THESIS

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LOGISTICS MANAGEMENT AND REVERSE LOGISTICS IN THE PHARMACEUTICAL INDUSTRY

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ABSTRACT OF THESIS

Thesis title: Logistics management and reverse logistics in the pharmaceutical industry
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It is an undeniable fact that companies in the globalizing world need to pay more attention to logistics networks and supply chains in order to be able to cope with the competition. The pharmaceutical sector, which is the third largest sector of the world after arms and food, is one of the sectors where competition is most intense. National and international companies operating in this sector have to establish logistics networks in the most effective manner and to ensure their continuity with the fundamental principles of profit maximization and cost minimization. On the contrary, the concept of reverse logistics is an increasingly important concept in recent years. Reverse logistics, applied for economic, ecological and legal reasons, enable the products to be reintroduced into the system or destroyed under appropriate

conditions. Conversely, thanks to logistics, companies aim to increase profitability and create customer satisfaction by trying to create value from returning products. In this study, pharmaceutical companies, drug stores and free pharmacies, drug logistics and reverse logistics applications which are active in drug industry in our country were investigated. The findings have been tried to be expressed against findings and potential problem.

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SYMBOLS and ABBREVİATİONS

APICS	Association for Supply Chain Management
DFR	Design for Recovery
FEFO	First Expired First Out
GDP	Good Distribution Practice
GMP	Good Manufacturing Pratices
IGEME	Export Promotion Center (Turkey)
ICOC	Istanbul Chamber of Commerce
NHRMC	National Health and Medical Research Council
OTC	Over the Counter
RFID	Radio Frequency Identification
TEKB	All Pharmacist Cooperatives Association (Turkey)
3PL	Third Party Logistic

Introduction

Today, there are many manufacturers focusing on the production field. Manufacturers are dealing with similar processes. With the increasing competition, it hasbecome more important to define and manage these transactions.

After the industrial revolution, large-scale production phases were started, and diversity in products and services increased. In parallel with the development of technology,consumer demands and behaviors have changed. Consumers have focused not only on purchasing products, but also on solving their problems regarding the product they do not need or want to return.

The increasing importance of the concepts of logistics and supply chain managementin global trade has brought along the increasing importance of reverse logistics. Reverse logistics, which companies implement due to legal, economic and ethical values, has also become one of the determining factors of customer satisfaction.

In this study, logistics management reverse logistics applications in the pharmaceutical industry were investigated. For this purpose, information was collected fromthe manufacturers in the sector, pharmaceutical warehouses and community pharmacies thatmake up the distribution channels.

In the first chapter, the definition of logistics and reverse logistics is made, its importance, content and activities are explained, and information is given about the positiveand negative aspects of both concepts.

In the second part, the definition of the drug is given, and information is given aboutits properties, functions and the pharmaceutical industry. Information on logistics partnershipsin the sector, supply chain management, pharmaceutical logistics, green logistics and reverse logistics in the sector was given.

In the last part of the study, information about how reverse logistics practices are applied in the sector was gathered by meeting with drug manufacturers, distributors and vendors operating in Denizli (city of Turkey), problems encountered in practice and solutionsuggestions were expressed.

Logistics Concept, Logistics Management and Reverse Logistics

1.1 Logistics Concept

The first emergence of the concept of "logistics" emerged in 1898 in relation to the conduct of military activities and was defined as the organizing gathering of soldiers during the war, their movements and division into sections. In the following years, logistics; In order to meet customer demands, it is defined as the whole of the processes that plan, implement and control the flow of raw materials at an affordable price, storage, obtaining the product and the related information from the initial stage to the last moment (Çancı and Erdal, 2003: 83).

Association for Supply Chain Management (APICS) defines logistics as the science and art of sourcing, transmitting and distributing products and materials at the right time andin the right quantity in an industrial context. Logistics can be defined as a tool to provide resources such as products, services and people, where they are needed and at the desiredtime. The logistics management process consists of the activities of planning, implementation, transportation, storage and inspection of the entire logistics-related process (Tekin, 2013:14). The basis of the term logistics comes from the ancient Greek word "logos". Logos means ratio, calculation, logic, speech. Soldiers with the title of Logistikas in the ancient Greek, Roman and Byzantine empires were responsible for financial, supply and distribution works in the military (Zaralı, 2013:16). In this context, logistics is supply and distribution operationsbased on logical computation.

Logistics first focuses on the products that have been packaged after the production phase has ended, and before the production activity, it mostly includes the purchase, transportation, storage/stocking of raw materials/parts in the context of material management. For this reason, in order to be able to talk about a complete logistics company, at least three activities (customer service, warehousing, handling, demand management, production planning, purchasing, etc.) must be performed one after the other and there must be more than one function within the logistics integrity. Logistics operations carried out in a business can be listed under three main headings, excluding reverse logistics. These;

1) Supply Logistics; Supply logistics deals with all material flow related processes (Waters, 2003: 252). The ability of enterprises to continue their production activities

It includes taking the raw materials and materials required for production from the suppliers and delivering them to the production areas required for production. This process takes place before production and helps move resources to the production line. In other words, supply logistics provides the link between supply markets and production.

2) Production Logistics; Production logistics is a type of logistics of industrial enterprises. It covers the planning, management and control of in-house goods and information flows. It is the logistics process that plans, implements and controls the transformation of raw materials, information and inputs into final products and services in an effective and efficient manner in enterprises that are heavily engaged in production activities.

3) Distribution Logistics; Distribution logistics is concerned with the function of transferring final products (goods or services) and presenting them to the customer. The distribution channel is the channel that ensures that the user receives the product in the right place, time and quantity.

1.2 Logistics and Its Importance

Logistics activities are very important as they affect all business activities closely. E.g.; If the raw material is not transported to the enterprise as a result of logistics operations, production will not be carried out in the enterprise. For this reason, the starting point of all activities in businesses is logistics, and there are activities such as distribution and storage,

which are also logistics activities, in the continuation and end phase of these activities. The importance of logistics in terms of business, administrative and economic activities in the entire business are closely related to logistics. E.g.; logistics management is closely related to both production management and marketing management. Because; Logistics activities such as supply, distribution and storage are mandatory for production and marketing. As a result of successful logistics activities, a successful management will be possible in companies with the production of raw materials, materials or semi-products in the enterprises and the product reaches the final consumer in the right place, time and quality.

With the increasing importance of logistics activities, some enterprises establish logistics departments, while some enterprises carry out logistics activities with outsourcing. With the outsourcing of logistics activities, significant benefits can be provided to the business in terms of time, resource and money usage, with the outsourcing of services from companies specialized in this business. In terms of time benefit, the time to reach the marketis shortened by reducing the stocks of raw materials, semi-finished products and finished products and in terms of operating time. Ultimately, the manufacturing company primarily focuses on its own business, and its main business is production, sales, etc. He invests in hiswork, takes time.

The main point where logistics is fed is a global economy based on trade. With the increasing international competition following the increasing importance of free trade and the weight of large-scale organizations, the longer moving distances have increased the importance of speed. Ultimately, it has increased the importance of delivering the final products and raw materials to the consumers at a lower cost and on time. In this context, competition is focused on logistics activities. Establishing effective logistics networks is a keypoint in success for companies that strive not to lose their competitiveness with the growing global economy. At the same time, logistics has become a sector that creates resources for countries, sectors and companies as well as labor (Demirbilek, 2011:26)

1.3 Basic Logistics Activities

Logistics activities are very diverse. These activities are in a variety that can be directly decisive for companies to come to the forefront of competition and to exhibit efficient and effective work. Effective logistics services have become very important in the success of competitive markets shaped by globalization in the world.

Logistics services are strategic activities aimed at managing the flow of goods, services and information and establishing the connection between the consumer and the supplier. The most well-known logistics services are primarily transportation and then storage activities. However, the logistics industry offers a wide range of services. Demand planning, order management, packaging, handling, customs clearance, insurance, customer service, stock management and newly developing services are among the basic logistics activities (Carlos et al. 2007:3).

1.3.1 Transportation Services

Transportation services are one of the most important logistics activities. In a narrow sense, transportation is the transportation of all kinds of goods from one place to another by means of transportation, and in a broad sense, it is the timely delivery of the goods producedto meet the demands of the consumers (Waters, 2003:309). Within the scope of logistics activities, it is the realization of the most effective way of transporting the desired product from one point to another.

Transportation services, which have gained importance especially in logistics activities in the last thirty years, consist of different sub-transportation services such as road, sea, air, rail, pipeline transportation and multiple transportation within the scope of logistics activities related to products or raw materials (Bolero et al., 2003:328). Which sub-transportation type will be chosen may vary depending on factors such as the nature of the transported goods, the duration of transportation, the cost of the transportation service, the

infrastructure adequacy of the transportation type, the political structures and policies of the countries (Delfman, 2004: 10). E.g; In the case of sending large volumes of cargo to the United States, maritime transport is the only alternative. On the routes that allow the use of other modes of transport besides maritime transport, air or road transport can be chosen due tothe long duration of transport by sea, as long as the condition of the cargo allows.

1.3.2 Storage, Warehouse and Handling Activities

Another important service group among logistics services is storage, warehouse andhandling services, which are also of great importance in the realization of physical distribution.

Warehouses and warehouses play an important role in the transmission of goods from seller to customer, especially during the execution of worldwide logistics operations. Warehouses can be defined as facilities where raw materials, semi-finished and finished materials are segregated after they are taken from the supply sources, recorded, protected and distributed to domestic or foreign intermediary firms or end consumers. Warehouses are commonly used as "distribution center" or "logistics center". In this context, warehousing services facilitate the transportation of all the items needed for production to the production areas, as well as the final goods prepared in accordance with the demands, to the market.

Warehouses are areas established in bonded areas where the quantity, quality and characteristics of the products are examined, their valuation is carried out and they are protected under the necessary conditions, and they have the qualifications specified in the relevant articles of the Customs Law and Customs Regulation (Çancı, 2003: 83).

One of the most important services performed in the warehouse operation process is handling activities. Provided that the shape and technical characteristics of the goods that cannot be stored continuously remain the same, in order to ensure that they are preserved in the same way.

It can be subjected to various interventions under the permission and control of the customs administration. This is called "handling". It is a group of activities that includes handling, transportation of goods, and all movements to which materials in the warehouse can be subjected (Customs Law art.3). Handling takes place during the transportation, storage and loading of goods, and this process directly affects the efficiency of the processes. It can be expressed as a transaction that does not lose the value of the goods, does not create added value, but can lose the value of the goods if it is not done properly (Dölek, 2004:42).

1.3.3 Customs Clearance Services

Customs clearance services are one of the complementary services that play an important role in logistics activities. Exit of goods or services outside the borders of the country or entry of goods or services into the borders of the country is realized through customs clearance procedures shaped by customs legislation. It is very important not to make mistakes in the documents that need to be prepared and to follow up the processes, since thereare often legal regulations that differ and frequently change according to the product or country that are imported and exported. Small mistakes that can be made can leave exporting and importing companies in a difficult situation. For this reason, it is important that the transactions are carried out by companies that are experts in their field.

