	19	31.15 %
Response Time indicator	17	27.87 %
Cost/Financial indicator	16	26.23 %
Productivity indicator	4	6.56 %
All	5	8.20 %
Total	61	100.00 %

Source: Survey Result, 2016

Quality metric had the highest percentage with its 31.15%, then response time metric with 27.87 % and followed by a comparable percentage of respondent's 26.23 % cost/financial indicator whereas only 6.56 % of the respondents were select productivity metric and 8.20 % of them for all indicator. This implies that most respondents believed that quality indicator seems to be most valuable and should be given with high emphasis and response time and cost/financial indicator also important. However their expectation for productivity indicator is less.

4.3.4 The Fourth Research Question

What is the perception of the employees of the enterprise regarding the performance implication of capacity of warehouse?

In order to answer what is the perception of the employees of the enterprise regarding the performance implication of capacity of warehouse? Respondents Choice were summarized in tables as shown below (Table 4.8 and 4.9)

Table 4.8 Analysis of respondents' choice regards to the second qualitative question (Type of Warehouse)

Choice	No. of Respondents	Percentage of Respondents
Private Warehouse	5	8.20 %
Public Warehouse	4	6.56 %
Automated Warehouse	12	19.67 %
Climate-Controlled Warehouse	4	6.56 %
Distribution Center	11	18.03 %
Based on situation	25	40.98 %
Total	61	100.00

Source: Survey Result, 2016

As depicted in the above table most of the respondents are concentrated on based on situation choice regards the implication of the type of the warehouse on performance, and some of them believed that automated warehouse and distribution are important in enhancing warehouse performance. The rest of the respondents were equivalently selects the other choices.

Table 4.9 Analysis of respondents' choice regards to the third qualitative question (Size of warehouse)

Choice	No. of Respondents	Percentage of Respondents
Small	4	6.56 %
Medium	2	3.28 %
Large	3	4.92 %
Based on situation	52	85.25 %
Total	61	100.00

Source: Survey Result, 2016

The same attitude of respondents were snatched for the implication of size of warehouse on performance even more 85.25%, it is based on situation as depicted from the above table. And very few respondents were select the rest of the choice.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

This research was conducted in an attempt to reveal the status of warehouse Performance in Ethiopian Trading Enterprise by making particular emphasis to the measurement of the level of warehouse performance.

The following conclusions have been drawn on the bases of the findings of the data analysis effort.

A total of 61 respondents have filled and returned the survey questionnaire making the response rate about 87%. About 72.1% of the respondents are males, while females constituting the remaining 27.9% of the total respondents. About 73.3% of the respondents have served one years and above in their current position as a youngest enterprise implying that the major portion of the response is obtained from respondents who had relatively better information regarding the warehouse practices of their respective company have with a knowledge of their warehouse performance.

The composite mean scores of the scales of the dimensions, namely quality indicator, response time indicator, cost/financial indicator and productivity indicator, revealed that the respondents perceive that Ethiopian Trading Enterprise exert relatively lower efforts in quality and cost/financial indicator of warehouse performance, whereas their perceived evaluation of the respective organizations' endeavor, as expressed by the composite mean values, suggested that only moderate efforts have been exerted by enterprise in enhancing warehouse performance, the respondents' perceived evaluation implies that the response time dimension was at best rated as moderate and a little bit above in improving performance of their warehouse.

Generally, the study findings have suggested that the levels of warehouse performance is moderate in the case of Ethiopian Trading Enterprise in terms of the four key performance indicators as the perceived evaluation of the respondents imply. It has also revealed that, though measurement of the warehouse performance based on dimension of response time is comparatively in a better position. Respondents also implied that the performance implication of

capacity of warehouse is based on the situation and they all have different point of view among the four key performance indicator that can heavily contributed to the overall performance of a warehouse.

5.2. Recommendations

The studied enterprise required to review its existing warehouse performance based on the four key performance indicators and make the necessary modifications in order to benefit from the performance improvements in terms of securing minimized total cost of warehousing, improved quality, improved response time and improved efficiency or productivity. Here, some suggestions are forwarded on the basis of the findings of the study.

