

# Optimization of Pharmaceutical Logistics Distribution Efficiency in E-business Environment

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**Keywords:** E-business; Medical logistics; Distribution efficiency; Optimization strategy; Supply chain coordination

**Abstract:** The purpose of this article is to discuss the current situation, challenges and optimization strategies of pharmaceutical logistics distribution in e-business environment, in order to provide useful reference for the government, enterprises and industry associations. Firstly, this article analyzes the influence of e-business on pharmaceutical logistics, including the new demand brought by the change of consumer behavior and the reshaping of pharmaceutical logistics process by the innovation of e-business model. Then, the paper analyzes the particularity of pharmaceutical logistics distribution, emphasizing the requirements of temperature control, safety and traceability of pharmaceutical products, as well as the constraints and guidance of laws and policies on pharmaceutical logistics distribution. The results show that technological innovation and application, supply chain coordination and optimization, and the construction of policies, regulations and standards are the keys to improve the efficiency of pharmaceutical logistics distribution. Based on the above analysis, this article puts forward suggestions to the government, enterprises and industry associations, as well as future implementation strategies and path planning. The conclusion points out that in order to continuously improve the efficiency of pharmaceutical logistics distribution, we must make full use of information technology, strengthen supply chain coordination, and improve the policy, regulations and standard system.

## 1. Introduction

In recent years, the rapid development of e-business has not only profoundly changed the pattern of traditional retail industry, but also gradually penetrated into various industries, and the pharmaceutical industry is one of them [1]. With the growing demand of consumers for health and the popularity of Internet shopping, more and more pharmaceutical products are sold through e-business platforms [2-3]. This new sales model has brought unprecedented opportunities to the pharmaceutical industry, but it also puts forward higher requirements for pharmaceutical logistics and distribution [4].

As a key link between pharmaceutical production and consumption, the efficiency and accuracy of pharmaceutical logistics distribution are directly related to the accessibility and safety of pharmaceutical products and the therapeutic effect of patients [5]. However, due to the particularity of pharmaceutical products, such as strict temperature control requirements and complex traceability system, pharmaceutical logistics and distribution are facing many challenges [6]. Especially in the e-business environment, the surge of orders, the expansion of distribution scope and the diversification of consumer demand all put forward higher requirements for the efficiency of pharmaceutical logistics distribution [7].

Therefore, the purpose of this study is to deeply discuss the optimization of pharmaceutical logistics distribution efficiency under the e-business environment. By analyzing the current situation and challenges of pharmaceutical logistics distribution, combined with the characteristics of e-business, this article puts forward targeted optimization strategies in order to improve the efficiency of pharmaceutical logistics distribution, reduce operating costs and ensure the quality and safety of pharmaceutical products. This research is not only of great significance to promote the healthy development of the pharmaceutical e-business industry, but also provides a useful reference for the optimization of logistics distribution efficiency in other industries.

## 2. The present situation and challenges of pharmaceutical logistics distribution in e-business environment

### 2.1. The impact of e-business on pharmaceutical logistics

The rise of e-business has undoubtedly brought far-reaching changes to the pharmaceutical logistics industry. Traditional pharmaceutical logistics processes often rely on offline distribution and retail networks, while the innovation of e-business model enables pharmaceutical products to reach consumers directly through online platforms, thus greatly shortening the length of the supply chain [8]. This change not only requires pharmaceutical logistics enterprises to have more efficient order processing ability, but also urges them to reshape all aspects such as warehousing, sorting, packaging and distribution to meet the needs of rapid response and flexible adjustment in e-business environment.

The change of consumer behavior also puts forward new requirements for pharmaceutical logistics distribution [9]. Driven by e-business, consumers are more and more inclined to buy pharmaceutical products online, and expect to get fast, accurate and convenient delivery services [10]. This change in demand urges pharmaceutical logistics enterprises to continuously optimize the distribution network and improve the distribution efficiency to meet the expectations of consumers.

### 2.2. Analysis on the particularity of medical logistics distribution

Compared with other industries, medical logistics distribution has more remarkable particularity, as shown in Table 1.

