

MANAGEMENT

**EFFICIENT WAREHOUSE MANAGEMENT ANALYSIS IN LOGISTICS SERVICES\***

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**ABSTRACT**

The importance of logistics operations in the processes has started to increase each passing day with the increasing competitive conditions. Logistics processes enable organizations to take a step forward by creating a difference in the competitive environment. One of the most important goal of the logistics operation processes is to ensure that the right product is found in the right quantity, at the desired time and to be undamaged. It is very important to manage warehouse processes efficiently in meeting all these criteria. Since the transportation and distribution processes are the continuation of the warehouse processes, a small problem in warehouse management processes affects the whole logistics service. In order to manage warehouse processes in logistics services efficiently, many factors must be taken into consideration. In this study, field surveys were conducted to determine the factors that should be considered for efficient warehouse management in logistics services. After performing the required field research, a list of questions was developed to measure the efficient warehouse management. The survey was applied to the logistic companies serving the food sector.

**Keywords:** *logistics, warehouse management, efficient warehouse management*

YÖNETİM

*LOJİSTİK HİZMETLERDE ETKİN DEPO YÖNETİM ANALİZİ*

**ÖZ**

Artan rekabet koşullarıyla birlikte her geçen gün lojistik operasyonların süreçler içindeki önemi artmaya başlamıştır. Lojistik süreçler, işletmelere rekabet ortamında farklılık yaratarak işletmelerin bir adım öne geçmesini sağlamaktadır. Lojistik operasyon süreçlerinin en önemli amaçlarından birisi doğru ürünün, doğru miktarda, istenilen zamanda ve hasarsız olarak bulunmasını sağlamaktır. Bütün bu kriterleri sağlamada depo süreçlerinin etkin bir şekilde yönetilmesi çok önemlidir. Nakliye ve dağıtım süreçleri, depo süreçlerinin devamı niteliğinde olduğu için depo yönetim süreçlerinde yaşanacak en küçük problem lojistik hizmetin tamamını etkilemektedir. Lojistik hizmetlerde depo süreçlerini etkin yönetebilmek için pek çok faktörü göz önünde bulundurmak gerekmektedir. Bu çalışmada lojistik hizmetlerinde verimli depo yönetimi için dikkate alınması gereken faktörleri belirlemek için saha araştırmaları yapılmıştır. Saha araştırmasından sonra etkin depo yönetiminin ölçümü için soru listesi geliştirilmiş ve gıda sektörüne hizmet veren lojistik firmalarına uygulanmıştır.

**Anahtar Kelimeler:** *lojistik, depo yönetimi, etkin depo yönetimi*

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## **1. INTRODUCTION**

Logistics operations have a critical importance for businesses in a competitive environment. They may be one of the strongest point of the business or one of the weakest point of the business. The products sold by the companies to be in the desired amount of the customer in a desired place and at the desired time will give to that business an advantage, otherwise it will give to that business a disadvantage. Logistics operations can protect or destroy all the efforts made before them with a multiplier effect.

The main purpose of logistics is to supply materials (semi-finished products, raw materials, finished products), store them, transport them to the designated points (production point or consumption point) in an optimum way and provide value to the customer (Yanginlar, 2019: 274). Logistics includes demand management, order management, warehouse management, transportation, packaging and material handling, customer service and inventory management activities (Tanyaş and Hazır, 2011: 4-5). Efficient warehouse management system is the part of the logistics activities and many mistakes could be prevented by it and it could give a company a big competitive advantage.

In this study, the evaluations of managers of logistics companies operating in the food industry and the analysis of efficient warehouse management were determined.

## **2. EFFICIENT WAREHOUSE MANAGEMENT**

Efficient warehouse management represents the technical and operational knowledge as well as the successful application of this knowledge to the total system (Ten Hompel and Schmidt, 2007). Components affecting efficient warehouse management are customer services, information systems, key performance indicators, warehouse layout and ergonomic structure, financial indicators, cost management and control of inventory. These components are explained shortly below.

### **2.1. Customer Services**

In general customer service in logistics can be regarded as ease of ordering, short delivery time, reliability of delivery and good communication (Kulyk et al., 2017). The term of logistics is defined as “keeping the right resources at the right place, at the right time, at the right quantity” and also “right customer service” should be added to this definition (Rushton et al., 2014).