5.2.1 Recommendations for the enterprise

As revealed from the findings of the study, levels of warehouse performance at the disposal of enterprise is approximately rated as moderate.

So hence Ethiopian Trading Enterprise shall give special emphasis in the improvement of warehouse performance in line with its corporate and functional strategies and objectives in order to operate according to international best practices and consistently offering quality products at affordable prices to the community.

The study advocated that a lot of emphasis need to be directed to warehouse management and performance measurement based on key performance indicators and the enterprise should maintain the effort made on response time in enhancing performance of their warehouse which is still need to be improved and also the warehouse manager of the enterprise should know the level of efficiency in the warehouse and makes sufficient amount of effort in utilizing of key performance indicators to measure warehouse performance by placing efficiency(performance) level targets

The study advocated that a lot of emphasis need to be directed to quality and cost indicator in order to achieve significant cost savings from minimized total cost of warehousing and improved quality

The enterprise should give ranked emphasis to each of the performance indicator of warehouse to identify which dimension contributed a lot in enhancing performance

The enterprise should assure quality aspects through each and every activities of the warehouse like marinating good quality procedure manual, inventory accuracies by placing products in their designated place, picking or loading accurately and reducing accidents.

The enterprise should exert a tangible effort in reducing total cost of warehouse (carrying or holding cost) includes cost of product damage, cost of obsolescence, rental costs, insurance costs and etc.

The enterprise should also give emphasis for storage space utilization including material handling space through the use of automated material handling equipment in order to improve productivity

The enterprise should consider the capacity implication on the performance of the warehouse especially in the case of size of the warehouse

Finally the enterprise should assure the level of satisfaction of warehouse customers (Suppliers and internal customers) by reducing the total serving time.

5.2.2 Limitations of the Study

Like many research works, this particular study is also subjected to some limitations. First and for most, this study does not comprehensively capture all aspects of supply chain practices as applicable to warehouse management, rather it made emphasis in assessing warehouse performance of the enterprise. In order to benefit from a comprehensive assessment of the dimensions that truly measure the performance of the enterprise, future studies shall consider more dimensions or key performance indicator of the warehouse performance that haven't been considered in this particular study and as suggested by (Edward Frazelle, 2001).

The other most important limitation of the study is the fact that though the unit of analysis was only the warehouses of the enterprise, the study was purely conducted on the basis of the responses obtained from the employee of the enterprise since it assumed the enterprise perspective. To have a holistic insight, one need to have to more other similar company perspective in order to consider it as an industry.

Reference

Adams J, Khan H.T.A, Raeside R, and White D, (2007), Research Methods for Graduate Business & Social Science Students. California, Sage.

Agami N, Saleh M, and Rasmy M, (2012) Supply Chain Performance Measurement Approaches: Review and Classification, Journal of Organizational Management Studies,

Akyuz, G.A., Erkan, T.E. (2010), Supply chain performance measurement: a literature review, International Journal of Production Research, Vol. 48, No. 17, 5137–5155.

Alan Rushton, Phil Croucher, Peter Baker (2010), The Handbook of Logistics and Distribution Management 4th edition; Kogan Page Limited, 2009 ISBN 978-0-7494-5714-3, 635 pages

Alan Rushton, Phil Croucher, Peter Baker (2010), The Handbook of Logistics and Distribution Management 4th edition; Kogan Page Limited, 2009 ISBN 978-0-7494-5714-3, 635 pages

Andrew L. Johnson (2009) warehouse benchmarking results: a comparison of wholesale and manufacturing warehouses

Aronovich, Dana, Marie Tien, Ethan Collins, Adriano Sommerlatte, and Linda Allain. (2010), Measuring Supply Chain Performance; Guide to Key Performance Indicators for Public Health Managers. Arlington, Va.: USAID

Assrar Sabry (2015) Faculty of Commerce, Alexandria University, Egypt International Journal of Business and Management; Vol. 10, No. 6; 2015 ISSN 1833-3850 E-ISSN 1833-8119

Inc, S. (2016) Agile supply chain management - 17-11-04. Available at: <http://www.scribd.com/doc/16918276/Agile-Supply-Chain-Management-171104> (Accessed: 17 January 2016).

