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Article

Key Indicators for Analysis of Logistics Activities of Wholesale Trading Enterprises

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Abstract: This article explores the critical role of logistics in wholesale trade and evaluates the effectiveness of key performance indicators (KPIs) used in warehouse and transportation activities. With the globalization of markets and increasing competition, efficient logistics operations have become essential for wholesale enterprises to remain competitive. A significant knowledge gap exists in understanding how logistics costs, especially in transportation and warehousing, impact overall business efficiency. This study uses both ABC and XYZ analysis methods to examine logistics activities and propose a systematic approach to cost reduction and resource allocation. The findings suggest that transport and warehouse costs comprise over 70% of the logistics expenses, with transportation being the dominant cost component. By utilizing ABC analysis, enterprises can prioritize high-value products, while XYZ analysis helps in managing inventory based on demand variability. The results underscore the importance of these analytical methods in streamlining logistics operations, reducing costs, and improving service delivery. The study further highlights the potential for digitalization and automation in enhancing logistics efficiency. These findings have significant implications for wholesale enterprises seeking to optimize their logistics operations and improve their overall competitiveness in the marketplace. The research serves as a foundation for further exploration into advanced logistics management techniques and offers practical recommendations for wholesalers aiming to minimize costs while maintaining high service standards.

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1. Introduction

In the globalized economy, logistics plays a vital role in the effective functioning of wholesale trade. The movement, storage, and management of goods are crucial for enterprises aiming to meet customer demands, reduce costs, and maintain competitiveness. With logistics costs accounting for a significant portion of total operational expenses, understanding how to optimize these processes has become paramount. This article focuses on the logistics activities of wholesale trading enterprises, examining key indicators such as transportation and warehouse costs, and evaluating strategies like ABC and XYZ analysis for improving operational efficiency. The relationship between logistics management and wholesale trade is complex and deeply intertwined. Logistics encompasses the planning, implementation, and control of goods movement, including procurement, storage, inventory management, and distribution. Efficient logistics systems are essential for maintaining the flow of goods from suppliers to consumers, which in turn affects the profitability and competitiveness of wholesale

enterprises. Theories related to logistics, such as the supply chain management theory and cost efficiency theory, serve as the foundation for understanding the complexities of logistics activities in wholesale trade [1].

A major knowledge gap exists in understanding how wholesale enterprises can effectively apply logistics models to reduce operational costs while maintaining high service levels. While logistics outsourcing, 3D printing technology, and modern transportation systems have been widely studied, the direct impact of logistics costs and key performance indicators (KPIs) on wholesale business success remains underexplored. Previous studies, such as those by Chen et al. and Sainz have examined the role of logistics infrastructure in wholesale trade, but few have analyzed the relationship between logistics costs and wholesale enterprise performance in-depth. Furthermore, there is limited research on combining ABC and XYZ analysis methods in wholesale logistics management. This study employs monographic observation, abstract-logical thinking, and statistical methods to analyze logistics costs and performance indicators in wholesale enterprises [2]. The aim is to provide a detailed assessment of the transportation and warehouse costs, explore how ABC and XYZ analysis can optimize logistics activities, and suggest strategies for cost reduction. By using these methods, the article seeks to bridge the knowledge gap and offer practical solutions for improving logistics efficiency in the wholesale sector.

The findings from this study are expected to reveal the impact of logistics costs on the competitiveness and operational efficiency of wholesale enterprises. Key performance indicators such as transportation cost, inventory turnover, and order fulfillment accuracy will be analyzed to determine their effect on business performance. The study's results will contribute to the broader field of logistics management by offering insights into the practical application of logistics theories and strategies [3]. The implications of these findings are significant for wholesale enterprises looking to optimize their logistics systems, reduce costs, and improve service delivery to customers.

Literature Analysis

A number of researchers are conducting scientific research on the study of logistics activities of wholesale enterprises and analyzing the results. In particular, Chen, Zhiyu & Kudriavtseva, Oksana studied the contribution of logistics outsourcing, innovative services, and 3D printing technology to the formation of an effective logistics system in wholesale enterprises. These researchers analyzed ways to reduce costs, improve service quality, and achieve environmental sustainability using logistics outsourcing, innovative services, and 3D printing technology [4].

R.Hidayat et al. studied the impact of logistics companies on wholesale trade volume and distribution channel performance. They found that distribution channels have a strong impact on wholesale trade performance through statistical analysis and found that the correlation was high.