Within the scope of customs clearance services, entry and exit procedures of the vehicle carrying the goods from the country border, preparation of summary declaration and customs declaration, preparation or follow-up of other documents that should be prepared in the annex of the declaration and differ according to import and export, obtaining the necessary

permits from the relevant institutions according to the characteristics of the product, calculation of customs taxes import or export of goods procedures are carried out.

1.3.4 Insurance Services

Since risk factors become important when it comes to international trade activities, products subject to global trade must be insured by the provisions of the contract between the relevant parties. As there may be more risks during transportation, which is one of the most important logistics activities, insurance services are an assurance against these risks. The protection of globally traded goods by insurance, on the one hand, must be done legally, on the other hand, the parties trust each other.

It ensures that the goods subject to transportation are heard and their values are protected against the risk factors that may occur (Dölek, 1999: 159).

Insurance services can also be provided by companies that provide logistics services, agreed by the insurer for other logistics operations.

1.3.5 Stock and Inventory Management

Stock and inventory management are two complementary concepts and have an important place in logistics activities. Stock; is the stacking of raw materials, semi-materials or final products and storing them for use when needed. Inventory, on the other hand, is the listing of holdings held in stocks (Waters, 2003: 252).

Inventory management determines which amount of product will be kept at which points in order to realize the correct flow of goods. The inability to keep inventory at optimum levels is one of the leading problems of companies. Too little or too much inventory or the inability to store the goods in hand under appropriate conditions can also be a factor that increases costs. Operational costs may increase due to faulty inventory management policy. (Keskin, 2006:65). Small parts and materials that are not taken into stocks because their foresight is not made or neglected can not only hinder the entire production process, but also cause the loss of existing customers; On the contrary, the losses in the inventory that are overstocked but not put on the production line at that time due to the inaccuracy of demand planning may be more than expected (Markus, 2002:17).

Within the scope of logistics activities, operating costs arising from inventory can be significantly reduced and the level of efficiency in production can be increased. In this respect, inventory management is of great importance in logistics processes (ITO, 2016:14).

1.3.6 Packaging and Packaging Services

Packaging and packaging services, which is another of the logistics services, has become an important service undertaken by logistics companies with the increasing importance of international standards in this regard recently.

Packaging can be defined as all of the protective tools used in the distribution chain from the producer to the consumer for the safe and undamaged transportation of the products.(İGEME, 2006:166). In other words, packaging; It is a substance that serves to protect the product inside. It protects the product from physical effects such as hitting, getting wet, and being damaged.

Packaging, on the other hand, gains importance during handling activities. It is necessary to pay attention to packaging in terms of controlling the goods to be imported or exported quickly and effectively, as well as maintaining the quality of the goods (Bowersox, 2002:408).

The package is defined as the final container that enables the packaged products to be brought together and loaded onto the transport vehicle subject to customs clearance. Different types of packages have been defined for packaging services in international transportation activities. These can be specified as boxes (parcels), crates, bags and sacks, bales and pallets. It is necessary to mark and label on the packages in accordance with international standards (Canıtez, 2009:64).

1.4 Success Factors in Logistics

There are important factors affecting the success in logistics operations. The firm must ensure that it has the desired materials and products. If a company has insufficient inventories, production may stop due to a lack of raw materials and customers may be dissatisfied because they did not receive their orders. To avoid this, a company must have different types of stocks for better organization. Stock management is one of the key factors to be more competitive. For better stock management, automatic picking system should be used, warehouses should be shared in different cities or researched the most cost-effective way to send and receive the product. In addition, the packaging of the product is a factor that serves not only to protect the product, but also to give the customer a sense of privilege. Products with high brittleness should be packaged in more rigorous conditions. It is important to follow the delivery of the goods requested by the customers and to provide the necessary information when the customer needs it. If the customer is not satisfied with the product, the proper execution of the return process is one of the most important elements in logistics. It is important to use internet-based logistics and supply chain, especially to increase the efficiency of logistics and supply chain management (Barutçu, 2007).

1.5 The Place of Logistics among Economic Disciplines

Logistics, which initially expressed the activities in the military field, and later gained importance with the adaptation of the applications in the military field to the field of management and production, is a field that has connections with many disciplines such as economics, management, marketing, political sciences, sociology, mathematics and engineering sciences. it has become an interdisciplinary science (Stock, 1997:518). The relevance of the logistics discipline to economics is expressed by Stock (1997) within the scope of different theories.

Table 1. Economic Theories and Logistics Applications

Theory	Logistics Applications
Benefit-Cost Analysis	Budgeting; Balance Analysis
Input-Output Analysis	Logistics Decision Mechanism and Planning
Pareto Efficiency	Inventory Management; Logistics Decision Mechanism
Product Lifecycle Theory	Logistics Decision Mechanism, Strategy Formulation
Utility Theory	Supplier Selection, Added Value Creation with Logistics

Weber's Place of Origin	Storage Location Selection
Absolute Advantages Theory	Competitiveness, International Trade
Comparative Advantages	Competitiveness, International Trade
Competitive Advantages	International Trade, Innovation (innovation), Creating Value with Logistics, Logistics
New Trading Theory	Logistics, Clustering, Competitiveness
Nash Equilibrium	Logistics Decision Mechanism, Supplier relations
Firm Theory	Logistics Strategy

Source: Adapted from Stock, 1997:521-525.

As it can be seen in **Table.l**, Benefit-Cost analysis, which is important in evaluating investment projects in terms of efficiency, choosing the projects that will provide the highest benefit to the society or determining the order of priority, plays an important role in budgeting and especially balance analysis in logistics applications.

On the other hand, Input-Output analysis has a guiding role in the effective operation of the logistics decision mechanism and in the planning of logistics applications. Input-Output analysis is a method of determining the interrelationships of industries in an economy through input-output tables and shows the flows of goods and services between industries.

Pareto efficiency and product life cycle theory also have an impact on the effectiveness of the logistics decision mechanism. The Pareto Efficiency is a state of general equilibrium, where changes in production or consumption make at least one person better without putting anyone else in a worse situation. In the Pareto Efficiency, there are simultaneous equilibrium situations of consumers, producers and owners of production factors. In this respect, inventory within the scope of logistics applications, in other words, it is a guide in stock management.

On the other hand, the Product Life Cycle theory states that the comparative advantages of the various inputs used in the production of a good are different from each other, so the comparative advantage of the product may also change depending on the change in the inputs during its life cycle. In this context, it is seen as an effective theory in determining logistics strategies as well as the effectiveness of logistics decisions. One of the economic theories that the logistics discipline is related to is the Theory of Utility. Utility is defined as the ability of goods and services to meet human needs in the economy, and is important in consumer equilibrium analysis. In this context, the Benefit Theory gains importance especially in determining the suppliers in the logistics processes of the goods or services that areconsumed, in the supply of logistics services and in creating added value for the consumer for the goods or services. Weber's Place of Establishment Theory is an economic theory that covershow to choose the place where the firm will be established or where the production will be made, the conditions under which the production will take place, and how to choose the place where the firm's raw material procurement costs, production cost and marketing expenditures can affect production in the most appropriate way. In this context, Establishment Location

Theory is effective in logistics, especially in the selection of warehouse location. Absolute Advantage Theory, Comparative Advantage Theory, which are among the classical international trade theories, explain the basics of the relationship between logistics and competitiveness. According to Absolute Advantages, the basis of international trade is the free movement of goods. Countries are increasingly turning to international trade, and whichever country has absolute superiority in the production of that product, exports that product. In the continuation of the Absolute Advantage Theory, which is lacking in many ways, the Comparative Advantage Theory developed by D. Ricardo was put forward. The Theory of Comparative Advantage, defending international trade, states that comparative advantage is the only condition in international trade. These classical international trade theories are of great importance in the competitiveness of countries today (Stock, 1997).

Competitive Advantages can be expressed as the modernization of classical international trade theories. With competitive advantages, Porter refers to the importance of companies and their industries in achieving competitiveness of countries. Moreover, companies can only have a competitive advantage by creating value and argues that it can increase the volume of international trade. The competitive advantage that companies will have can be through price competition or non-price competition. Either way, logistical importance. In this respect, innovation gains importance in terms of logistics and value creation. Conversely, the competitive advantages approach, which emphasizes the importance of clustering in order for the sectors to provide competitive advantage, also constitutes a basis for the formation of logistics clusters.

Krugman's New Trade Theory emphasizes that economic actors such as companies, sellers, buyers and all institutions in a certain area direct other companies in the sector to the same area, and this area also occurs through positive externalities and common information resources created by the synergy created. Therefore, synergy within logistics clusters and their effects on industry sectors are important in this context. On the other hand, Nash Equilibrium is expressed as the best strategy that a firm can choose according to the strategy applied by the opposite firms. In this respect, logistics is effective in decision mechanisms and supplier relations.

The Theory of the Firm includes strategies aimed at profit maximization according to the type of market in which the firm is located. Therefore, it expresses an important relationship with the determination of logistics strategies (Stock, 1997).

1.6 Logistics Management

You can define logistics management as the management of the flow of raw materials, products, services and information throughout the entire supply chain of a product or service. In an informal definition, logistics can be understood as the management of all operations that seek to guarantee the availability of a particular item (product, service, information) in the most convenient time and manner. Thus, logistics management includes the management of a variable number of elements depending on the element whose flow is being managed; but can generally include the following elements:

- Management of warehouses
- Vehicle management
- Management of logistics processes
- Management of related information

1.6.1 Logistics Management Activities

Logistics is a continuous set of business activities. Within the scope of supply chain management, logistics continues 24 hours a day, 365 days a year. Without logistics activities, it is not possible for the enterprise to fulfill its basic functions such as production and marketing (Çancı, 2003: 24). There are some basic operations that need to be done regarding logistics. With the emergence of the concept of logistics, the main logistics activities that businesses focus on and carry out especially in order to be able to carry out these activities are as follows (Devrim Gün, "A Paradigmal Approach to Logistics Villages for Sustainable Logistics Management at Global Level and İskenderun Logistics Village Project" "National Logistics and Supply Chain Congress (Necmettin Erbakan University 10-12 May 2012):

Transport; it refers to the physical movement of a raw material or product from one place to another. It is one of the most important stages of logistics activities. Transportation costs constitute a significant part of the costs of logistics movements. Transportation costs include all costs incurred from the starting point of the raw material, input or product to the destination, and the storage and maintenance costs of the transported goods. One of the functions of logistics management is to provide the most cost-effective transport selection.

Storage; Storing all the necessities required for the activities in the enterprises to be used when the time comes is within the scope of storage. Storage costs are also activities that logistics management should minimize.