Table 1 Overview of Specialties in Pharmaceutical Logistics and Distribution

Specialty	Description
Professionalism	Pharmaceutical logistics requires specialized knowledge. Operators need to possess knowledge on drug storage and transportation, and must pass GSP certification.
Complexity in Storage	Due to the wide variety of pharmaceuticals, they need to be classified and stored according to their properties, such as room temperature, low temperature, and frozen.
Emergency Response	Greatly influenced by natural and human factors, requiring rapid response to sudden demands.
High Transportation Requirements	Pharmaceuticals are high-value items with small batch sizes and high frequency. They require stable transportation, and some need to be transported at low temperatures.
Frequent Breakdowns	Mainly focused on retail, resulting in a large number of breakdown operations, which require strict quality control.

By analyzing the contents of the form, this article draws the following core understandings about the particularity of pharmaceutical logistics distribution:

**Professionalism:** Medical logistics and distribution requires a high degree of professionalism, which is reflected in the requirements for operators' drug knowledge and GSP certification. This means that pharmaceutical logistics enterprises need to have employees with professional knowledge and skills, and ensure that their operations meet the quality management standards stipulated by the state to ensure the safety and effectiveness of drugs.

**Complexity in Storage:** Due to the variety of drugs and the complexity of classification, pharmaceutical logistics and distribution are facing challenges in warehousing. Drugs with different properties need to be stored under specific conditions, such as normal temperature, low temperature and freezing, which requires pharmaceutical logistics enterprises to have advanced storage facilities and management capabilities.

**Emergency Response:** Medical logistics distribution has certain emergency, which requires enterprises to quickly respond to sudden demand, such as natural disasters or epidemic diseases. This requires pharmaceutical logistics enterprises to establish an efficient emergency response mechanism to ensure timely and accurate distribution of drugs in an emergency.

**High transportation requirements:** the logistics and distribution of medicine have high requirements for transportation, which is mainly reflected in the stability of transportation tools and the demand for low-temperature transportation of some medicines. Due to the high value, small

batch and high frequency of drugs, pharmaceutical logistics enterprises need to choose suitable transportation modes and ensure the quality and safety of drugs during transportation.

Frequent Breakdowns: due to the variety of drugs and the characteristics of retail, a large number of disassembly operations will occur in pharmaceutical logistics and distribution. This requires pharmaceutical logistics enterprises to have efficient disassembly operation ability and strict quality control to improve operation efficiency and ensure the quality of drugs.

In the e-business environment, pharmaceutical logistics and distribution are facing many challenges and problems. First of all, the low efficiency of logistics distribution is a prominent problem. Secondly, the problem of cost control is also an important problem faced by medical logistics distribution. Finally, information security and privacy protection are also important issues in medical logistics distribution.

### **3. Strategy and practice of optimizing the efficiency of pharmaceutical logistics distribution in e-business environment**

#### **3.1. Technological innovation and application**

In the e-business environment, technological innovation has become the key to improve the efficiency of pharmaceutical logistics distribution. The wide application of information technology has brought unprecedented changes to medical logistics. Among them, the Internet of Things technology enables every link of medical products from production to distribution to be monitored in real time, ensuring the quality and safety of products. The application of big data and cloud computing technology enables pharmaceutical logistics enterprises to predict market demand more accurately, optimize inventory management and reduce waste.

The introduction of automated warehouse greatly improves the efficiency of warehousing and sorting and reduces human errors, as shown in Figure 1.



Figure 1 Automated warehouse

Intelligent path planning technology can plan the optimal driving route for distribution vehicles according to the actual situation, saving time and cost. The exploration of unmanned aerial vehicles and unmanned vehicles also provides new possibilities for medical logistics distribution, especially in remote areas or emergency situations, which can deliver medical products to patients more quickly.

#### **3.2. Supply chain coordination and optimization**

In the e-business environment, the coordination and optimization of pharmaceutical logistics

supply chain is particularly important. The information sharing and cooperation mechanism among suppliers, distributors, hospitals and pharmacies can ensure smooth communication between all parties and reduce the problems caused by information asymmetry. By establishing a unified information platform, all parties can check the inventory situation, order status and delivery progress in real time, so as to better coordinate each other's work.