Mahrour et al. analyzed the impact of the LPI index on wholesale trade volume using a gravity model [5]. In this study, researchers found that a 1% increase in the LPI index leads to a 0.8% increase in wholesale trade volume.

In his scientific research, S.V.Tokmanev studied how the development of logistics infrastructure leads to the development of services provided in the system of stock management and goods movement in wholesale and intermediary activities [6]. In his opinion, the creation of an economically viable logistics infrastructure serves to reduce prices in commodity markets, ensure the growth of wholesale and retail turnover, reduce material reserves in the supply chain, and increase the level of customer service.

Sainz R. studied the role of logistics infrastructure in the development of wholesale trade activities. The studies conducted by these researchers emphasized that in the conditions of modern market relations, logistics infrastructure serves as a means of connecting relations between a number of market entities. Logistics infrastructure also directly affects production and trade activities. In particular, the development of wholesale trade activities has a positive effect on the growth of wholesale turnover [7][8].

The movement of products from producers to consumers through transfer points, distribution centers, and retailers forms distribution channels. If you use distribution

channels that are acceptable, reliable and productive, the distribution channels can run well or be successful. This delivery strategy is very important because the faster the distribution channel, the faster the product will arrive at the consumer's destination. For a business to increase sales and profits, distribution channels and their management are essential.

2. Materials and Methods

The methodology employed in this study combines both qualitative and quantitative approaches to analyze the logistics activities of wholesale enterprises. The primary focus is on evaluating the structure of logistics costs, specifically transportation and warehouse costs, and identifying key performance indicators (KPIs) that influence the effectiveness of logistics operations. To achieve this, the study uses monographic observation and abstract-logical thinking, which allows for an in-depth examination of the various components involved in wholesale logistics management. The analysis includes a review of transportation and warehouse cost structures, with particular attention to factors such as fuel expenses, vehicle depreciation, and storage costs [9]. Data collection is based on both primary and secondary sources, including case studies from existing wholesale enterprises and relevant academic literature. Additionally, the study incorporates mathematical and statistical methods to assess KPIs such as inventory turnover, delivery time, order fulfillment accuracy, and transportation efficiency. These KPIs are critical in determining the efficiency and effectiveness of logistics activities, and their analysis helps in formulating strategies for optimizing logistics performance.

Furthermore, the study employs ABC and XYZ analysis methods to evaluate the logistics activities in wholesale trade. ABC analysis helps to categorize products based on their value and turnover, while XYZ analysis assesses the stability of demand for each product [10]. By applying these analytical methods, the research provides a comprehensive assessment of how to allocate resources efficiently, reduce logistics costs, and improve inventory management. This mixed-method approach allows for a thorough understanding of logistics operations and offers practical solutions for improving efficiency in wholesale enterprises.

3. Results and Discussion

Logistics is an economic activity related to the organization, planning, management and control of the delivery of goods and services to the right place, in the right volume and at the right time. Logistics is an important component of the activities of wholesale enterprises, encompassing all processes from the wholesale purchase of goods from procurement sources to retail sales.

The main tasks of logistics in wholesale trade are:

1. preparation and management of orders for wholesale purchases;
2. implementation of wholesale purchases and storage of goods;
3. transportation and delivery of wholesale purchased goods;
4. management of wholesale stock;
5. preparation, packaging and labeling of goods for resale;
6. processing of information related to wholesale purchases, etc.

Wholesale trade is closely related to logistics, as it is associated with the transportation and storage of goods in large batches. Logistics serves to increase the efficiency of purchasing and delivering goods in wholesale trade. Since wholesale trade involves storing goods in a warehouse, delivering them to customers, and organizing after-sales service, great attention is paid to logistics. The level of satisfaction of customer needs in wholesale trade is largely related to logistics [11].

Wholesalers store large quantities of goods due to their large-scale purchases. Therefore, logistics helps wholesalers effectively manage warehouses, reduce excess inventory, and prevent delivery delays.

The correct selection of routes and means of transport is important for the timely delivery of wholesale goods. Logistics, in turn, helps to minimize costs in organizing these processes and increase the efficiency of delivering goods.

The main place in the structure of logistics costs in wholesale trade is occupied by transport costs. The costs of transportation, loading and unloading when delivering purchased wholesale goods from the source of purchase to the consumer can be up to 45 percent, see Table 1.