One of the most important requirements for installing a storage space is to have ample space to house the storage units or create a new installation. Construction of a new storage facility can be costly if it requires special security measures or plans to offer climate- controlled storage. A storage facility's business plan largely depends on the type of customer itintends to attract and the specialized services it offers. The number of potential customers in the area should determine the size of the investment for the storage facility. Firms should also determine whether they will offer transportation or insurance services.

Handling; Work by hand or any instrument and mixing or combining a product to change its composition or create a new product. The transportation of goods is the group of activities that includes all the movements to which the materials in the warehouse can be subjected. In this way, handling is integrated with different operations occurring in preset time domains.

Handling, how the movement of raw materials, materials and products associated with what will be done. Operations such as transporting the products to transport vehicles, loading them, unloading them from transport vehicles, taking them into the warehouse and exiting the warehouse are included in the field of handling.

Order Processing; It consists of the necessary processes to provide the right information flow from customers to businesses so that the basic activities of logistics can be carried out in harmony with each other to meet customer requests and needs. It is necessary to benefit from information technologies for an effective order processing.

Packaging; It is one of the important links that allows logistics to achieve its goal. Once goods are produced or manufactured, they are subject to any interference or danger that must be protected until they reach their final destination, and thus packaging for handling and shipping is essential.

Buying; It consists of the processes from the beginning of the ordering process of the material needed for the enterprise until the purchase of this material and reaching the enterprise. Purchasing consists of the processes carried out in order to ensure the quality, quantity, time and place suitability of all the input resources necessary for the production and marketing of the enterprise. Purchasing is the process of obtaining it from outside the business by invoicing it at the most affordable price possible and for a price.

Demand management and demand forecasting; related to customer orders. Demand management includes making the right transactions at the right time, place and order, depending on the accuracy of customer orders. With demand management; Demand policies and strategies based on market or consumer needs are determined. In this; It is aimed to reach the appropriate product, service, related resources and information through material flow management and distribution channel. In this context, it is necessary to forecast, plan, control and coordinate the demand in order to meet the customer orders and to create the harmony between all these transactions.

Logistics activities described above; Project management activities consisting of research, design, development and production processes, procurement and procurement costs, transportation activities, quality costs for quality assurance and control can be added. In addition to these, business support activities such as coding activities, logistics training activities, environmental protection and recycling of wastes to the economy, informaticsactivities, maintenance and repair can be added (Tekin, 2013:22).

1.7 Reverse Logistics

Reverse logistics is the process of planning, implementing, and controlling the flow of raw materials, in-process inventory, and finished goods from a point of use, manufacturing, or distribution to a point of collection or disposal as appropriate. Reverse logistics is the process of transporting goods that cannot be used for various reasons from their final destination to another point in order to preserve their value without completely destroying them or to dispose of them under appropriate conditions. The responsibility of the companies continues after the sale of the final products due to various environmental, economic or legal reasons.

Reverse logistics is a fairly new concept in logistics and supply chain management and its importance is increasing. Reverse logistics is used in many industries. Electronics, aircraft, computers, steel, chemical products or medical products, etc. extensively applied in the fields. The effective use of reverse logistics is a factor that can directly affect the competitiveness and profitability of the company in its industry.

Today, many manufacturers or retailers are more interested in product returns or recycling, recognizing the importance of reverse logistics. For reverse logistics activities, the company may use its own experience and resources, or it may choose to establish a logistics partnership through outsourcing. The direct outsourcing of reverse logistics operations by companies that do not want to bear the return or recycling costs with their own resources can also be explained by the cost-effective working principle.

The main areas of interest of reverse logistics are:

- Management of the recovery and distribution of end-of-life products
- Production planning and inventory management
- Supply chain management issues in reverse logistics
- Purchasing management Waste management
- Withdrawal of goods
- Classification of products
- Recycle

Some strategic achievements to consider when designing a reverse logistics network factors exist. For a successful reverse logistics system, it is necessary to minimize strategic costs. Strategic costs include:

• cost of equipment used to remanufacture products

• cost of skilled workers

• cost of warehouse facilities

• transportation costs

Identifying and meeting customer service requirements are other important considerations. Product features, market features, and resource requirements are among other important factors.

The reasons that need reverse logistics application are basically:

• Defective goods

• Return of excess inventory

• Customers' returns

• Unused products

• Seasonal inventories

It is an undeniable fact that the implementation of reverse logistics has legal, economic and ethical obligations for companies. With the increasing prevalence of the total quality management approach and its application in every field, reverse logistics applications have also become an issue that needs to be taken into account for companies.

1.7.1 Advantages and Disadvantages of Reverse Logistics

The advantages of reverse logistics applications are mainly:

• Reduction in unexpected situation or uncertainty in the arrival of goods that will be subject to return or recycling

• The reuse of certain materials allows the Company to cover other markets.

• Giving more confidence to the customer when making a purchase decision

• Significant improvement of company image in front of consumers

• Obtaining product feedback information

• Accurate repetition of the costs of industrial packaging reduction with the use of

• Minimizing the industrial impact on the environment

• Creating opportunities to substitute products for customer loyalty

• Allows reused materials to replace new materials

• Significant reduction of the amount of products in inventory

• Opening of new markets for reused products

• Possibility to obtain government and European subsidies to develop this function

• Reducing costs and increasing profitability

The disadvantages of reverse logistics applications are mainly as follows:

• Unpredictability of the inputs of the reverse logistics process

• No simple manipulation of the product

• The necessity of carrying out studies beforehand in order to establish relevant decision-making policies.

• The need for inspections to be carried out separately and thoroughly on each product

• All departments of the company are involved in activities designed for reverse logistics applications

• Reverse logistics chain includes a series of operations that are not directly in logistics

• The necessity to decide whether the firm should carry out different activities with its own resources or, on the contrary, if it requires the services of a specialized operator.

• The tendency of small financial returns to cause high costs when integrated into the system

Reverse logistics applications can have many advantages for companies as well as disadvantages. In this case, the point of view of the company on reverse logistics will be extremely decisive in revealing the advantage or disadvantage.

1.7.2 The Importance of Reverse Logistics

It is not as easy to determine the exact cost of reverse logistics to companies as it is for logistics costs. The most important reason for this is that companies do not follow reverse logistics activities sufficiently. Reverse logistics is very important for a company's business model. Because it helps provide customers with a more immersive service experience, lowers operating costs and even helps increase profits.

Reverse logistics applications vary according to the type of industry and the location of the channel. Companies where return is a significant part of operational costs oftenhave good reverse logistics systems and processes. For example, in the book industry, returns are a decisive factor in profits. In the computing world, where the life cycle is almost as short as that of food, the rate at which returns are captured and disposed of is already considered a critical strategic variable. Reverse logistics is crucial to a company's business model because it helps provide customers with a more comprehensive service experience, lowers operating costs and even helps increase profits. Through this process, companies can take back damagedgoods, seasonal inventory, miscellaneous goods, old equipment and hazardous material. They also have the possibility of stocking, recalling and recycling. As in the field of supply chain, reverse logistics must face the increasing complexity in the behavior of consumers demandingmore personalized services. For example, on-time delivery should not be of a special nature when the customer not only receives the product but also wants to return it to the seller, and the company will use the same must comply with quality standards.

Pharmaceutical Industry and Logistics

2.1 Pharmaceutical Industry

The pharmaceutical industry is also the industry that manufactures, prepares and markets medicinal chemicals for the treatment or prevention of a disease. Pharmaceutical companies perform research and development (R&D) tasks to deliver new improved treatments and achieve the necessary economic benefits. Because its activities directly affect human health, this industry is subject to a wide variety of laws and regulations regarding the research, patenting, testing and marketing of pharmaceuticals. The sector is technologically very advanced and includes biology, biochemistry, engineering, microbiology, pharmacy and pharmacology, medicine, nursing, physics, etc. covers topics. This industry develops research and development (R&D), manufacturing, quality control, marketing, medical representation, public relations or administrative activities. Better quality of health services is closely related to the strength of the pharmaceutical industry. In addition, the pharmaceutical industry, which provides extremely important contributions in terms of economic development, should have a pharmaceutical industry that can produce to meet the pharmaceutical needs of the country in the face of factors such as war, epidemic diseases and a possible embargo.

Many pharmaceutical companies conduct R&D studies to promote newly developedtreatments. Most countries grant patent protection for newly developed or modified drugs for approximately 15 years from the date of authorization. After the patent expires, any company that meets the regulatory agency's standards can manufacture and sell products with the generic name. 95% of the world pharmaceutical market belongs to multinational pharmaceutical companies.

The industry branch with the highest R&D expenditures in the world is pharmaceuticals. The costs are quite high, and clinical trials of a drug can take an average of 15 years to complete. The cost incurred for an active ingredient to be discovered and marketed as a final product is approximately 1 billion dollars.

2.2 Definition, Classification and Functions of the Drug

Medicine; It can be defined as any substance that has the potential to treat or prevent a disease. It is used as a synonym for "active substance" or "drug" in medicine and pharmacology. A general form in the medical field is any chemical used in the prevention, diagnosis, or treatment of human disease. In biological terms, a drug is any chemical substance capable of modifying or interfering with cellular functionalism, producing the biological action or response of cells or tissues. The mechanism of action of drugs may be via interaction with a pharmacological receptor, an enzymatic action or physicochemical properties, and cellular responses may vary depending on the cellular system or tissue. A medicament is understood as a pharmaceutical form or active substance duly arranged for use by patients. The main features expected from the drug in the medical sense; effectiveness, safety, selectivity, persistence of the effect for a certain period of time, low cost, no toxic effects and non-addiction. Medicines can be obtained from natural sources (plants, animals, microorganisms and minerals) or synthetically.

The main purposes of using drugs are the prevention, diagnosis and treatment of diseases. In order for drugs to be used by patients, they must be prepared in various ways. Medicines that can be used directly by the patient are called galenic preparations. Galenic preparations; It is divided into two as magistral and ophinal drugs. magistral drug; It is a medicine prepared specifically for the patient in the pharmacy, and the structure and recipe of which the physician determines specifically for the patient. If it is an office drug; It refers to

drugs produced subject to fabricated production in a standard way. In addition to prescription drugs, pharmaceutical companies also produce various types of products, such as over-the-counter drugs (OTC) for maintenance purposes, drugs for animal health, medical devices and equipment, products to aid in the diagnosis of disease, and hospital support products. Medicines used by humans are called human medicines, and those used by animals are called veterinary medicines. However, when medicine alone is used without any distinction, it is generally understood as a human medicine group. It is possible to classify drugs under two main headings according to their pharmaceutical forms and their therapeutic qualities:

I. By pharmaceutical types:

- Solid pharmaceutical forms,
- Semi-solid pharmaceutical forms,
- Liquid dosage forms,
- Gaseous pharmaceutical forms,

2. According to its therapeutic nature:

- Antipyretic,
- Antidepressants,
- Anti-inflammatory,
- Antihistamines,
- Antibiotics,
- Antiallergics,
- Antihypertensives,
- Analgesics
- Analeptics,
- It can be grouped as anesthetics.

