Factors Affecting Warehouse Cost Reduction: A Case Study of ABC Company

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Abstract

This study investigates the factors influencing warehouse cost reduction through a case study of ABC Company. The objectives are to identify key cost-reduction factors, examine effective warehouse management practices, and propose appropriate technologies to enhance competitiveness. A mixed-method approach was employed, using questionnaires and interviews to collect quantitative and qualitative data. The results indicate that effective warehouse management practices have a strong positive relationship with technology adoption ($r = 0.750$) and a moderate negative relationship with warehouse costs ($r = -0.620$). This suggests that well-structured management directly supports cost reduction through accurate inventory planning, efficient inbound and outbound operations, and waste reduction. In addition, the use of warehouse technologies shows a moderate negative relationship with warehouse costs ($r = -0.580$). Technologies such as Warehouse Management Systems (WMS), IoT/RFID, and data analytics improve accuracy, reduce errors, and speed up operations, leading to lower overall costs. Overall, sustainable warehouse cost reduction requires effective management practices, appropriate technology adoption, and workforce development to support operational efficiency and long-term competitiveness.

Keywords: Warehouse, Warehouse Cost Reduction, Warehouse Management System (WMS), Inventory Management

1. Introduction

Improving the efficiency of logistics systems and warehouse management is a key strategic priority for national economic development, particularly in Thailand, where the economy relies heavily on exports and international trade. Effective warehouse management plays a critical role in reducing operational costs across the supply chain, which directly influences a country's competitiveness in the global market. According to the World Bank (2020), logistics costs in Thailand account for approximately 14.5% of gross domestic product (GDP), which is significantly higher than the average of developed countries, typically ranging between 8–10%. As a result, reducing logistics and warehouse costs has become an important strategy for both the public and private sectors to enhance long-term competitiveness and attract sustainable foreign investment (Office of the National Economic and Social Development Council, 2023; Council of Supply Chain Management Professionals, 2021).

At the firm level, many Thai businesses, particularly small and medium-sized enterprises (SMEs), continue to face challenges related to warehouse cost management. ABC Company, a manufacturer and distributor of industrial products, represents a clear example of this issue. Warehouse cost reduction is a critical organizational goal, as it improves resource utilization and strengthens competitive performance. Effective warehouse management not only lowers costs but also enhances operational flexibility and responsiveness to customer demand. The adoption of modern technologies, such as Warehouse Management Systems (WMS), can reduce losses caused by operational errors and improve inventory data accuracy. Harrison and van Hoek (2020) reported that organizations implementing WMS can reduce warehouse costs by 20–30% within two to three years.

Internal company data indicate that warehouse costs account for approximately 25% of total operating costs. These high costs are primarily attributed to inefficient space utilization, excessive inventory levels, and outdated management systems, all of which increase expenses without generating added value (Christopher, 2016; Economic and Logistics Research Institute, 2022). Moreover, these inefficiencies negatively affect the company's competitiveness through delayed deliveries, limited storage capacity, and inventory management errors, ultimately reducing customer satisfaction in the long term (Heizer et al., 2020). Leuschner et al. (2014) further emphasized the importance of information integration among supply chain partners to minimize losses within warehouse operations.

Therefore, examining the factors that influence warehouse cost reduction at ABC Company is essential to identify practical and applicable management strategies within an organizational context. The findings of this study are expected to help the company better understand the root causes of cost inefficiencies and design effective strategies to enhance competitiveness. In addition, the insights gained from this research may be applied to other firms within the same industry, contributing to broader improvements in warehouse cost management practices.

1.2 Research Objective

1) To identify the factors influencing warehouse cost reduction at ABC Company.

2) To analyze effective warehouse management practices at ABC Company.

3) To propose appropriate technologies or warehouse management systems that can reduce costs and enhance the company's competitiveness.

2. Literature review

2.1 Warehouse Management

Warehouse management is a core component of logistics systems, playing a crucial role in improving operational efficiency and reducing organizational costs. Key aspects of warehouse management discussed in the literature include the following.