### **2.2. Information Systems**

Efficient and efficient use of warehouse resources is important to increase warehouse efficiency and reduce costs. One of the important factors that affect increasing the warehouse efficiency is the determination of the most suitable storage places for thousands of products. There are also many other factors that affect this efficiency.

The order collection method, the structure of the orders, the layout of the warehouse, the properties of the products, the need for space are some of them. The large amount of product handled, the complexity of the processes, the need for continuous monitoring of processes and resources make the use of information systems inevitable. As the complexity of warehouse processes increases, the need for warehouse management arises and it makes it possible to monitor processes and resources. Data entry to warehouse management systems can be done manually as well as it can be done with barcode, RFID, etc. technologies in real time (Ramaa et al., 2012).

### **2.3. Key Performance Indicators**

Measurement of warehouse operation with numerical data is important in terms of providing potential data and opportunities to warehouse management. The measurements are directly related to the company's strategies and have a direct impact on the financial results. As warehouse operations affect the supply chain, their performance needs to be measured with some numerical data (Ramaa et al., 2012). In warehouse operations, performance should be measured in four areas. These are; reliability, flexibility, cost and use of resources (Richards, 2014: 294). Warehouse performance is handled in three categories. These are order fulfillment, inventory management and warehouse efficiency (Ramaa et al., 2012).

### **2.4. Warehouse Layout and Ergonomic Structure**

Nowadays the design of warehouses and distribution centers provides enterprises significant competitive advantages over the changing market. For this reason, it is important to design the warehouses in such a way that they can be flexible against changes. The points to be focused on in this process are as follows (Richards, 2014: 201):

- As much as possible data should be collected and analyzed.
- Flexible design should be considered according to the business future plans which are made for 5-10 years.
- Should be focused on the cubic capacity of the building.
- The design must be compatible with existing equipment.
- Employee health and safety must be in front of everything. In this context, ventilation and lighting of the warehouse should be appropriate for the health of the employees. Equipment should be ergonomic.
- The warehouse should be designed to reduce the amount of movement in it.
- Packaging used during transport and storage should be standardized.
- Ground bearing capacities and local regulations should be considered.
- Environmental conditions of the building should be taken into consideration.

### **2.5. Financial Indicators**

Financing control is closely related to logistics efficiency and corporate profitability. Management must be aware of the cost of each activity before the various activities

of storage are properly integrated into a single unified system. From that point of view financial accounting and control techniques gain importance. In a survey which is done in 140 companies and 19 different industries, the Ernst and Whinney accounting firm found five key findings on warehouse accounting and control. These findings include (Lambert and Stock, 1993: 342-343):

- The configuration of warehouse networks - number, size and location - varies between industries and generally between firms in the same industry.
- The way a company markets its products is a major determinant of the overall warehouse network structure and function in a successful company.
- The positioning of particular warehouse networks and warehouse management have generally developed in response to external developments and pressures, not as a result of strategic distribution plans.
- The functions of individual warehouses in the distribution network are subjected to major categories (eg stocking, consolidation and distribution), each requiring different types of information to efficiently manage it.
- Warehouse operations include separate activities that need to be analyzed separately for both operational and financial management purposes.

#### **2.6. Cost Management**

Cost management is an extremely important issue in logistics operations, especially in companies providing logistics services. In this respect, the unit costs of each stage of the operation should be examined in detail and the factors affecting the cost should be considered. In addition, the identified costs should be distributed to the types of services provided and reflected to the products sold from the types of services provided.

#### **2.7. Control of Inventory**

The most important function of warehouse management is the proper storage of inventory. While keeping inventories, the products must be protected under appropriate conditions and measures should be taken against the risks of theft or abuse of safety. For this reason, inventories should be checked continuously and the resulting defect should be identified immediately (Cedillo-Campos and Cedillo-Campos, 2015).

### **3. EFFICIENT WAREHOUSE MANAGEMENT ANALYSIS**

In this section, efficient warehouse management analysis studies are included and the reliability and validity results of analyzes are shared.

### **3.1. Purpose of research**

The main purpose of the research is to determine the efficiency of logistics companies providing food service to warehouse activities and to determine the factors affecting this activity.