Basically, each group of drugs grouped under these two main headings may have different mechanisms of action or active substances.

2.2.1 Nomenclature of Drugs

Medicines; They can be named in 3 types as generic, commercial and chemical. generic name; It refers to the name standardized by the World Health Organization and used to facilitate communication in health. Trade name; refers to the special name that the manufacturing companies give to their products. The chemical name is; It refers to the name that identifies the chemical structure determined by the International Chemical Union.

2.3 Logistics Partnerships in the Pharmaceutical Industry

The main purpose for companies to establish partnerships is to improve customer service and to be more competitive in the market by increasing efficiency and productivity. In the definitions of logistics partnerships, it is emphasized that risks, commitments and information are shared within a period specified in the agreement. Ignoring mutual trust generally, a long-term approach provides the parties with a competitive advantage in the market.

Logistic partnerships are threefold in terms of the degree to which they share risks and commitments. The simplest form of logistics partnerships is partnership agreements. The more advanced form is third party supplier agreements and the most advanced form is integrated service agreements. partnership agreements; Logistic partnerships in which no changes are made in business and business processes except for the necessary changes in order to gain a certain synergy in the main service areas and are carried out with informal relations. Third Party Logistics (3PL) agreements; is the use of an outside company to perform some or all of the supply chain functions performed internally. Integrated service agreements are; Formal contracts, in which commitments and risks are shared the most, aiming to provide integrated service in order to serve more than one logistics function. These are logistics partnerships based on consulting services (Bowersox, 2004:11).

With logistics agreements, the firm can focus on production activities and execute a cost-effective strategy. It also helps the firm to achieve its strategic goals. Logistics agreements also support the facilitation of intra-company logistics processes. The simplification of internal processes will also indirectly affect consumer satisfaction, as it will also help to eliminate all kinds of additional costs and time-wasting factors.

After the production area, drugs are stored in central warehouses or warehouses of 3PL providers. It constitutes the central warehouse stage, which is the first step of this type of logistics. Manufacturers carry out this transportation process with their own vehicles or with the possibilities of 3PL companies. on order, depending on quantity high base storage or shelf storage drugs are automatically selected manually and shipped to wholesalers and/or chain wholesalers via pharmaceutical transport via 3PL service providers. After that, the regional warehouse phase begins. Wholesalers and chain wholesalers are responsible for delivering the right amount of medicine at the right time to the sales points. Pharmacies and other outlets place orders on time (usually between two hours and a day) when patients need them. This is where 3PLs come into play. At the point of sale stage, it is the stage where the patients, that is, the consumer, reach the drug. Patients can obtain drugs directly from public pharmacies or from hospitals and similar clinics. The fact that drugs reach the point of sale through wholesalers ensures that the supply chain works more effectively and that patients can reach the drug faster (Arslan, 2007:49).

2.4 Pharmaceutical Industry and Supply Chain Structure

The supply chain includes all processes that are directly or indirectly involved in the act of meeting the customer's needs. The supply chain includes all the following stages from the initial supply of resources such as raw materials, inputs and information to the production and final product stage and reaching the final consumer. Topics covered by the supply chain; material supply, production, sales, distribution, stock management and customer service.

The supply chain is the structure that connects many companies that start from raw raw materials and deliver them to the final consumer using finished products. The supply chain should have some basic features. It is primarily dynamic and includes a continuous flow of information, products and funds at different stages. It is an essential part of customer supply chains. The main purpose of supply chains is to meet the needs of the customer. A typical supply chain may encompass several stages that include customers, retailers, wholesalers/distributors, manufacturers, suppliers of components and raw materials. Each stage of the supply chain is connected by the flow of products, information and funds. Each of the stages need not be in the supply chain, and the appropriate design of the supply chain depends on the customer's needs and the functions the covered stages perform.

The supply chain structure applied in the pharmaceutical industry is different from the others. The difference of the sector is due to various reasons ranging from legal restrictions to

high R&D costs, from circulation in the supply chain to the consumer-sector relationship. Pharmaceutical manufacturers must be competitive so that they can reduce their costs and wholesalers and retailers can tolerate lower profit levels. They turn to logistics strategies and supply chain management that will provide advantages and reduce costs. Supply chain is defined as "a set of elements that includes suppliers, logistics service providers, manufacturers, distributors and retailers, among which information flows, materials and products" (Kopczak, 1997:227).

A supply chain is a network of manufacturers and distributors who procure raw materials and convert these raw materials into intermediate and final products and distribute the final products to customers (Lee et al., 1992:66). While aiming for an effective supply chain network, concepts such as the life cycle of the product subject to production, recycling feature, predictability of demand for the product, stockability, diversity and availability are discussed. If the product in question is a drug, all these factors create a different supply chain structure.

The functioning of the supply chain process in the pharmaceutical industry starts with the raw material and continues with the production process. Produced medicine is distributed to retailers such as pharmacies and hospitals through pharmaceutical warehouses, pharmaceutical cooperatives, which are in the position of wholesalers. Pharmaceuticals at retail points are distributed to consumers.

R&D activities are the first step of the value chain structure in the pharmaceutical industry. Afterwards, the drug license is obtained and production is carried out. During the marketing phase, sales and distribution are carried out through warehouses. The drugs in the warehouses are delivered to the pharmacies and finally to the patients who are consumers. With R&D studies, companies constantly develop new products and deliver products to customers with marketing studies.

Pharmaceutical industry is an industry branch that develops new products as a result of R&D activities that can take many years. A drug is a product that emerges after a high cost and long process. Putting the drug on the market and promoting it are supervised by the authorities. This distinguishes the life cycle of the drug from other products. However, the emergence of unexpected situations such as war, disasters, epidemics are the reasons that make it difficult to forecast the demand for the product. For this reason, manufacturers produce in line with their own forecasts rather than demand forecasts. Pharmaceuticals is a product in which high standards are applied from production to storage, from distribution to collection, and there is no flexibility in these standards. Thanks to the standards known as the pharmaceutical industry, Good Manufacturing Practices and Good Distribution Practices in theinternational framework, the interests of the public in drug safety and transportation are taken into consideration.

The drug is produced as a result of successive processes and distributed to wholesalers. It reaches patients, who are consumers, from wholesalers through retailers. Manufacturers rarely sell drugs directly to retailers or the public. Thanks to this structure in the sector, manufacturers can focus more on R&D and production activities. Since the direct sale of drugs to the public by manufacturers is mostly prohibited, they use pharmaceutical warehouses, chain or community pharmacies, hospitals, food or large retail markets, nursing homes or outpatient clinics as distribution channels.

Two supply chain structures used in pharmaceutical industry studies can be mentioned. The first is the product development supply chain, and the second is the physical supply chain. The next step is to manage the logistics activities related to the product.

2.4.1. Raw Material, Pharmaceutical Factory, Pharmaceutical Warehouse

The first stage of pharmaceutical supply chain management is the shipment of all kinds of raw materials to be used in production from the suppliers or from the raw material factory of the same organization to the pharmaceutical factory. The drug forms produced

according to the warehouse and serial numbers are packaged and placed in boxes. Products are invoiced according to company orders and needs and delivered to warehouses. Transportation between the pharmaceutical factory and the drug warehouse is usually done by cargo. During the entry of products to the warehouses, serial numbers and invoice information are checked and the products are placed on the shelves according to their serial numbers. Product circulation is also taken into account during placement. In addition, there are special cold air sections for products that come with cold chain. The most important feature that should be in drug warehouses is that the warehouse standard is to prevent the packaging of drugs from deteriorating in any way.

2.4.2 Pharmaceutical Warehouse, Independent or Hospital

Drug orders of pharmacies are transmitted to pharmaceutical warehouses via telephone or computer systems. Orders are transmitted directly to the hand terminal of the employee. Invoices of orders placed in transport containers are prepared according to their serial numbers, invoice information is checked and transferred to parcels or special transport bags. Products separated by shipping regions are distributed according to carriers. Pharmaceutical warehouse - pharmacy shipment may vary according to demand. Urgent orders are sent by warehouse vehicles or motor couriers. Products that need to be transported as a cold chain, such as vaccines, are transported wrapped in ice packs.

2.4.3 Independent or Hospital - Sick and Healthy Individuals

Drug orders of pharmacies are transmitted to pharmaceutical warehouses via telephone or computer systems. Orders are transmitted directly to the hand terminal of the employee. Invoices of orders placed in transport containers are prepared according to their serial numbers, invoice information is checked and transferred to parcels or special transport bags. Products separated by shipping regions are distributed according to carriers. Pharmaceutical warehouse - pharmacy shipment may vary according to demand. Urgent orders are sent by warehouse vehicles or motor couriers. Products that need to be transported as a cold chain, such as vaccines, are transported wrapped in ice packs.

2.5 Product Development in the Pharmaceutical Industry, Supply Chain

In the product development supply chain, after the discovery of a new active ingredient with a therapeutic quality, converting it to the final drug and obtaining permissions from the necessary authorities in all these processes involve a series of studies that require a long process. Pharmaceutical industry has a research and development centered structure. There is a continuous flow of new products in the sector. The product development supply chain is typically a period of more than 10 years. The more the company that discovers and produces the drug develops and launches new products, the more its profitability will increase. Since patent protection will expire after a certain period of time, equivalent products containing the same active ingredient will be put on the market and will negatively affect the profitability of the original product.

2.5.1 Physical Supply Chain

It includes procurement for use in production, transportation of raw materials from their initial source to production points, and delivery to loading and storage areas. The chain in question starts with the manufacturer and ends with the consumer. Sharing information and plans with suppliers and customers can increase chain efficiency and competitiveness.

2.5.2 Structure of the Pharmaceutical Supply Channels Network

1. Manufacturers:

We can group the manufacturers in the pharmaceutical industry as follows:

- Multinational pharmaceutical companies that can make R&D investments,
- Large manufacturers producing equivalent and over-the-counter drugs,
- Local manufacturers: They produce both generic and own brands in their own countries witha license or contract,
- Contract manufacturers: Companies that do not have their own production and product ranges, but that produce the active substance or end product by outsourcing to other companies,
- Pharmaceutical invention and biotechnology companies: companies without manufacturingcapacity to be considered.

There is no second quality in medicine. Therefore, manufacturers should follow good manufacturing practices in order to ensure that pharmaceutical products are produced according to the determined quality standards and the intended use type as presented in the registration information and to provide quality assurance.

Manufacturers have higher profit margins than wholesalers and retailers. However, this profit margin is not enough to finance high-cost R&D studies or to meet the ever-increasing standards of production. In addition, sector-specific sensitivities require high stocks. For this reason, manufacturers attach more importance to supply chain management and logistics activities and establish strategic partnerships in these areas.

2. Wholesalers:

Wholesalers operating in the pharmaceutical industry; They are undertakings that provide product flow between drug manufacturers and independent retailers, hospitals and doctors authorized to distribute drugs, including pharmacies, chain pharmacies, large markets and other sales points. Wholesalers operating throughout our country have higher purchasing power than wholesalers operating on a regional or provincial basis.In this way, the discounts obtained can be transferred to the retailers, which are the other link of the chain, and this brings with it relatively higher market shares.