B. Bigliardi & E. Bottani (2014) Supply chain performance measurement: a literature review and pilot study among Italian manufacturing companies; International Journal of Engineering, Science and Technology Vol. 6, No. 3, 2014, pp. 1-16

Bartholdi, John. Hackman, Steven T. (2011) Warehouse & Distribution: Science Release 0.95 Atlanta. Georgia Institute of Technology Atlanta.

Bhattacharjee A., (2012), Social Science Research: Principles, Methods, and Practices, 2nd edition, University of South Florida Tampa, Florida, USA

Biniam Assefa (2006), Effects of Warehouse efficiency on Operational Performance at Selected Manufacturing Companies in Ethiopia: A Case Study

Bititci U S, Carrie A S, McDevitt L G (1997) "Integrated Performance Measurement Systems: A Development Guide", International Journal of Operations and Production Management, vol 17 no 6, MCB University Press, ISSN 0144-3577, pp. 522-535.

Björklund, Maria. Paulsson, Ulf (2003) Att skriva en report. Available at: www.tlog.lth.se/fileadmin/tlog/Utbildning/Kurser/Att_Metod_PM/AttSkrivaEnRapport.pdf (Accessed: 17 January 2016).

Blanchard D. (2008) how perfect is a Perfect Order Available at: <http://www.industryweek.com/companies-amp-executives/how-perfectperfect-order> (Accessed: 17 January 2016)

Casey, A. (2011) Delivering the perfect order. Manufacturers' Monthly, March: pp 18.

Chatrarat Hotrawaisaya, Watcharavee Chandraprakaikul & Nanthi Suthikarnarunai (2014), Performance Improvement by Logistics Collaboration Management Model for Orchid Flower Industry in Thailand; Engineering Management Research; Vol. 3, No. 2; 2014 ISSN 1927-7318 E-ISSN 1927-7326

Cronbach, L.J., (1951) Coefficient alpha and the internal structure of tests. Psychometrika 16, 297–334.

Rattanachai, A., Wasusri, T., Srilaong, V., Tanprasert, K. and Kanlayanarat, S. (2010) 'Key Performance Indicators In Baby Corn Supply Chain In Thailand', Acta Horticulturae, (875), pp. 463–468. doi: 10.17660/actahortic.2010.875.60.

Edward Frazelle (2001) World-Class Warehousing and Material Handling, Mc-Graw-Hill

F.Curtis Barry & company/Solution for multi-channel operations & fulfilment (2011). On-line at <http://www.fcaco.com/articles-andwhitepapers/articles/bid/129449/Why-and-How-to-Conduct-a-Warehouse-Assessment> (Accessed: 17 January 2016).

Geraldine N. Okeudo, Chikwendu & David Uche (2013), Department of Transport Management Technology, Federal University of Technology, Owerri Department of Transport Management Technology,(logistics option), Federal University of Technology, Owerri, Journal of Logistics Management 2013, 2(1): 26-34

Gunasekaran, A. Patel, C. Tirtiroglu, E. (2001) Performance measures and metrics in a supply chain environment. International Journal of Operations & Production Management. 21(1): pp 71 – 87.

Gwynne Richards, (2011, 2014), Warehouse Management A complete guide to improving efficiency and minimizing costs in the modern warehouse

Gyula Laszlo, Florian and Alexandru Constangioara (2013), The Impact Of Performances In Romanian Supply Chains On Organizational Performances; Proceedings Of The 7th International Management Conference "New Management For The New Economy", November 7th-8th, 2013, BUCHAREST, ROMANIA

Ilies, L. Turde, M. Crisan, E. (2009) Warehouse Performance Measurement: A case study. Annals of Faculty of Economics. 4(1): pp 307-312.

Johnson, A. L. and L. F. McGinnis (2008). Outlier detection in two-stage semiparametric DEA models. European Journal of Operational Research 187 (2): 629-635.

Johnson, A. L. and L. F. McGinnis (2009). The Hyper bolic Oriented Efficiency Measure as a Solution to Infeasibility of Super Efficiency Models. Journal of the Operational Research Society 60(11): 1511-1517.