2.1.1 Concepts and Theories of Warehouse Management

Warehouse management involves storage, inventory control, and movement of goods to achieve maximum efficiency. One widely accepted concept is Just-in-Time (JIT) warehouse management, which focuses on holding inventory based on actual customer demand in order to minimize inventory holding costs (Christopher, 2016; Vichit Chinrak, 2023). Another important theoretical tool is the Economic Order Quantity (EOQ) model, which is used to determine optimal order quantities that minimize total ordering and holding costs (Heizer et al., 2020).

2.1.2 Efficient Warehouse Space Management

Effective warehouse space management is a critical factor in cost reduction and storage capacity optimization. ABC analysis is commonly used to classify inventory based on value and usage frequency, where Group A items, high-value and fast-moving products should be stored in easily accessible locations (Council of Supply Chain Management Professionals, 2021; Economic and Logistics Research Institute, 2022). In addition, technologies such as Automated Storage and Retrieval Systems (AS/RS) enhance space utilization accuracy and operational efficiency (World Bank, 2020).

2.1.3 Storage Techniques and Inventory Control

Appropriate storage techniques, including pallet racking and shelving systems, help maximize storage space and reduce product damage. Inventory control systems such as barcode and RFID technologies provide accurate, real-time inventory information, improving inventory visibility and control (Chan et al., 2020; Vichit Chinrak, 2023). Warehouse Management Systems (WMS) further support systematic inventory tracking and storage planning.

2.1.4 Prevention of Overstocking and Obsolete Inventory

Overstocking and inventory obsolescence are common challenges in warehouse operations. These issues can be mitigated through effective purchasing and storage planning. Enterprise Resource Planning (ERP) systems support sales data analysis and demand forecasting, enabling more accurate inventory decisions (Christopher, 2016; Heizer et al., 2020). Moreover, the application of lean warehouse principles helps reduce waste and improve overall warehouse efficiency (Harrison & van Hoek, 2020).

2.2 Warehouse Costs and Cost Reduction

2.2.1 Cost Analysis and Related Factors

Cost analysis is essential for effective cost management and competitiveness enhancement. Understanding cost structures enables organizations to allocate resources more efficiently and control operational expenses.

2.2.2 Basic Cost Concepts

Costs reflect the use of organizational resources in business operations and are generally classified as fixed costs and variable costs, both of which influence operational structures

(Drury, 2019). A clear understanding of cost behavior supports effective planning and decision-making (Heizer et al., 2020). The Total Cost Concept extends cost analysis across the entire supply chain, including transportation, warehousing, and production with the objective of minimizing total costs while improving operational efficiency (Christopher, 2016).

2.2.3 Types of Warehouse Costs

1) Warehouse-related costs can be categorized into several groups. 2) Storage Costs: Expenses related to space utilization and storage equipment (Harrison & van Hoek, 2020). 3) Inventory Holding Costs: Costs associated with product depreciation, insurance, and security (Council of Supply Chain Management Professionals, 2021). 4) Transportation Costs: Expenses incurred from inbound and outbound product movement (Vichit Chinrak, 2023).

2.2.4 Total Cost Analysis

Total Cost Analysis is a valuable tool for warehouse cost planning, as it considers trade-offs among different cost components. For example, increasing storage capacity to reduce frequent transportation may lead to lower total costs in the long run (World Bank, 2020). This approach also supports informed investment decisions regarding new technologies (Christopher, 2016).

2.2.5 Factors Affecting Warehouse Costs

Key factors influencing warehouse costs include order quantity, which affects space utilization and procurement decisions (Harrison & van Hoek, 2020); order frequency, which impacts transportation and storage costs (Chan et al., 2020); and forecasting accuracy, which helps reduce unnecessary inventory holding costs (Heizer et al., 2020).

2.2.6 Technologies and Tools for Cost Analysis

Modern technologies such as Warehouse Management Systems (WMS) and Radio Frequency Identification (RFID) enable organizations to monitor costs and evaluate process efficiency more effectively (World Bank, 2020; Vichit Chinrak, 2023). In addition, Big Data analytics and machine learning techniques support more accurate future cost forecasting (Christopher, 2016).

2.2.7 Strategic Warehouse Cost Management

Strategic warehouse cost management focuses on waste reduction and process efficiency improvement. Approaches such as Lean Management and Six Sigma are widely applied to enhance value creation and reduce costs across the supply chain (Council of Supply Chain Management Professionals, 2021). Benchmarking practices further allow organizations to compare performance with competitors and continuously improve operational efficiency (Harrison & van Hoek, 2020).