In addition to distribution, wholesalers also perform the function of storing drugs. Medicines are special products that need to be stocked and shipped in accordance with the criteria specified in Good Storage Practices. Due to the limited storage conditions, retailers prefer to keep the drug in the sales area within the framework of short-term needs. Thus the stock enclosure they deduct this item from their expenses by transferring their responsibility to wholesalers.

3. Retailers:

Retail sales in the pharmaceutical industry are mostly carried out by pharmacies. In addition to pharmacies, in some countries, drug sales can also be made in large retail stores. England, Germany, Canada, USA can be given as examples of countries where drug sales can be made in large retail stores that are not pharmacies. In hospitals, the greatest assurance of human health, the availability of medicines and medical consumables when needed is of great importance in terms of ensuring the uninterrupted continuation of the service.

4. Joint Purchasing Organizations:

Retailers use Group Buying Organizations to be more powerful in purchasing. Thanks to these organizations, retailers, together with hospitals and other health care organizations, can make large purchases by having a high bargaining share with manufacturers and wholesalers.

2.6 Good Distribution and Good Storage Practices in the Pharmaceutical Industry

Maintaining product safety and quality during distribution is extremely important in the pharmaceutical industry. Good distribution practices in storage and transport activities willbe the assurance of the quality and integrity of these drugs, as distribution creates a bond. With these applications, consistent and permanent quality management is ensured throughout the chain, from the beginning of the raw material supply to the delivery of the final product to the end user.

Transport and storage of drugs, temperature, humidity, light, ventilation, radiation, etc. It ensures that its physical and pharmacological properties are preserved. As a distribution channel for pharmaceutical industry sales; chain pharmacies, independent (freelance) pharmacies, pharmaceutical warehouses, hospitals, e-pharmacies, food stores, large retailstores, long-term care homes, outpatient clinics.

2.6.1 Active Ingredients of the Drug

The ability to manage the critical processes of drug logistics depends on the active ingredients used in the properties of the drug and the substances they contain. Active substance is important in determining the logistics process of pharmaceutical products.

2.6.2 Physical, Chemical and Biological Contamination

In the management of the critical processes of pharmaceutical logistics, it should be taken into account that a chemical and biological substance is defective or contains a foreign substance that should not be in it, as a result of which the product is dangerous for health. For this reason, appropriate packaging and transparent banding should be done in order to prevent the contact of any foreign substance with the product during production and post-production processes.

2.6.3 Excipients

It is a different substance from the active ingredient that is appropriately evaluated for safety in the drug delivery system. Excipients in pharmaceutical logistics should allow for the optimization of the drug delivery system in the manufacturing process. In pharmaceutical logistics, the protection of the product is important in terms of maintaining its biological usefulness to the patient.

2.6.4 Shelf life

The shelf life of the drug is important in drug logistics. Shelf life, that is, the expiry date of a drug, is the date when 10% of the active ingredient in that drug form becomes

ineffective. At the end of the production process, the expiry date mentioned for each product can be valid as long as it is stored correctly. Therefore, the shelf life of a pharmaceutical product is directly dependent on storage and transportation conditions.

2.6.5 Labeling

Labeling in pharmaceutical logistics is essential for logistics management. The labeling process consists of preparing the correct label containing the specific information of the product and sticking it on the product. Information on the label in the labeling it should be clear and distinct so that it can be understood by everyone.

2.6.6 Production

It is the transformation of all the inputs of the drug into a product by going through the transformation processes. The manufacturing process of pharmaceutical products consists of the procurement, production, post-production quality control, storage and distribution processes of active and excipients.

2.6.7 Material

Active drug ingredients, excipients, packaging and labeling materials, and slovenes are defined as materials subject to drug logistics (Erdal, 2008).

2.6.8 Packaging Materials

It includes printed packaging materials and auxiliary materials used in the packaging of medicines.

2.6.9 Reassessment Period

Products can be re-evaluated and controlled before use.

2.6.10 Srorage

It is the storage of drugs and similar products for a short time after production.

2.6.11 Supplier

Distributors, raw material producers, vendors, brokers and logistics companies involved in the procurement of materials to be used in the production of pharmaceuticals assume the title of supply. Suppliers can be decisive actors in the logistics process.

2.6.12 Employee

In every unit where storage is made such as production, distribution, hospitals and pharmacies, it is necessary to employ specialized and trained personnel in pharmaceutical logistics. The healthy use of drugs and other health products and the protection of public health for this is a requirement.

2.6.13 Storage Area

The storage area should be designed to provide the most suitable storage conditions for the products. The warehouse should be dry, free from dust and dirt, have the features to provide heat at the protection temperature of the products to be stored, and at the same time have a compartmentalized structure for the storage of different products.

There should be a warning system (RFID) regarding the expiration date of the drug or if it becomes unusable for any reason. In this way, economic losses that may occur due to the

deterioration of drugs and medical products will be prevented. Medicines and medical products containing high radioactivity are considered as dangerous goods.

In storage, the first expired-first out principle (FEFO), which is a suitable system for drugs and medical products, should be applied. Products that have expired or become unusable should be quarantined and descriptive labels should be affixed to them. Drugs with narcotic properties should be stored and stored in accordance with international rules. The areas where the drug is stored should be properly illuminated, and overheating of the environment as a result of lighting should be prevented.

2.6.14 Monitoring Warehouse Conditions

It is necessary to continuously monitor the conditions in the warehouse area and to record the temperature in the warehouse at the same time. The recorded values should be checked continuously and the data should be kept for at least one year.

2.6.15 Labeling and Container

All of the drug should be stored in the storage area. For each product, there should be descriptive labels on the container in which it is stored. All information about the product should be on these labels. This information should include information on protection conditions and bacterial contamination.

2.6.16 Stock Cycle and Control

Periodic stock control of the drug should be done regularly. While the stock controls to be made in the electronic environment are made on a daily basis, the controls should be made manually at least every six months. Medicines and medical products that are damaged or unusable in stock should also be taken into account separately in stock control. All movements of the products must be recorded in writing.

2.6.17 Returned Products

Products that are returned and returned from pharmacies or health institutions should not be taken directly to the warehouse area, damage, expiration dates, etc. conditions should be reviewed and taken to the storage area separately. Medicines and medical products that have become unusable as a result of the controls should be destroyed before being taken to the storage area.

2.6.18 Distrubition and Transport

Pharmaceuticals and medical products should be loaded into vehicles in accordance with their own characteristics and transported under appropriate conditions. The storage conditions of the products and the transportation conditions should be the same. Therefore, the "Cold Chain" should not be broken in the transportation of drugs and medical supplies. According to the features of the products; The temperature of the product should be preserved by dry ice, cariogenic cooling and cold ventilation method. On the other hand, freezing and crystallization of drugs and medical products should be prevented. It is not possible to use frozen or crystallized drugs after thawing. Such problems are usually in air transport; During transfer and flight, storage in unsuitable conditions (when the temperature is below 0 C) and the prolongation of the acceptance process at the point of delivery (when the temperature is below 0 C) are encountered. In road transport; It is caused by improper placement of used ice

batteries and incorrect applications in cold weather (and not using ice/warm batteries). In order to eliminate this problem;

- Properly placing the used ice packs in the long-lasting vaccine transport containers before the vaccines are placed,
- Using a freeze indicator,
- Being careful during transport,

In extremely cold weather: precautions such as removing ice batteries and using batteries filled with ice water can be taken (Tekin: 2014:91).

2.7 Pharma Logistics

Logistics activities have an important place in the production and marketing management of enterprises in the pharmaceutical industry. Pharmaceutical logistics consists of the production of the drug in the pharmaceutical factory by taking the raw material from the suppliers, the shipment of the drug to the warehouses, and the transportation, storage and handling of the products taken from the drug warehouses by the sellers to the end customer. Pharmaceutical logistics are considered as operations in the field of medical transportation. Medicines are products that need to be stored, transported and stored under certain conditions, just like food products.

In the pharmaceutical industry, where competition is intense, significant problems are encountered in balancing production and consumption. One of the factors that make it most difficult for the manufacturing pharmaceutical companies to plan is the need to meet the pharmaceutical demand immediately, and the intense and oppressive demand that comes with it. The financial and operational costs experienced in "overstock" products in the pharmaceutical industry and the sales losses experienced in "sold out" products negatively affect the overall efficiency and profitability of the industry (Şen, 2005).

There are many actors in pharmaceutical logistics. These;

- Pharmaceutical distribution / freight forwarding services
- Pharmaceutical promotion services management
- Cargo services
- Raw material and auxiliary material warehousing
- Representative Pharmaceutical Warehouse

- All secondary packaging services such as DataMatrix, Boxing, Box Change, Label Operations

Objectives of pharmaceutical logistics;

- Redesigning the supply chain by analyzing the contradictions within the system,
- To be able to manage the dynamics in the pharmaceutical supply chain efficiently and creating value with effective resource planning,
- Keeping drugs in distribution channels in accordance with sales targets,
- Fully comply with Good Distribution Practices (GDP: Good Distribution Practice of Medicinal Products for Human Use)
- Reducing pharmaceutical logistics costs (Tekin, 2014:96).

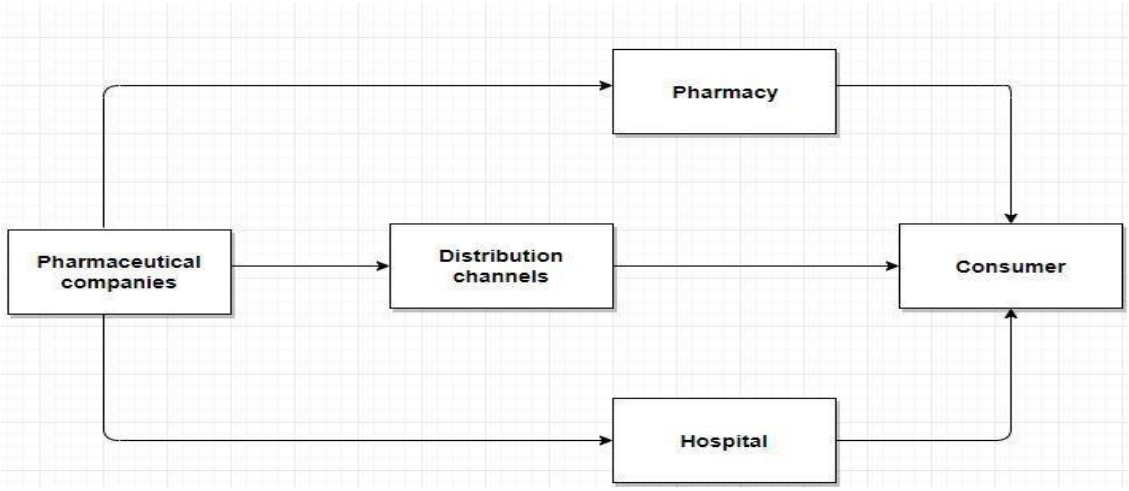

Figure:1. Pharmaceutical Logistics in Turkey.