### **3.2. Research Model**

The study was identified as a descriptive study. Descriptive research models aim to make some predictions in order to make accurate definitions between the variables constituting the research problem without entering into cause and effect relationship. (Çengel, 2008). In this research, efficient warehouse management and dimensions of efficient warehouse management will be revealed.

### **3.3. Population and Sample**

The universe of the research was determined as companies operating in the logistics sector. The number of companies operating in the warehousing activity code in Istanbul is 354 (İTO, 2019). Research has been conducted on those who have only warehouses and serve food companies in their warehouses. The study was conducted on 250 people working in the logistics sector in Istanbul.

### **3.4. Data Collection Method**

In the process of data collection, firstly, which items should be included in the analysis of efficient warehouse management has been studied. For this purpose, literature review was made. In the literature review, the elements of the warehouse management process were examined. After conducting literature research, interviews were conducted with experts on efficient warehouse management. Interviews were held with executives who worked for a long time (at least five years) in the logistics sector and warehouse management. According to the notes obtained as a result of the interviews, a pool of items was created containing the points that all managers emphasized. In the design phase of the articles, the items should be simple and understandable and one item should not contain more than one judgment (Karakoç & Dönmez, 2014: 41). The items are arranged in a simple and understandable way. At the same time, articles containing more than one jurisdiction have been separated or removed. Subsequently, the 53-item 5-point Likert Question List was prepared. Opinion of experts were used to evaluate the questionnaire in terms of necessity, specificity and clarity. The content validity of the items was determined by the scope validity ratio developed by Veneziano and Hooper (1997). Lawshe analysis was used to determine whether the items were included in the draft questionnaire. The 53-item trial form was put into practice with a 5-point Likert-type questionnaire ranging from "I completely agree", "I agree", "I am undecided", "I disagree" and "I completely disagree".

### **3.4. Data Analysis**

The validity and reliability studies of the responses obtained from the 250 employees who agreed to participate in the study were conducted. Firstly, it was found that the sample size used in the research was suitable for factor analysis (Tabachnick and Fidell, 2001). Then, in order to determine the construct validity of the efficient warehouse management analysis question list, the SPSS statistical program was conducted by using Varimax rotation and principal components analysis and Explanatory Factor Analysis (EFA). Cronbach's alpha coefficient was calculated for reliability. In order to test the accuracy of the structure revealed by EFA, Confirmatory Factor Analysis (CFA) was performed by using AMOS 22 statistical program.

### **3.5. Research Findings**

#### **3.5.1. Findings on the Validity and Reliability of the Analysis of Efficient Warehouse Management**

A list of 53 items of efficient warehouse management analysis was given to a total of 261 employees working in warehouse operations in the logistics sector in the study group and 250 of the questionnaires were filled out. Factor analysis is needed to test the construct validity (Sipahi et al., 2008: 89) and to explain the measurement with few factors by combining the variables that measure the same quality. For this purpose, an exploratory factor analysis was conducted to find factors based on the relationships between variables (Büyüköztürk, 2006: 123). In the exploratory factor analysis, the lowest limit of the factor load value was adopted as .40 to decide whether or not the items remained. Furthermore, if the difference between the high load values of an item at the same time in two factors is 0.10 and smaller, it is accepted as an overlapping item. In this context; items with a factor load value less than .40, overlapping, and which were not considered to provide meaning integrity with other items under the factor in which they were found, were excluded from the question list. On the data collected from the research group first of all validity of "Efficient Warehouse Management Analysis Question List" was performed and then reliability analyzes were performed. According to the analysis, it is determined that efficient warehouse list analysis consists of six factors. The eigenvalue of these factors, total variances and Cronbach alpha values are shown in Table 1. It is seen that the items have a factor load value between 0.557 and 0.800. Cronbach's Alpha analysis, which is a reliability test, was found to be 0.955. Reliability is thought to be high since the Cronbach's Alpha number is above 0.70. The reliability coefficients of all factors above 0.70 indicates that the list is well-reliable in all aspects. It was determined that the distribution of the formed items to dimensions was consistent. The factors that make up the efficient warehouse management analysis are named after looking at the expressions contained in the items. Accordingly, the first factor is named customer satisfaction, the second factor is named information systems, the third factor is named operational performance monitoring system, the fourth factor is named warehouse

layout and ergonomic structure, the fifth factor is named employee performance and rewarding system and the sixth factor is named financial indicators.