Table 1. Composition of logistics costs in wholesale trade (hypothetical example)

Cost Types	Share of total costs, %	Note
Transportation	**45**	Shipping and delivery
Storage and Warehousing Services	**25**	Storage, packaging, warehouse management
Distribution	**15**	Delivery of goods,
Information, Management and Administration	**10**	ERP, TMS, real-time monitoring
Other	**5**	Returns processing, etc.

In wholesale trade, more than 70 percent of logistics-related costs fall on transport and warehousing costs [12]. Transport costs occupy a leading position in the logistics system of wholesale trade enterprises. There are also main types of transport costs. For example, in the transportation of wholesale purchases, transport costs include fuel and lubricants, vehicle depreciation, vehicle insurance, driver salaries, etc, see Table 2.

Table 2. Types of transportation costs in wholesale trade

Expense types	Contents
Fuel and lubricants	Purchase of fuel and lubricants for vehicles. This is the main source of expenses
Vehicle depreciation	Obsoleteness of vehicles, replacement of spare parts, repair costs
Driver's wages and service fees	Wages of permanent or service drivers
Vehicle insurance and taxes	Compulsory transport insurance, road taxes
Tolls, customs fees	Highway, terminal, customs expenses
Payment for external services	Payments to freight forwarding organizations
Monitoring and control systems	Expenses for GPS, trackers, telematic systems
Loss of goods, delays, damages	Expenses for adverse events during transportation

The share of these costs varies across wholesale trade. The main part of the costs is fuel and lubricants for vehicles, see Table 3.

Table 3. Structure of transportation costs in wholesale trade (hypothetical example), in %

Expense types	Share in total transport costs, %
Fuel and lubricants	**35**
Vehicle depreciation	**20**
Driver's wages and service fees	**15**
Vehicle insurance and taxes	**10**
Tolls, customs fees	**5**
Payment for external services	**5**
Monitoring and control systems	**5**
Loss of goods, delays, damages	**5**

Among transportation costs, fuel and lubricants for motor vehicles, vehicle depreciation account for the largest share [13]. There are a number of key performance indicators (KPIs) related to the organization of transportation activities in wholesale trade, see Table 4.

Table 4. Key performance indicators (KPIs) of transport activities in wholesale trade

KPI name	Contents
Cost per km (USD/km)	Total cost of the trip divided by total distance
Delivery time	Delivery time after order
Percentage of delays in transportation	Percentage of late deliveries
Vehicle load, %	Real capacity utilization of the vehicle
Accuracy of goods delivery	Percentage of orders delivered in full, correctly and on time
Fuel efficiency (km/l)	Average distance traveled per liter of fuel
Vehicle turnover	Loading of the vehicle over a certain period

Among the costs related to logistics in wholesale trade, warehouse costs occupy a major place. Warehouse costs consist of costs incurred in the processes of temporary storage, management and movement of goods [14]. If we also classify warehouse costs in wholesale trade, they include a number of major and minor costs, see Table 5.

Table 5. Types of warehouse costs in wholesale trade

Expense Types	Contents
Rent/Capital Expenses	Costs of renting or building a warehouse
Energy and Utilities	Costs for electricity, water, gas, cooling and heating systems
Labor Expenses	Wages of warehouse workers, social insurance
Equipment and Machinery Depreciation	Forklifts, pallets, conveyors, monitoring equipment
Inventory and Consumables	Packaging, labeling, stickers, special clothing, etc.
IT Systems and Software	Warehouse management system (WMS), monitoring systems
Security and Insurance	Alarm, camera, fire extinguishing system, insurance
Goods Loss and Obsolescence	Expiration, damage, spoilage of goods

The share of warehouse costs in wholesale trade also varies. The largest costs are rent or capital costs, and costs related to labor costs, see Table 6.

Table 6. Share of warehouse costs in wholesale trade, (hypothetical example) %

Expense Types	Share in total warehouse costs, %
Rent/Capital Expenses	35
Energy and Utilities	25
Labor Expenses	10
Equipment and Machinery Depreciation	8
Inventory and Consumables	7
IT Systems and Software	5
Security and Insurance	5
Goods Loss and Deterioration	5

In wholesale trade, overall efficiency can be achieved by reducing warehouse costs. To do this, there are opportunities to reduce costs through automation, digitalization and energy efficiency of operations and processes performed in the warehouse [15].