An example of drug logistics is shown in Figure 1. Pharmaceutical companies sell products to pharmaceutical warehouses, pharmacies or hospitals through tenders. The drug, which is the final product, is delivered to the patients, who are the final consumers, through hospitals or pharmacies.

2.8 Recycling (Green logistics) Logistics

Recycling is, in a way, reverse logistics. Pharmaceutical recycling may be in the form of distributing the expired medicine to patients or their relatives, as well as the destruction and recycling of expired medicines or packaging materials. The recycling logistics process and the organizations in the process;

- Drug recycling,
- Collection of drugs from patients or consumers,
- Distribution from pharmacies to pharmaceutical warehouses and from there to drug logistics places,
- Disposal of unusable medicines. Recycling of recyclable packaging and similar materials.

Considering the characteristics of the product and storage conditions of logistics service providers, which are among the most important problems for companies that produce drugs, especially products. It is important that they provide storage and transportation services.

Especially in pharmaceutical logistics, which has an important place in human life, storage and transportation are very important for all sector stakeholders. For example; A medicine that is spoiled or whose bottle is broken due to poor storage and transportation conditions will deteriorate and carry a great risk for the patient who will use this medicine. In this context, pharmaceutical logistics requires very sensitive logistics processes and operations at every stage after the production phase of the drug.

Pharmaceutical logistics is a specific type of logistics, and it starts with the transportation and storage of pharmaceutical raw materials and material components from the production stage of the drug to the place where the drug is produced. From this stage on, if the substances used in pharmaceutical logistics production are imported to Turkey, all logistics operations at customs points must be managed by designing a process in accordance with the rules by reviewing the temperature and humidity control and times. In the next stage, the transportation of the raw material, semi-product or product to the warehouses should be carried out quickly with temperature-controlled and compartmentalized vehicles. The conditions for the storage of raw materials for the manufacture of drugs must be suitable. In the transport of raw materials required for drug production to the factory, shipment should be made with temperature-controlled vehicles. At this point, the important thing is to zero the risk of logistics operations that may arise in all pharmaceutical production supply processes as much aspossible.

Sensitive logistics tools and logistics management are also needed in the processes of transporting drugs produced in pharmaceutical logistics to hospitals and patients through drug warehouses and pharmacies. In this context, business managers in the pharmaceutical industry should be aware that effective and efficient supply chain management is an important element in providing their businesses with competitive advantage in pharmaceutical logistics. It is seen that some companies that provide logistics service in the pharmaceutical logistics sector offer storage and transportation services without adequately knowing the storage conditions of the product. This naturally complicates the work of logistics providers who do not act according to the logistics and supply chain conditions related to pharmaceuticals (Tekin, 2014-102).

In pharmaceutical logistics, the stakeholders involved in the supply and distribution segment of the pharmaceutical industry; Pharmaceutical manufacturers, pharmaceutical warehouses and pharmacy owners should be handled, stored and transported in accordance with the storage and transportation conditions of the drug. Pharmaceutical logistics sector and sector stakeholders in Turkey are experiencing important storage and distribution problems. These problems arise as a result of not complying with the standards suitable for drug storage and storage conditions. Pharmaceutical Logistics companies should consider in logistics;

- It should be strictly observed that the drug is stored in a controlled temperature and humidity environment.

Hygiene standards must be complied with in warehouses and storage.

Attention should be paid to drug packaging markings.

It should be ensured that the shelf systems and sections of the warehouses are at an appropriate distance from other drugs or other products that will adversely affect each other.

The first drug that comes to the warehouse must be acted in accordance with the first-out rule.

Thanks to the wireless network technology of the vehicles used in the shipment of drugs, rapid and error-free warehouse management should be possible simultaneously.

Medicine; It should be able to enter, store and ship on the basis of pallets, parcels or even boxes.

There should be pallet tracking on the basis of order, product and customer.

Flexible placement and collection should be possible on the basis of product-address, parametrically, thanks to automatic algorithms.

User errors should be minimized (resetting if possible).

Companies operating in pharmaceutical logistics should not forget that they carry

and store a sensitive product such as pharmaceuticals and carry out handling operations.

In this, they should know the drug, prepare the environment in accordance with the rules to ensure the safety of the products, and ensure the traceability of the process by continuous inspection. When the people involved in these processes comply with these rules, all segments of society, especially patients, physicians and all health workers, and drug manufacturers will be positively affected by the healing and treatment results of the drug.

2.9 Reverse Logistics in the Pharmaceutical Industry

Reverse logistics is a process that covers all logistics activities, from the product that is no longer needed or usable, to be returned or recycled, to the product that can be reused in the market. In this context, reverse logistics includes the physical transportation of the final product from the end user to the first manufacturer. In the next stage, the product in question is recycled, destroyed or turned into a reusable product.

Returned products can be taken back from the point of sale or consumption point. The expenses incurred for waiting for the returned product on the shelf, preparing for return, transporting it back, storing it in the warehouse, returning it to the manufacturer, and ultimately destruction are added to the expenses incurred until the product reaches the point of sale or the consumer, thereby increasing the logistics costs of the product in question. Increasing expenses reduce the profit margin and decrease the market share.

Considering the pharmaceutical industry, the situations where reverse logistics are needed can be grouped under four headings. The first one, which is the most important in the sector, is the returns arising from the emergence of any hidden or explicit defect in the product. This process, also called “Withdrawal”, is the fact that manufacturers have to collect the drugs they have put on the market due to health threats and safety precautions.

Pharmaceutical withdrawal is a process determined by specific legal procedures by which the government forms and grades on behalf of the public. With the approval of the Ministry, it is decided to withdraw the drug due to faulty production, side effects, faulty packaging, incorrect information/prospectus, and the drug manufacturer notifies the warehouses and pharmacies of this decision.

In line with the type of withdrawal degree, drugs collected in pharmaceutical warehouses are returned to the pharmaceutical company. Pharmaceutical companies apply the destruction procedures after accepting and controlling the returned products. Pharmaceutical companies need a well-planned reverse logistics procedure in order to complete the collection activity as quickly as possible in such events that cause both reputational and monetary losses. The second reason for returns is due to non-compliance or disagreement with commercial agreements. The other two types of returns encountered are shipping errors that occur during shipment and returns that occur to apply a new value-added service on the product in accordance with a certain agreement or to be shipped to a different customer.

Withdrawal is a reverse logistics activity that pharmaceutical companies, pharmaceutical warehouses and pharmacies should carefully consider and plan for, ethically, aside from all commercial concerns. In the pharmaceutical industry, as it should be in all industrial areas, environmental awareness is taken into account in each of the steps of designing, synthesizing, producing, packaging, reaching the consumer and destroying or recycling the drug.

The concept of Green Pharmacy, which has emerged in recent years, is the least harmful to the environment. It includes the use of reagents in drugs and the preference of more water-based chemistry in the synthesis steps, the creation of unstable formulations (easily soluble).

There is an official but voluntary Product Management Program for the disposal and recycling of pharmaceuticals and personal care products within the framework of environmental responsibility. Through these programs, the associated industries guide the public, regional, national medical centers (hospitals, nursing homes) and physicians for the most appropriate disposal of these wastes. In some countries, there are take-back programs implemented by pharmacies and health care institutions for the disposal of medicines. By

applying to the nearest pharmacy or health institution providing this service, consumers can ensure that the expired or unused medicines are destroyed in a controlled manner. Similar practices have been carried out in Canada since the mid-1990s and in Australia since 1998. Since 1999, the Australian National Health and Medical Research Agency (NHMRC) recommends that the wastes generated by pharmaceuticals and personal care products should be incinerated where possible, that such wastes should not be buried in regular collection areas, and that they should not be mixed into sewer systems.

Presenting drugs and personal care products such as aspirin, which are frequently used and easy to access, in as small and convenient packages as possible is an application that provides convenience both economically and in recycling and disposal. In the Regulation on the Control of Packaging and Packaging Wastes applied in our country, it is stated that the packaging of pharmaceutical products and drugs consumed at home, apart from health institutions, should be collected separately with other packaging wastes, provided that they are not contaminated with disease agents or microbes (Packaging and Packaging Waste Control Regulation, July 2004, 25538).

Used medical materials, called medical waste, must be collected and disposed of separately. A total of 20-24 tons of medical waste is collected daily from 202 Health Institutions with a bed capacity of 20 or more in Istanbul. The fact that these wastes are not collected separately increases the risk of transmission of dangerous diseases, especially hepatitis, to humans, and brings many health, environmental and cost problems. In order to prevent this danger, “Medical Waste Control Regulation” was issued. In Turkey, in order to ensureconsumer health and safety, pharmaceutical and medical substances or materials that have expired and appear to be objectionable are returned. Rules and responsibilities regarding withdrawal and recall are specified in the “Regulation on the Withdrawal and Collection of Pharmaceutical and Medical Preparation Substances, Materials, Compositions and Herbal Preparations”. The role of information and communication technologies in reverse logistics is quite large. First of all, information and communication technologies are used in the productionof products with DfR (Design for X-Environment, Recovery, Disassembly) features during theproduct development phase.

Processing of returned goods with Barcode and RFID are applications that facilitate the tracking of the product. Knowing the place of the product in the chain is realized with the help of communication technologies in all logistics activities. Firms heavily prefer outsourcing for this field of activity. In our country, within the framework of legislative harmonization carried out in the European Union candidacy process, studies are carried out in line with the European Union IPPC Directive (Integrated Pollution Prevention and Control Directive) numbered 96/61/EEC. It is within the scope of this directive to prevent and control the pollution arising from the activities of chemical plants where pesticides are produced, and facilities producing medical preparations with chemical or biological processes, with an integrated approach.

Reverse Logistics Applications in the Pharmaceutical Industry

3.1. Purpose of the research

In this study, the pharmaceutical industry and reverse logistics applications in the industry were examined. It is aimed to determine the problems encountered by analyzing reverse logistics processes. The process from the production stage of the drug to the end user patient, and the reverse logistics of the products recalled from the market for various reasons, were investigated. Within the scope of the study, the logistics processes of many companies inthe sector were examined and it was determined that all of them had a similar logistics-reverselogistics process. In the application part of the study, the logistics processes of pharmaceuticalcompanies and warehouses are explained. In addition, suggestions were made for the processesto work more efficiently.