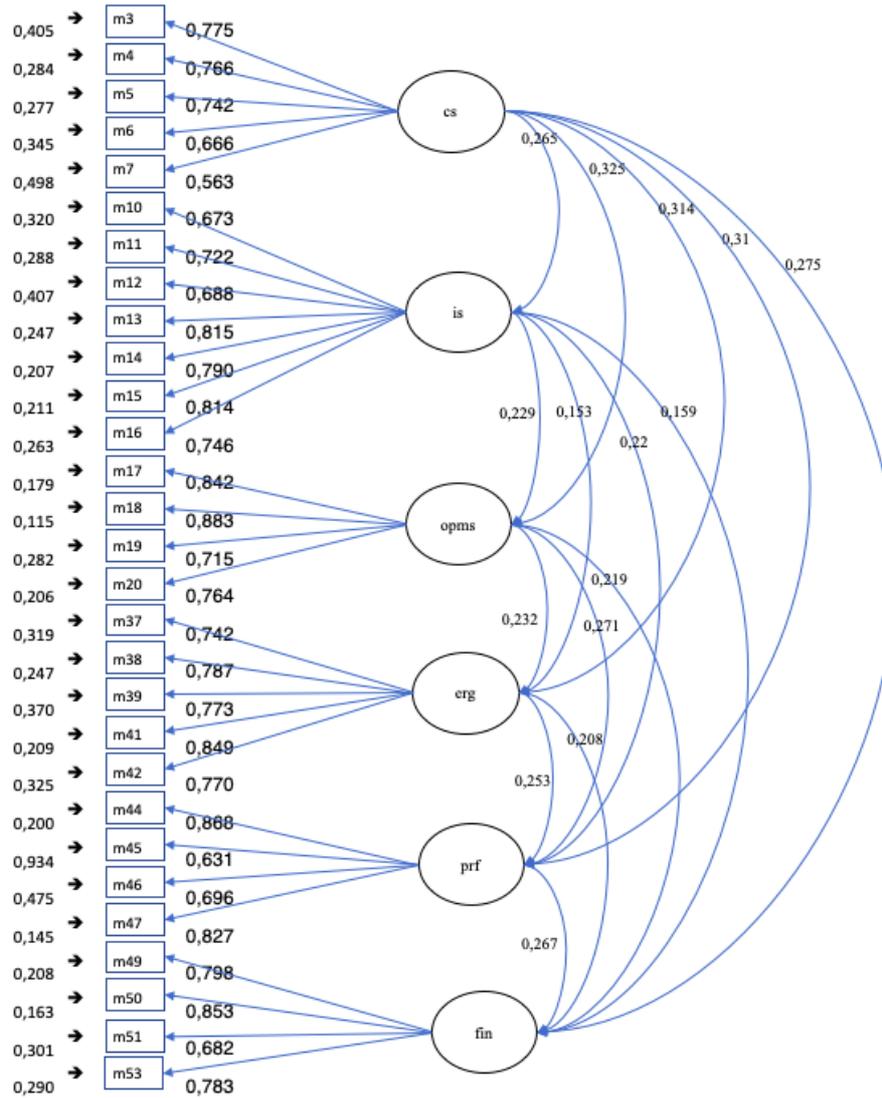
**Table 1. Factor Analysis and Item Load Values, Eigenvalues, Total Variance and Alpha Coefficient**

<b>Factor Name</b>	<b>Items</b>	<b>Factor Loadings</b>
1.Factor Customer Satisfaction	3. Routine meetings are held with customers regarding logistics operations.	,557
	4. Operation is evaluated with concrete data with customers.	,726
	5. Complaints of customers are recorded.	,754
	6. Customers are given feedback on their complaints.	,690
	7. Customer complaints are based on concrete data.	,639
2. Factor Information Systems	10. Information systems are used efficiently to control the processes of warehouse operations.	,692
	11. Information systems are used to solve the problems.	,770
	12. Technological infrastructure is used in all processes.	,669
	13. Information systems prevent errors that may occur.	,795
	14. Information systems are used in planning processes.	,695
	15. Inventory losses have been reduced due to the information systems.	,779
	16. The order fulfillment rate is high due to the information systems.	,617
3. Factor Operational Performance Monitoring System	17. Operational efficiency is high due to the information systems.	,705
	18. Due to the information systems, resources (personnel, equipment) are used efficiently.	,730
	19. Due to the information systems, costs are reduced.	,754
	20. Due to the information systems, operation service level has increased.	,749
4. Factor Warehouse Layout and	37. Shelves and ramps are properly positioned.	,683
	38. The locations of everything (inventory, empty pallet, equipment, collection area,	,794