There are key indicators (KPIs) of warehouse activity in wholesale trade. Through these indicators, it is possible to assess the efficiency of warehouse activities in wholesale trade.

1. Inventory turnover. It shows how quickly the goods in the warehouse are sold.

$$IT = \frac{Cost\ of\ goods\ sold}{Average\ reserve\ amount} \quad (1)$$

2. Order fulfillment speed. This indicator is an important indicator related to customer satisfaction. It shows how long it takes from receiving an order to sending it.

$$OFS = \frac{Total\ time\ to\ complete\ all\ orders}{Number\ of\ orders} \quad (2)$$

3. Order fulfillment accuracy. A measure of whether orders are delivered to customers correctly and without errors.

$$OFA = \frac{Number\ of\ orders\ executed\ by\ the\ thief}{Total\ orders} * 100 \quad (3)$$

4. The quality of storage of products in the warehouse. It indicates whether the products are stored safely and without damage. The number of unusable or damaged products is based on the determination of inventory losses.

$$Percentage\ of\ unusable\ products(\%) = \frac{Number\ of\ defective\ products}{Total\ number\ of\ products} * 100 \quad (4)$$

5. Stock Availability. This indicator indicates the additional stock that is kept against unexpected demand increases or delays in delivery. It also helps to determine whether the product requested by the customer is available in the warehouse, and "Stock-out" situations, that is, the product ordered is no longer in the warehouse.

$$Reserve\ adequacy\ (in\ days) = \frac{Current\ reserve\ amount}{Average\ daily\ demand} \quad (5)$$

6. Warehouse utilization rate. This indicator shows the extent to which warehouse capacity is being utilized.

$$Warehouse\ capacity\ utilization\ ratio = \frac{Used\ capacity}{Total\ warehouse\ capacity} * 100 \quad (6)$$

The ABC analysis method is important in analyzing the logistics activities of wholesale enterprises. ABC analysis plays a very important role in the logistics activities of wholesale enterprises. Because the ABC analysis method helps to effectively allocate the resources of the enterprise and focus on the most important products. ABC analysis is a method of dividing the products in the warehouse into three groups according to their value or sales volume. The division of goods into three groups is based on the Pareto principle [16].

Group A – the most expensive or best-selling products (about 70-80% of the total value. But less in quantity, usually 10-20%).

Group B – medium-value products (about 15-25% value, 20-30% quantity).

Group C – low-value or least-sold products (15% or less value, but more in quantity 50-70%).

The importance and role of using the ABC analysis method in analyzing the logistics activities of wholesale enterprises are as follows:

1. It allows for the improvement of inventory management in wholesale enterprises.

For group A products, the inventory is checked and replenished frequently. Stockouts of products in this group are not allowed.

In group C, less inventory can be kept or even order-based storage is used.

2. It is possible to reduce the logistics costs of wholesale enterprises.

More logistics resources (stock, storage, transportation) are allocated to goods in groups A and B.

Simple methods are sufficient for products in group C.

3. Efficient use of warehouse space.

Group A products are stored mainly in the most convenient and quickly accessible areas of the warehouse.

Group C products are placed in less used areas of the warehouse.

4. Strengthening strategic relationships with partners in the supply chain.

Working with suppliers who can deliver reliably and quickly for Group A products will be a priority.

The specific features and content of ABC analysis are explained by the division of products available in wholesale trade into three groups based on Pareto principles, see Table 7.

Table 7. Contents of ABC analysis

Group	Contents	Share in turnover, %	Specific features
A	Most important products	≈ 20 % nomenclature, but ≈ 80 % value	Analysis of product turnover, high-precision planning is required
B	Medium-important products	≈ 30 % nomenclature,	Stock levels are balanced, control is moderate
C	Less important products	≈ 15 % value	Stock levels should be minimal

The application of the ABC analysis method in analyzing the logistics activities of wholesale enterprises consists of certain stages, see Table 8.