2.3 Technology in Warehouse Management

Technology plays an essential role in improving warehouse performance through systems such as WMS, IoT, and RFID.

Warehouse Management Systems (WMS) support storage planning, real-time inventory tracking, and error reduction in processes such as order fulfillment and returns management. WMS also helps control inventory levels, reduce overstocking, and accelerate warehouse operations (Harrison & van Hoek, 2020; Vichit Chinrak, 2023).

The Internet of Things (IoT) enables accurate and efficient warehouse data monitoring through sensors and connected devices that collect information such as temperature, humidity, and product location. IoT applications enhance transparency, reduce errors, and allow remote monitoring and control of warehouse operations (Christopher, 2016; World Bank, 2020).

RFID technology allows fast and accurate product identification using radio-frequency signals, reducing inventory counting time and operational errors while improving processing speed. RFID has been widely adopted in retail and logistics industries to enhance inventory management efficiency (Council of Supply Chain Management Professionals, 2021; Economic and Logistics Research Institute, 2022).

In addition, integrating logistics management with information technology improves operational efficiency, reduces errors, and enhances service satisfaction. Previous studies highlight the importance of developing modern, integrated logistics systems that connect all operational processes to improve service quality and long-term user satisfaction (Sarainmoon, 2025).

2.4 Application of Data Analytics in Warehouse Management

Data analytics plays a vital role in predictive analysis and operational optimization. By analyzing historical and real-time data, such as sales trends, weather conditions, and seasonal patterns, organizations can forecast demand more accurately and reduce unnecessary inventory costs (Heizer et al., 2020; Chan et al., 2020).

Data analytics also support warehouse space optimization by analyzing product demand frequency and usage patterns, reducing picking time and improving operational speed (Christopher, 2016; Vichit Chinrak, 2023). Furthermore, analytics enables managers to identify process bottlenecks and improve loading and unloading times, leading to cost reduction and enhanced overall performance (Harrison & van Hoek, 2020; Economic and Logistics Research Institute, 2022).

2.5 Factors Influencing Warehouse Cost Reduction

2.5.1 Internal Factors

Efficient warehouse process design is a key internal factor directly affecting cost reduction. Well-designed processes eliminate unnecessary steps, improve resource utilization, and enhance operational efficiency through optimized storage layouts, improved material flow, and automation. Heizer et al. (2020) reported that effective process planning, and design can reduce operational costs by approximately 15–20%.

2.5.2 External Factors

External economic conditions also influence warehouse management, including fuel prices, transportation costs, and interest rates. Changes in these factors affect warehouse planning and operational decisions. For example, rising fuel prices may encourage companies to optimize transportation routes or adopt energy-efficient technologies to reduce costs (World Bank, 2020; Economic and Logistics Research Institute, 2022).

3. Methodology

3.1 Research Design

This study employed a mixed-method research design, integrating quantitative and qualitative approaches to obtain a comprehensive understanding of factors influencing warehouse cost reduction at ABC Company. The combination of both methods enabled the study to capture statistical relationships among key variables while also providing in-depth insights into managerial practices and contextual factors related to warehouse operations.

3.2 Population and Sample

The study population consisted of warehouse managers, warehouse and logistics staff, and experts involved in warehouse system design and technology implementation. Purposive sampling was applied to ensure that participants possessed relevant knowledge aligned with the research objectives. For the quantitative component, 150 warehouse employees were selected using stratified sampling to ensure appropriate representation across operational levels. For the qualitative component, five key informants, including warehouse managers and logistics or warehouse system experts, were selected using purposive sampling to provide in-depth perspectives on warehouse cost reduction and management practices.

3.3 Research Instruments

The quantitative instrument was a structured questionnaire developed based on a review of relevant concepts, theories, and previous studies. Questionnaire items were constructed in accordance with the research framework and refined following expert and advisor recommendations. Content validity was assessed, and reliability was tested through a pilot study involving 30 respondents, confirming that the instrument met acceptable reliability standards. For the qualitative component, a semi-structured interview guide was used to explore factors affecting warehouse cost reduction, allowing participants to express their views freely. Interview data were recorded through systematic notetaking and analyzed using content analysis to support and validate the quantitative findings.