Lean logistics management is an important means of supply chain coordination and optimization. By reducing inventory and improving response speed, pharmaceutical logistics enterprises can respond to changes in market demand more flexibly. Lean logistics management emphasizes continuous optimization and improvement of processes, which can reduce operating costs and improve customer satisfaction by eliminating waste and improving efficiency.

### 3.3. Policies, regulations and standards construction

The support of policies and regulations is very important to improve the efficiency of pharmaceutical logistics. The government can encourage pharmaceutical logistics enterprises to carry out technological innovation and model innovation by introducing relevant policies to promote the healthy development of the industry. The government can also strengthen the supervision of the pharmaceutical logistics industry to ensure that the operation of enterprises meets the requirements of laws and regulations and protect the rights and interests of consumers.

The standardization and standardization construction of logistics distribution is also an important link to improve the efficiency of pharmaceutical logistics. By formulating uniform distribution standards and norms, the quality and safety of pharmaceutical products in the distribution process can be ensured. Standardization and standardization also help to improve the efficiency and accuracy of distribution and reduce problems caused by improper operation or different standards. Therefore, the government and enterprises should work together to promote the standardization and standardization of pharmaceutical logistics and distribution, and lay a solid foundation for the sustainable development of the industry.

## 4. Policy recommendations

In the e-business environment, in order to further optimize the efficiency of pharmaceutical logistics distribution, the government, enterprises and industry associations should bear their respective responsibilities and cooperate with each other, as shown in Table 2.

Table 2 Responsibility Allocation Table for Optimizing Pharmaceutical Logistics and Distribution Efficiency in the E-business Environment

Responsibility Subject	Responsibility Content
Government	Formulate and improve laws and regulations related to pharmaceutical logistics to ensure the industry's standardized development. Provide policy support and financial subsidies to encourage technological innovation and green logistics. Strengthen supervision to ensure the safety of drug circulation and combat illegal drug transactions. Establish a pharmaceutical logistics information platform to promote information sharing and improve logistics efficiency.
Enterprises	Invest in logistics technology and equipment upgrades, such as automated warehousing and intelligent distribution systems. Optimize internal management processes to improve logistics operation efficiency and accuracy. Strengthen employee training to enhance the professional competence and service awareness of the logistics team. Collaborate closely with upstream and downstream enterprises to form supply chain synergies.
Industry Associations	Formulate industry standards and norms to guide enterprises in compliant operations. Organize industry exchange activities to promote experience sharing and technological innovation. Mediate and resolve disputes within the industry to maintain a fair competition environment. Provide policy interpretation and consulting services to enterprises, helping them cope with market changes.

Table 2 summarizes the responsibilities of the government, enterprises and trade associations in order to further optimize the efficiency of pharmaceutical logistics distribution under the e-business

environment. Through cooperation, all parties can jointly promote the healthy development of pharmaceutical logistics industry and improve distribution efficiency and service quality.

## 5. Conclusions

The purpose of this article is to discuss the strategy and practice of optimizing the efficiency of pharmaceutical logistics distribution under the environment of e-business. Through in-depth research and analysis, this article finds the challenges and problems faced by pharmaceutical logistics distribution in e-business environment, and puts forward corresponding optimization strategies and practical enlightenment. The main findings include: technological innovation and application are very important to improve the efficiency of pharmaceutical logistics distribution; Supply chain coordination and optimization is the key to realize efficient logistics distribution; The construction of policies, regulations and standards provides a strong guarantee for medical logistics and distribution. The key points of optimizing the efficiency of pharmaceutical logistics distribution in e-business environment are: making full use of information technology to improve the intelligence and automation level of logistics distribution; Strengthen the cooperation and coordination between upstream and downstream of the supply chain; Formulate and improve relevant policies, regulations and standard systems.

With the continuous development of e-business and the continuous progress of pharmaceutical logistics industry, the optimization of pharmaceutical logistics distribution efficiency will face more opportunities and challenges. Future research can further expand the scope of research and deeply discuss the optimization of pharmaceutical logistics distribution efficiency in the international market.

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