3.2. Findings of the Study

In the study, the logistics department of Pierre Fabre pharmaceutical company, headquartered in Istanbul, was researched first. The company is an international pharmaceutical and dermocosmetic company of French origin and produces all of its products outside of Turkey. Pierre Fabre İlaç A.Ş., the Turkish branch of the company, operates in Ümraniye, Istanbul andhas a sales and marketing network throughout Turkey. It mainly sells human health and cosmetic products. Working with all pharmaceutical warehouses operating in Turkey as logistics, the company delivers products from Ümraniye, which is its main warehouse, to all over Turkey. As with all pharmaceutical companies, the company carries out its basic logistics cooperation with pharmaceutical warehouses. Its products are delivered to contracted pharmacies through pharmacy warehouses. Due to the prohibition of direct sales and shipment to the final consumer, the products are mostly delivered to the consumer through pharmacies, as in all companies.

3.2.1. Pharmaceutical Company Logistics Application

In this section, the logistics network of the French-based Pierre-Fabre pharmaceutical company examined. In Figure:2, the logistics network of the company is explained.

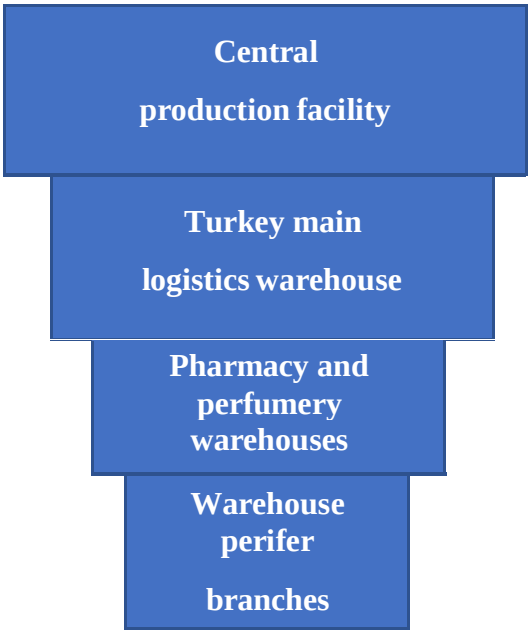

Figure:2. Pierre Fabre Direct Logistics Chart

The company delivers its products manufactured abroad to Ümraniye, the central warehouse of Turkey. Imported products coming to Turkey's main logistics warehouse, distribution channels via road and air transportation vehicles to the contracted pharmaceutical warehouses. Products registered in pharmaceutical warehouses are available all over thecountry and sent to the peripheral branches of the warehouses. From here, you can make an agreement with the warehouses. Delivery of drugs to the chain or community pharmacies wherethey work in return for orders. The transportation and sale of drugs to the final consumer is onlythrough pharmacies being carried out.

3.2.2. Pharmaceutical Warehouses Logistics Applications

When the consumer wants to purchase the final product, it can not be obtained directly from the manufacturer or the pharmacy either. For this reason, pharmaceutical warehouses are in direct contact with the consumer. Pharmaceutical warehouses are a bridge between the manufacturer and the pharmacies that deliver the drug to the consumer. Pharmaceutical warehouses, requests from pharmacies through their branches collects and according to the amount of products needed as a result of the analysis of the incoming demands. Procured and stored in central warehouses products are delivered to the branches of the warehouse by land and air. Some products are special storage and transportation conditions. For example, cold chain products, certain temperature and conditions must be transported. It should be delivered to the relevant branch as soon as possible. The storage and storage conditions of each product reaching the peripheral pharmaceutical warehouses are different from each other. Specific products such as injectable products and cold chain products if the products are not stored in the peripheral warehouses under appropriate conditions, they become very quickly may decompose and be sent for destruction. Again, such products are available in pharmacies vehicles with cold transport units and cold storage units motorcycles are used. Other storage and storage conditions that do not require transporting drugs by road from branches to pharmacies that order all drugs transported by vehicles that comply with the norms. Consumers who want to buy these products, the only channel they can reach is the legally authorized community pharmacies. The direct logistics phase ends when the consumer purchases the drug from the pharmacy.

3.2.3. Pharmacy Logistics Applications

The pharmacies interviewed within the scope of the research were contacted by one or more pharmaceutical warehousesn that have agreed on the supply of drugs. Dealing with multiple pharmaceutical warehouses pharmacies who stated that doing so gives them an advantage in price and purchasing conditions as well as pharmacies that make an agreement

with a single pharmaceutical warehouse for the purchase of goods are available. They also get a higher discount rate in the purchase of goods in this situation.

Almost all of the interviewed pharmacies do not work with stocks and in case of need, stated that they reached the warehouses via telephone or the internet. During the purchase of goods producers or pharmaceutical warehouses, which provide purchasing and cost advantages, they also added that they benefit from the campaigns. intense from consumers it has been observed that the products in demand are mostly supplied with these campaigns. It is a great risk to stock up when they cannot anticipate consumer demand and pharmacies indicate that products used in the treatment of chronic diseases, are on their shelves. They stated that they were careful to keep it in small quantities. However, due that the expired products constitute a large cost item for them, and therefore they stated that they may experience commercial losses.

In addition, pharmacies, injectable or cold chain products, regulations must be kept under specified and strictly controlled storage conditions. This means more physical space, more cost to build and suitable storage conditions for pharmacies.

3.2.4. Reverse Logistics Applications - Pharmaceutical Company Take Back Processes (Pharmacy Processes)

Medicines that are not sold in private pharmacies or that are withdrawn by the ministry products that have undergone the withdrawal procedure it returned to the warehouse against a return invoice. Authorization of free pharmacy return procedures for drugs and other non-pharmaceutical products owned by the company is appropriate for evaluation under two main headings.

1. Mandatory Collection Procedures (Ministry of Health Withdrawal

Applications): The only authority authorized to issue drug licenses and conduct on-site inspections Ministry of Health institution, possible problems related to drugs or scientific developments. The emergence of situations that require the use of the drug to be stopped as a result of in case of emergency, recall the drugs from the field and dispose of the collected drug to the manufacturer. Such cases are known as forced collection and the pharmacist must obliged to return the drugs that have been collected to the pharmacy warehouse. This process continues with the same procedure for cold chain products and other products. Pharmacies issue the return invoice of the products that are decided to be collected, and together with the products to the motor-couriers of the pharmacy branch from which bought the products, or to the size of the drug or delivers it to the shipping vehicles according to the quantity. Delivery vehicles from all pharmacies collect these collected products when the collection process is over, by arranging the report and sends it to the main repository. The central warehouse is preferred by the manufacturer to have the product destroyed. It delivers by the method of transport. This process is a non-commercial process. It is done by road and the lowest possible logistics method.

2. Commercial Return Procedure: Commercial return procedure pharmacist's as the process of returning the product in hand to the pharmacy warehouse for commercial reasons. There is no mandatory recall. The pharmacist puts the product in the warehouse for commercial reasons and wishes to return it. Products subject to cold chain and to be stored at room temperature and return processes for products vary. Examine in two subheadings possible:

Cold chain reverse logistics: Products subject to cold chain are delivered by pharmaceutical warehouses and can not be taken back in any way. The pharmacist is

responsible for purchasing these products by the pharmacy and maximum attention should be paid to its intake product subject to cold chain. It is delivered to the pharmacy by the pharmaceutical warehouse intact, by moto-courier or shipment and is taken out of the cold shipment of the vehicle and delivered to the pharmacist against a stamp. From now on, it is not possible to return the product to the warehouses.

Reverse logistics procedures for products stored at room temperature: Products stored at room temperature do not deteriorate and can be resold again by the pharmacist, by the pharmaceutical warehouses, depending on the conditions that may be depending on the terms of the commercial agreement and the Turkish Commercial Code to the retailers. It is accepted with the conditions that the return period (30 days) is not exceeded. Pharmacist return according to the size of the product, the quantity of the product, which he invoices, to the motor courier or to the shipment vehicle, delivers the invoice along with the product to the officer. After reaching the relevant branch, it re-enters the pharmaceutical warehouse stock, and is sent to another warehouse by the warehouse. It can be sold to pharmacies or if the pharmaceutical warehouses want, they can also be transferred from warehouse to warehouse among themselves. They can make exchanges and sales between each other with the sales method.

3. **Reverse Logistics Process of Expired Products:** According to articles 27 and 41 of the regulation on pharmacists and pharmacies; pharmacy owner or their responsible persons should definitely check the expiry dates of the drugs. Expired products should be separated from other drugs and stored in a different place. Expired or perishable products must be listed and

should apply to the health authorities. The list should be kept as in Table 2:

Drug disposal report

Drug name	Quantity	Piece	Raw price	Selling price	Public bulk price	Sale bulk price
	...../201					

Table 2: Drug disposal report

With the destruction report, from the provincial health directorate, tax office and counting is made with the authorities from the chamber of pharmacists on the specified day and time and the report is recorded and signed. 4 copies of the report should be prepared. With this report, the pharmacist should be dropped out of date products from the drug tracking system. Full responsibility for the destruction of

products belongs to the pharmacist. There are 2 organizations in Turkey that carry out drug disposal. These organizations are Environmental Pharmacists Cooperative which operates in Izmir and Ecological Energy A.Ş based in Istanbul.

It is stated that the destruction of the products is done for a fee. That's why unfortunately, this procedure is not implemented effectively enough. Pharmaceutical warehouses does not receive both cold chain products and products stored at room temperature. Therefore, we can not be said that the reverse logistics process is carried out effectively. All risk remains with the pharmacist.

3.2.5. Reverse Logistics Applications - Pharmacy - Pharmaceutical Warehouse, Receiving Products from Reclaim Warehouse

Since the company only sells to pharmaceutical warehouses, return processes are also carried out through pharmaceutical warehouses. Before the return pharmacy warehouse gives information to the company center about the return and receives detailed information from the company on returns and invoicing. If the one that arrives at the warehouse is undamaged, it is taken to the sales stock. Refunds are not accepted for cold chain products unless absolutely necessary.

Outsourcing in the return process is done through cargo companies. If the expiration date is the reason for the return of the product, which is in the return process, it will be destroyed, ııf there is time to expire, it is taken into sales stock. Here is the packaging of the product whether it is damaged or not is also an important factor. Effective and efficient return process starts with the warehouse giving return information to the company. This news is from the company headquarters warehouse and warehouse employees are asked to follow the process. The shipment number of the cargo is obtained from the returned warehouse and the tracking is carried out.

Maximum sensitivity is shown to not harm the environment during product disposal. The disposal process is not done by the firm itself, but externally done by a professional firm. Before disposal, permission must be obtained from the provincial health directorate.

Another important issue for the company is to prevent the customers from sending unapproved products on their own decision without informing the company. The company always accepts returns that are under control and made by the company with knowledge.

Result/Conclusion

During this study, studies on similar subjects and published articles were scanned. While there are not many studies on the pharmaceutical industry in Turkey, the number of studies in the field of reverse logistics applications is also very low. In the field of reverse logistics, the applications in the sector are much more comprehensive, can be done withoutignoring the fact that there are many processes. It has been observed that more detailed studies are needed.