3.4 Data Collection

Quantitative data collection was conducted after obtaining official permission from Suan Sunandha Rajabhat University and the participating organizations. Questionnaires were distributed to the selected respondents and collected within the specified timeframe, with all responses reviewed for accuracy and completeness prior to analysis. For the qualitative data,

formal requests were made to conduct individual interviews with company executives and experts. A total of ten interviews were conducted either on-site or online, depending on participant availability, and the collected data was prepared for qualitative analysis.

3.5 Data Analysis

Quantitative data were analyzed using descriptive and inferential statistics. Descriptive statistics, including mean, standard deviation, and percentage, were used to summarize respondent characteristics and variable distributions, while correlation analysis was applied to examine relationships among the study variables. Qualitative data were analyzed using descriptive analysis, with findings systematically organized, interpreted, and linked to relevant theories within the research framework. The qualitative results were used to support and explain the quantitative findings, leading to conclusions aligned with the research objectives.

4. Result

4.1 Demographic Characteristics of the Respondents

A total of 150 complete questionnaires were returned, representing a response rate of 100%. The demographic data were analyzed using frequency and percentage distributions. The results indicate that many respondents were male and within the working-age group, particularly between 30 and 39 years old. Most respondents held a bachelor's degree and had considerable work experience. In terms of job position, the majority were in supervisory roles. This respondent profile suggests that the data were obtained from individuals with relevant knowledge, practical experience, and a certain level of decision-making responsibility, thereby enhancing the credibility of the findings.

4.2 Descriptive statistics

This study examined factors influencing warehouse cost reduction at ABC Company based on three main components derived from the conceptual framework: (1) effective warehouse management practices, (2) the use of warehouse technology, and (3) warehouse cost reduction. The analysis was based on responses from 150 participants, with the results summarized as follows:

Table 1: Mean and Standard Deviation of Effective Warehouse Management Practices influencing Warehouse Cost Reduction

Effective warehouse management practices	$\bar{X}$	S.D.	Interpretation	Ranking
Digital Technology Applications	4.28	0.62	High	2
Cost Efficiency	4.32	0.60	High	1
Average	4.30	0.61	High	

Effective warehouse management practices were rated at a high level overall (Mean = 4.30, S.D. = 0.61). Among the individual factors, warehouse control received the highest mean score (Mean = 4.32, S.D. = 0.60), followed by layout planning (Mean = 4.28, S.D. = 0.62). This indicates that respondents perceived warehouse control as the most influential management practice in reducing warehouse costs.

Table 2: Mean and Standard Deviation of the use of warehouse technology influencing Warehouse Cost Reduction

The Use of Warehouse Technology	$\overline{X}$	S.D.	Interpretation	Ranking
Warehouse Management Systems	3.95	0.78	High	1
IoT/RFID technologies	3.80	0.82	High	2
Aata Analytics	3.55	0.92	High	3
Average	3.77	0.84	High	

The use of warehouse technology was also rated at a high level overall (Mean = 3.77, S.D. = 0.84). Warehouse Management Systems (WMS) received the highest mean score (Mean = 3.95, S.D. = 0.78), followed by IoT/RFID technologies (Mean = 3.80, S.D. = 0.82) and data analytics (Mean = 3.55, S.D. = 0.92). These results suggest that WMS is perceived as the most important technology supporting warehouse cost reduction.

Table 3: Mean and Standard Deviation of Warehouse cost reduction outcomes influencing Warehouse Cost Reduction

Warehouse Cost Reduction Outcomes	$\overline{X}$	S.D.	Interpretation	Ranking
Operational Cost Reduction	4.18	0.71	High	1
Service Speed Enhancement	4.05	0.74	High	2
Inventory Management Error Reduction	4.22	0.69	High	3
Average	4.15	0.71	High	

Warehouse cost reduction outcomes were rated at a high level overall (Mean = 4.15, S.D. = 0.71). Among the outcomes, reducing inventory management errors received the highest mean score (Mean = 4.22, S.D. = 0.69), followed by operational cost reduction (Mean = 4.18, S.D. = 0.71) and service speed enhancement (Mean = 4.05, S.D. = 0.74). This highlights the importance of error reduction as a key driver of warehouse cost savings.