Johnson, A. McGinnis, L. (2010) Performance measurement in the warehousing industry. IIE Transactions, Texas A&M University Libraries.43: pp 220-230.

Johnson, A.L. and T. Kuosmanen (2009). “How Do Operational Conditions and Practices Effect Productive Performance? Efficient Nonparametric One-Stage Estimators”, working paper. Available at <http://ssrn.com/abstract=1485733> (Accessed: 17 January 2016).

Kripashankar, R. Kie, G. S. Sullivan, W. Wilson, D. Agarwal, A. Thakur, R. (2013) Evolving E-Commerce Market Dynamics. Available at: www.ca.capgemini.com/resource-fileaccess/resource/pdf/evolving_e-commerce_market_dynamics.pdf (Accessed: 17 January 2016).

Lebas, Michael J. (1995) Performance measurement and performance management. *International Journal of Production Economics*. 41(3): pp 23-35.

Marczyk G, DeMatteo D, and Festinger D, (2005), *Essentials of Research Design and Methodology*. Canada, John Wiley & Sons, Inc.

Melnyk, S. A. Stewart, D. M. Swink, M. (2004) Metrics and performance measurement in operations management: Dealing with the metrics maze. *Journal of operations management*. pp 211-215.

N. Faber (2013), Organizing warehouse management; *International Journal of Operations & Production Management* Vol. 33 No. 9, 2013 pp. 1230-1256 Emerald Group Publishing Limited 0144-3577

Neely, A. Gregory, M. Platts, K. (1995), “Performance measurement system design: A literature review and research agenda”. *International Journal of Operations & Production Management*. 15 (4): pp 80-116.116

Per Axelsson & Jonathan Frankel (2014) Performance measurement system for warehouse activities based on the SCOR model

Professor Jim Constand (May 4, 2009), A Case Study of Wal-Mart’s “Green” Supply Chain Management Adam Heying Whitney Sanzero MGT 520 Operations Management

Robert S. Kaplan (2010) Conceptual Foundations of the Balanced Scorecard Working Paper 10-074

Shlomo Globerson and Gal Wolbrum (2014), Logistics management and supply chain management: A critical evaluation; International Journal of Business and Economics Research 2014; 3(2): 82

Simatupang T.M, Sridharan R, (2004), a collaboration index: a measure for supply chain collaboration, International Journal of Physical distribution and Logistics Management, Vol. 35, No. 1, pp. 44-62,

Solakivi T, (2014), the connection between supply chain practice and firm performance: evidence from multiple surveys and financial reporting data, Turku School of Economics, Series A,

Steven T. Hackman, Edward H. Frazelle, Paul M. Griffin, Susan O. Griffin and Dimitra A. Vlasta (2013) Benchmarking Warehousing and Distribution Operations an Input-Output Approach, Journal of Productivity Analysis ISSN: 0895-562X (Print) 1573-0441 (Online)

Thakkar J, Kanda A, and Deshmukh S.G, (2009), Supply chain performance measurement framework for small and medium scale enterprises, Benchmarking: An International Journal, Vol. 16, No. 5, pp. 702-723,

Tigist Beyene (2011), The Role of Warehouse Management in Realisation of Supply chain Goals in Selected Ethiopian Wholesale companies: A Case Study

Types of Warehouses (2016). From Managing Product Movement Tutorial. KnowThis.com. Available at: knowthis.com/managing-product-movement/types-of-warehouses (Accessed: 17 January 2016).

APPENDIX A: Questionnaire

QUESTIONNAIRE

**ADDIS ABABA UNIVERSITY
SCHOOL OF BUSINESS & ECONOMICS GRADUATE STUDIES
DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT**

Dear respondents:

I'm a graduate student at Addis Ababa University School of Commerce in the Department of Logistics and Supply Chain Management. Currently, I'm conducting a research entitled '*Assessment of Warehouse Performance: A Case of Ethiopian Trading Enterprise*' as a partial requirement for the award of Masters of Art Degree in Logistics and Supply Chain Management.