Table 8. Stages of applying ABC analysis in analyzing the logistics activities of wholesale enterprises

Stages	Content
Information collection	Determine the sales volume or value of all goods in the warehouse
Sorting and organizing	Arrange products in descending order by value or sales volume
Grouping	Divide products into groups A, B, and C based on the analysis of their respective indicators
Analysis and decision making	Develop management strategies for each group of products based on the analysis results

In the analysis of the logistics activities of wholesale enterprises, the XYZ method is also used, along with the ABC method. The XYZ analysis method is a method of analyzing the stability of demand for products. It divides products into groups X, Y and Z based on the stability of their consumption (or sales) levels. Each group has its own characteristics:

1. Group X is products with very stable demand (low rate of change, < 10-15%);
2. Group Y is products with moderately variable demand (rate of change 15-30%);
3. Group Z is products with very unstable, seasonal or uneven demand (> 30%).

The logistics activities of wholesale enterprises are a complex process, which requires, first of all, the purchase of goods in the right volume, their delivery at the right time and to the right place. Therefore, XYZ analysis in wholesale activities plays an important role in the following:

1. Inventory management:

A constant and stable stock is required for group X goods;

A moderate stock is sufficient for group Y goods;

Group Z goods are ordered cautiously, as excess stock increases warehouse and other costs.

2. Forecasting demand for goods and planning purchases. With the help of XYZ analysis, wholesalers make more accurate decisions when forecasting demand.
3. Reducing logistics costs for wholesalers.

An automated delivery system is developed for goods with stable demand.

Flexible supply strategies are used for products with unstable demand.

The use of the XYZ method in the analysis of the logistics activities of wholesale enterprises is carried out in certain stages.

1. Data collection. Data on sales volume (daily/weekly/monthly/yearly) is collected for each product.

2. Determining demand variability. The variance or coefficient of variation of demand for each product is determined.

$$DV \frac{Standard\ deviation(\sigma)}{Average\ price\ (\mu)} x100 \quad (7)$$

1. Division of goods into groups X, Y and Z:
Group X has a VK ≤ 10%;
Group Y has a VK 10% < VK≤ 25%;
Group Z has a VK > 25%.
3. Analyze results and make decisions. Appropriate purchasing, stocking, and sales strategies are developed for each group.

The importance of XYZ analysis for the logistics of wholesale enterprises is explained by the following:

a. Improving inventory management - separating goods with stable and unstable demand, developing an individual inventory strategy for each;
b. Efficient use of warehouse capacity - allocating more space in the warehouse for stable goods, and temporarily allocating space for seasonal or unstable goods, mainly at the entrances of the warehouse.
c. Planning orders for wholesale purchases - creates the basis for automated systems.
d. Forecasting demand for goods - forecasting demand for each group of goods, with particular attention to goods of groups Y and Z.

Many wholesalers use ABC and XYZ analysis together. This helps to fully analyze the importance and stability of goods in terms of demand. The combined use of ABC and XYZ analysis methods is as follows, see Table 9.

Table 9. Combined use of ABC and XYZ analysis methods

Ratings	X (stable)	Y (variable)	Z (unstable)
A (expensive)	AX	AY	AZ
B (average)	BX	BY	BZ
C (cheap)	CX	CY	CZ

AX – very important, the stock of goods in this group should always be in the warehouse.

CZ – the demand for this type of goods is very low, the demand is unstable. Having excess stock in the warehouse leads to increased costs.

4. Conclusion

Logistics activities in wholesale enterprises are a complex system aimed at delivering goods at the right time, to the right place, in the right volume, with minimal costs. Analysis shows that effective logistics management ensures economic efficiency, customer satisfaction, and competitiveness for the enterprise. The success of a wholesale enterprise largely depends on how the logistics system is organized and managed. ABC and XYZ analyses are important tools for numerical and systematic evaluation of logistics activities. They can help form the assortment of goods, standardize the size of stocks, control costs, and be flexible to customer needs.

The analysis of logistics activities in wholesale trade enterprises holds significant scientific and practical importance, serving as a key tool for enhancing efficiency in enterprise management, optimizing costs, and ensuring competitiveness. The main indicators identified during the study – product turnover rate, inventory turnover ratio, delivery time, transportation costs, and order fulfillment level – play a crucial role in assessing the state and efficiency of the logistics system in wholesale trade enterprises.

The results indicate that systematic monitoring of logistics processes and regular analysis of these indicators serve as a fundamental basis for making important managerial decisions. Moreover, the implementation of modern information and communication technologies, automation, and supply chain optimization were highlighted as ways to further improve the efficiency of logistics activities. The findings of this study can serve as practical recommendations for enterprises operating in the wholesale trade sector and provide a foundation for more in-depth research in the fields of logistics management and supply chain theory.

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