As a result of the implementation, it has been observed that all actors in the sector pay utmost attention to complying with both legal obligations and their own procedures in direct logistics activities. The results of logistics processes can have devastating consequences both financially and in terms of human and environmental health. These; are adverse events that can range from loss of human life to heavy compensation payments of companies or businesses that are their customers, and ultimately to their bankruptcy. Therefore, it is a verycorrect approach to pay attention to the relevant processes. As a result of this point of view, many problems are eliminated before they occur, and there is no serious problem as long as the rules are followed. However, the situation in reverse logistics activities is not seen as positive as in direct logistics.

Although the pharmaceutical industry is an industry branch that mainly carries out activities for human health, it is an industry that attaches importance to the profit-loss cycle, as in the whole real market. From time to time, factors that increase this profit-loss cycle in the direction of harm may occur in the protection of human health. A large part of the activities that are the subject of reverse logistics is one of the factors that negatively affect the profitability of the companies in this cycle. As in all publicly traded companies, profitability is the most important indicator in all companies in the pharmaceutical industry. Firms are looking for ways to eliminate all kinds of factors that may negatively affect their profitability. Reverse logistics processes are also not one of the activities that are carried out very willingly,as they consist of processes that are both legally binding and directly increase the cost to the company. In this context, the procedures that need to be followed from the bottom up in the process can often be neglected, and since the procedures are not implemented, the last person responsible for the damage and the products to be included in reverse logistics remains.

Expiry date approaching products are tried not to be taken back as much as possible by pharmaceutical warehouses and companies. From time to time, the disposal of the products taken back is also often not implemented, as the relevant procedures require high cost and effort. Products that are expired and should be destroyed are automatically dropped from the drug tracking system, and since they no longer allow sale, they are written directly to the loss section of the business that last held the product. In practice, the products in question are subject to legal destruction. It is directly burned or thrown away without being processed. This is environmental health and includes significant risks in terms of protection.

Another problem experienced is the non-return problem experienced in cold chain products. From the production of these products to the end consumer in the pharmacy, the cold chain link comes without any interruption. Transportation of these products, most of which are imported, from the factory to the pharmacy is a logistically serious and error-free process. However, since it is not known how the storage condition will be in the return process for these products, although there is no insecurity in the direct logistics processes, the return process cannot be carried out either in sales / exchange from the pharmacy warehouse to the manufacturer, from the pharmacy warehouse to other pharmacy warehouses, or in reverse logistics from the pharmacy to the pharmacy warehouse. In this regard, my suggestionis to identify the thermal labels to be affixed on the cold chain products, to easily detect that the products do not leave the cold chain, and to define the necessary processes for the reverse logistics and return processes of the intact products.

In future studies, there is a need for a more detailed examination of the reverse logistics networks and applications of the manufacturing companies, and for the solutions to the problems that may be experienced in the distribution channels, both legally and economically.

Implementation of the inspections in the field of logistics in the field of reverselogistics will be beneficial in reducing the problems that may occur in this field.

References

1. Akçadağ, M. (2010), Protection of Consumer Health Safety in the Pharmaceutical Industry Logistics Activities and an Application in terms of Niğde University, Social Sciences

Institute of Sciences, 2010.

2. Packaging and Packaging Waste Control Regulation, July 2004,25538

3. Arslan, A. (2007), "Pharmaceutical and Medical Materials Logistics and a

Application" (MA,) Yıldız Technical University Social Sciences Institute, Istanbul.
Association of Research-Based Pharmaceutical Companies - AIFD, http://aifd.org.tr
E.T.07.01.2014

4. Baran D.(1995), Good Laboratory Practices Guide, (Ankara: Ministry of Health Pharmaceuticals

and General Directorate of Pharmacy, 1995).

5. Barutçu S. (2007), Internet Based Supply Chain Management (Denizli Tekstil Benefiting from Internet-Based Supply Chain Management for Businesses A Study on theSituation of Social Sciences", Selcuk University Institute Journal, vol:18

6. Brito, M.P. Flapper, S.D.P., Dekker, R.,(2002). Reverse Logistics: A Review of Case

Studies. Econometric Institute Repot EI 2002-21.

7. Brito M. and Dekker R. (2002), "Reverse Logistics - a framework" , Econometric

Institute Report EI 2002-38

8. Canitez M. (2009), Logistics and Applications in International Marketing, Gazi Publishing House, Ankara, p.64

9. Carlos M. et al.(2007),Innovation in Logistics Services, NESTA (National Endowment for Science, Technology and the Arts), Cranfield. 2007, p.3

10. Carter, C., Ellram, L., (1998). "Reverse Logistics: a Review of the Literature and Framework

11. Çancı M. - Erdal M. (2003), International Transport Management, ISBN 975-92469-2-9, Utikad Publication, Istanbul.

12. Demirbilek A.(2011), "The Importance of Logistics" http://www.lojistikdefteri.com/3037/lojistigin-onemi, (2 November 2011)

13 . Devashish, P. Gillian, W., (1996). "Developing Environmentally Conscious Product Strategies: a Quality Study of Selected Companies in Germany and Britain". Marketing Intelligence & Planning, vol.14, iss.1: 19

14. Donald W. (2003), Logistics, An Introduction to Supply Chain Management, ibid., 2003p.309

15. Dölek A. (1999), Foreign Trade Transactions and Market Applications in the Light of Legislation, Beta Publishing and Distribution, ISBN 975-486-808-6, Istanbul, 1999, p. 159

16. Dölek A.(2004), Customs Transactions and Smuggling, Beta Publishing and Distribution, ISBN 975-295-388-3, Istanbul, 2004, p.42

17. Ellison S., Snyder C.M., "Countervailing Power in Wholesale Pharmaceuticals" (July, 2001), www.chicagogsb.edu E.T. 07.01.2017

18. Günes, I.(2005)."Sustainable Development". http://www.SanalDerslik.com/modules.php?name=Kose_Yazilari&file=yazi_oku&sid=14 (30.10.2005)

19. DAY Devrim, "To Logistics Villages for Sustainable Logistics Management at Global Level A Paradigm Approach And Iskenderun Logistics Village Project" " National Logistics

and Supply Chain Congress (Necmettin Erbakan University 10-12 May

2012) İGEME, Foreign Trade in 100 Questions, DTM Publications, Ankara, 2006, 166

İTO (Istanbul Chamber of Commerce), Turkey Logistics Industry Infrastructure Analysis, Publication No: 2006-14, Istanbul, 2006, p. 15

20. James R. S. (1997), "Applying Theories From Other Disciplines to Logistics",

International Journal of Physical Distribution & Logistics Management, Vol. 27, no.

9/10, (pp. 515-539), 1997, p. 518.

21. Kou, T. C., Huang, S. H., Zhang, H. C., (2001). "Design for Manufacture and Design for

'X': Concepts, Applications and Perspectives". Computers & Industrial

Engineering, Vol. 41, p. 241-260.

22. Kopczak L.R. (1997), "Logistics Partnership and Supply Chain Restructuring: Survey

Results from the US Computer Industry", Production and Operations

Management, Vol.6. No.3 (California: Stanford University, Fall 1997): 227.

23. Mau M. (2002), Logistics: Mit Übungsaufgaben und Lösungen, WRW-Verlag, Cologne,

2002, z.17

24. Keskin H. (2006), Logistics, Supply Chain Management, Nobel Yayın Dağıtım, Ankara,

2006, p.65

25. Parkinson, H.J.- Thompson, G., (2003). "Analysis and Taxonomy of Remanufacturing

Industry Practice". Proc. Inst. Rapier. Engrs., Journal of Process Mechanical

Engineering, Vol. 217, Part E: 243-256.

26. Rogers, D.S.-Medical-Lembke, R.S., (1999). Going Backwards: Reverse Logistics Trends

and Practices. Reverse Logistics Executive Council.

27. Şen H. - Güventürk M. (2005). "A New Logistics Business Model in Pharmaceutical Distribution Channels,

TMMOB Chamber of Mechanical Engineers, V. Industrial-Management Engineering

Congress", 9-10 December 2005
28. Tekin E. (2014). E-Logistics and E-Logistics Applications in Pharmaceutical Distribution p:91- 95 (Unpublished PhD Thesis), Selcuk University Institute of Social Sciences,

Konya.
29. Tekin M. (2006), Technology Management in the Age of Change. 3rd Edition, Nobel Publication Distribution, Ankara, 2006.
30. Werner D. (2006), Logistics Service Providers Market View, University of Cologne,

2004, http://www.spl.uni. koeln.de , (02.09.2006.), p.10

31. Zafer A. (2010), Storage and Warehouse Management, 1.b., Nobel Yayın Dağıtım, Ankara, 2010
32. Zarali, F. (2013). Perception of the Employees in the Logistics Industry Regarding the Concepts of Logistics Determination of Level, II. National Logistics and Supply Chain Congress,

Aksaray University, 16-18 May. Aksaray
33. Zhang H.C., Kou, T.C., Lu, H., Huang, S.H., (1997). "Environmentally Conscious

Design and Manufacturing: A State of the Art Survey". environmentally

Conscious Design and Manufacturing, Vol. 16, No. 5, pp. 352-363.for Future

Investigations". Journal of Business logistics, Vol. 19, No. 1, pp. 85-102.

34. 4458 p. Customs Law, art. 3 (Amended with S.K. 5911)
35. http://www.transport.com
36. https://www.pharmalogistics.com/
37. http://www.erslojistik.com/lojistik-sozlugu-ilac-lojistigi/
38. http://www.transport.com.tr/
39. https://its.gov.tr/

40. http://ruhsat-ilac.blogspot.com/p/ilac-sektorunde-izlenen-sats.html/

41. https://acikders.ankara.edu.tr/pluginfile.php/23604/mod_resource/content/0/%C4%B0la%C3%A7%20ve%20ila%C3%A7la%20ilgili%20genel%20kavramlar.pdf/

42. https://ec.europa.eu/health/

THESIS TOPIC*

APPLICATION FORM

Student Name: Javidan Rufullayev _Neptun ID: UFNZ9U

Course: Master in Supply Chain Management

Level of Education: BA/BSc / MA/**MSc*** Grade:

Specialisation*: Master in Supply Chain Management

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Name of Host Institute / Department: Institute of Agricultural and Food Economics

Primary supervisor name and position: Dr. Balázs Gyenge, Associate Professor

Thesis topic: Logistics management and reverse logistics in the pharmaceutical industry

Date: _2023_ year___05___month__0 8___ day

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Application for the thesis topic is accepted/not accepted*

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Signed below, Javidan Rufullayev, student of the Szent István Campus of the Hungarian University of Agriculture and Life Science, at the BSc/**MSc** Course of Master in Supply chain management declare that the present Thesis is my own work and I have used the cited and quoted literature in accordance with the relevant legal and ethical rules. I understand that the one-page-summary of my thesis will be uploaded on the website ofthe Campus/Institute/Course and my Thesis will be available at the Host Department/Institute and in the repository of the University in accordance with the relevant legal and ethical rules.

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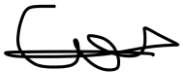

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