4.3 Correlation Analysis of Factors Influencing Warehouse Cost Reduction

Correlation analysis was conducted to examine the relationships among the factors influencing warehouse cost reduction at ABC Company. Based on the conceptual framework,

three main variables were included in the analysis: (1) effective warehouse management practices, (2) the use of warehouse technology, and (3) warehouse cost reduction. The results of the analysis are presented as follows.

Table 4: Results of Correlation Analysis of Factors Influencing Warehouse Cost Reduction

Variables	Effective Warehouse Management Practices	Use of Warehouse Technology	Warehouse Costs
1. Effective Warehouse Management Practices	1.000	0.750	-0.620
2. Use of Warehouse Technology	0.750	1.000	-0.580
3. Warehouse Costs	-0.620	-0.580	1.000

Based on Table 4, the results of the correlation analysis can be interpreted as follows:

4.3.1 The relationship between effective warehouse management practices and the use of warehouse technology shows a strong positive correlation ($r = 0.750$), indicating that improved management practices are strongly associated with higher levels of technology adoption.

4.3.2 The relationship between effective warehouse management practices and warehouse costs demonstrates a moderate to strong negative correlation ($r = -0.620$), suggesting that more effective management practices are associated with lower warehouse costs.

4.3.3 The relationship between the use of warehouse technology and warehouse costs reveals a moderate negative correlation ($r = -0.580$), indicating that increased technology utilization is associated with a reduction in warehouse costs.

4.4 Results of In-Depth Interview

4.4.1 Effective Warehouse Management Practices

Most interview participants agreed that effective management practices are the core driver of smooth warehouse operations and meaningful cost reduction. They emphasized the importance of systematic planning, clearly defined operational standards, and effective human resource management as key elements that support efficient warehouse performance and cost control.

4.4.2 Use of Warehouse Technology

Many interviewees viewed technology as a critical tool for improving operational efficiency and reducing warehouse costs. However, they also identified constraints related to investment costs and employee adaptability. Several participants noted that technology adoption should be carefully evaluated in relation to the size, resources, and nature of the business to ensure its suitability and effectiveness.

4.4.3 Warehouse Costs

Interview participants demonstrated a clear awareness of the various components of warehouse costs and were able to identify the main factors contributing to cost increases. Emphasis was placed on controllable costs and those resulting from operational inefficiencies, highlighting the importance of improving internal processes to achieve cost reduction.

4.4.4 Relationships Among Key Variables

All interview participants recognized a strong interrelationship among effective management practices, technology utilization, and warehouse cost reduction. They emphasized that effective management serves as a fundamental foundation for successful technology implementation, which in turn leads to sustainable reductions in warehouse costs.

5. Conclusion

This study investigated the factors influencing warehouse cost reduction at ABC Company and provides several important insights. The respondent comprising individuals with relevant experience, educational backgrounds, and supervisory roles, enhances the credibility and reliability of the findings. Overall, the results confirm that effective warehouse management practices, technology utilization, and warehouse cost reduction are perceived as highly important factors in organizational performance. The findings demonstrate that effective warehouse management practices play a central role in cost reduction, particularly through accurate inventory planning, efficient inbound and outbound operations, and the reduction of inventory management errors. The strong positive relationship between management practices and technology adoption indicates that well-structured management systems create a solid foundation for the successful implementation of warehouse technologies. In other words, effective management enables organizations to fully leverage technological investments and achieve their intended outcomes.

Moreover, while sound management practices are essential, the study highlights that technology adoption is increasingly necessary to remain competitive in a dynamic business environment. Warehouse Management Systems (WMS) were identified as the most influential technology in improving operational accuracy, reducing errors, and accelerating warehouse processes. However, technology investment should be carefully aligned with the firm's operational context, organizational size, and employees' readiness to adapt to change. Such alignment is critical to maximizing operational benefits and achieving a measurable return on investment (ROI). In conclusion, sustainable warehouse cost reduction requires an integrated approach that combines management excellence, appropriate technology adoption, and workforce development. By strengthening these elements simultaneously, organizations can improve operational efficiency, reduce costs in a sustainable manner, and enhance their long-term competitiveness.

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