Factor Name	Items	Factor Loadings
Ergonomic Structure	order preparation area, offices, etc.) were determined in the warehouse.	
	39. The equipment used in the warehouse has been selected in accordance with the warehouse.	,753
	41. Personal protective equipment (reflective vest, steel toe shoes, etc.) is sufficient in the warehouse.	,800
	42. Sufficient occupational safety training is provided to employees.	,669
5. Factor Employee Performance and Rewarding System	44. Performance measurement criteria are fair and accepted by everyone.	,699
	45. The work done by all employees is measured.	,607
	46. The wage and reward system is encouraging for the work of the staff.	,780
	47. Employees are aware of their performance goals.	,656
6. Factor Financial Indicators	49. Cost control is performed at every stage of the operation.	,740
	50. The profit and loss status of the operation is monitored monthly.	,760
	51. The costs of the services provided are determined separately.	,744
	53. The main purpose of each operation is to make a profit.	,691
Eigenvalues 1. factor: 11,943 2. factor: 2,332 3. factor: 1,643 4. factor: 1,458 5. factor: 1,425 6. factor: 1,214	Total Variance: 69,015% 1. factor: 15,943 2. factor: 12,785 3. factor: 10,640 4. factor: 10,633 5. factor: 10,250 6. factor: 8,764	Total Alpha: .955 1. factor: .836 2. factor: .904 3. factor: .876 4. factor: .882 5. factor: .820 6. factor: .866

As a result of the analysis, 24 items were removed. The extracted items were removed because they had a high load value in more than one factor or because they were not thought to provide uniformity of meaning with other items under the factor.

As a result of the Confirmatory Factor Analysis, it was observed that the structure revealed in the EFA was confirmed. The model obtained with CFA is given in Figure



**Figure 1. Confirmatory Factor Analysis**  
 Chi- Square= 1038,988, df= 465, p- value= ,000, RMSEA= 0,070

The ratio calculated by confirmatory factor analysis ( $\chi^2 / sd$ ) is 2,234 ( $p = ,000$ ) and since this value is less than 3, it shows that the proposed factor model is well

compatible with the data (Şimşek, 2007). The CFI value is .90 and SRMR value was found .05, which shows that the 6-factor structure of the question list formed as a result of confirmatory factor analysis yields acceptable and valid results (Lacobucci, 2010). After the reliability and validity analyzes, the established model of the research is given in Figure 3.



**Figure 2. Research Model**

#### **4. CONCLUSION AND SUGGESTIONS**

Efficient warehouse management has an important issue in logistics processes and can prevent many errors in logistics processes and provides competitive advantage to enterprises. For efficient warehouse management, many aspects such as customer services, senior management, working environment, costs, inventories, and information technologies should be considered all together.

In this research, a study was conducted on warehouse managers working in logistics companies serving the food sector and efficient warehouse management analysis was conducted. Six factors of efficient warehouse management were identified in the analysis, which are warehouse layout and ergonomic structure, customer satisfaction, information systems, operational performance monitoring system, employee performance and rewarding system and financial indicators. Research and observations show that logistics sector managers should always take these factors into

account during warehouse installation and warehouse manager selection processes to ensure efficient warehouse management.

This research was carried out on logistics companies serving the food sector. In the following studies, it can be done for efficient warehouse management in enterprises that serve different sectors. Likewise, research can be applied in enterprises receiving logistics services or in companies producing logistics services themselves.

In this study, "Efficient Warehouse Management" analysis was performed. In the following studies, the results of the efficient warehouse management or the issues affecting the efficient warehouse management can be studied.

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