The purpose of this questionnaire is to gather data for the proposed study, and hence you are kindly requested to assist the successful completion of the study by providing the necessary information. Your participation is entirely voluntary and the questionnaire is completely anonymous. I confirm you that the information you share will stay confidential and only used for the aforementioned academic purpose, thus not affects you in any way rather it will may help you in improving the performance of your company warehouse. So, your genuine, frank and timely response is vital for the success of the study. I want to thank you in advance for your kind cooperation and dedication of your precious time to fill this questionnaire.

Best Regards,

Tewodros Bogale

Note:

- 1.No need of writing your name.
- 2.Indicate your answer with a check mark (X) on the appropriate cell both for Section I and part of Section II questions and also circle your choice for question 7 to 9.
- 3.If you need further explanation please do not hesitate to contact me through my personal phone +251911262524 or in person.

Section I: Respondents Profile:

1. Age: 18-25 years 26-35 years 36-45 years above 45 years

2. Sex: Male Female

3. Educational Qualification:

Below college diploma College diploma First Degree (BSc, BA)

Second Degree (MSc, MA) PHD and above

4. Current Position _____

5. Year of service in the current position:

Below 1 year 1 to 2 years 2 to 3 years

Section II: Main Questionnaire

Please indicate your choice by putting the check mark (x) on the appropriate cell. **Where, 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.**

6. Please indicate the degree to which you agree with the following statements regarding the indicators of warehouse performance in your company. (Please take your key warehouse activities in mind while rating the statements).

No.	Measurement Items	Score				
		1	2	3	4	5
Quality Indicator						
6.1	Most of the time Our warehouse or storage locations has no inventory discrepancies when bin cards were compared to a physical inventory count.					
6.2	Most of the time in our warehouse, items are placed in the correct location or bin					
6.3	Most of the time in our warehouse items or lines are picked accurately (i.e., the correct items and quantities) from storage based on a request, and then placed into the appropriate truck.					
6.4	Most of the time accidents are not occurred in our warehouse like physical accident on daily laborers, warehouse personnel, and also on equipment's					
6.5	In our warehouse there are guidelines or standard operating procedures (SOP) in place that provide instructions to prevent theft, deterioration or leakage at a given storage location.					

No.	Measurement Items	Score				
		1	2	3	4	5
Response Time Indicator						
6.6	Most of the time our warehouse personnel serve our customer on the reasonable time i.e. From the moment an order is received at the storage facility until the time the order is actually shipped to the client.					
6.7	Most of the time our company makes product available for customer i.e. From the moment the cargo arrives in the port or airport until the moment that it clears customs, arrives at the warehouse, and is ready to be put away.					
6.8	Most of the time our warehouse personnel serve our supplier and makes product ready for shipment on the reasonable time i.e. the amount of time it takes From when a product(s) has been unloaded from a truck after arriving at a warehouse or other storage location to when it is stored in its designated place and is ready for picking.					
Cost/Financial Indicator						
6.9	We are successful in minimizing total carrying/holding cost					
6.10	We are successful in minimizing total product damage in the warehouse like product deterioration, breakage, leakage etc.					
Productivity Indicator						
6.11	Most of the time our warehouse personnel utilizes warehouse spaces properly i.e. the total storage space actually being used out of the total storage space available.					
6.12	Most of the time our daily laborer are not idle i.e. the number of units (e.g., boxes, pallets) or weight moved during a defined period of time, per person-hour, for each person working during that period. It can be considered both when receiving and shipping inventory.					
6.13	Most of the time our warehouse personnel utilizes a reasonable warehouse spaces for product handling i.e. the total storage area that is dedicated specifically to product handling (receiving, unloading, packing, loading, and dispatching)..					

7. Which key performance indicator do you believe that can heavily contributed to the overall performance of a warehouse?

- A. Quality Indicator B. Response Time Indicator C. Cost/Financial Indicator
D. Productivity Indicator E. All

8. Based on your experience what type of Warehouse better enhance warehouse performance?

- A. Private Warehouse B. Public Warehouse C. Automated Warehouse
D. Climate-Controlled Warehouse E. Distribution Center F. Based on situation

9. Based on your experience what size of Warehouse better enhance warehouse performance?

- A. Small B. Medium C. Large D. Based on situation