# Factors Affecting the Application of An Efficient Supply Management System at Cold Transport Sdn Bhd

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**Abstract.** This research investigates the effectiveness of transportation, warehousing, information technology, and lead time in contributing to an efficient supply management system. Focusing on Cold Transport Sdn Bhd, a key player in the Malaysian cold transport logistics sector, this study addresses the gap in specific, quantitative research on these factors within this competitive market. The study adopts a quantitative, non-experimental research design, with data collected through a structured questionnaire distributed to N=100 employees of Cold Transport Sdn Bhd. Using statistical software, the data were analyzed through descriptive statistics, Pearson correlation, and multiple regression analysis. Key findings indicate a significant positive correlation between all four factors and the efficient supply management system. The coefficient of determination (R2) is 0.508, indicating a moderate level of explanatory power for the model. Lead time ($\beta$=0.326, p=0.002) was identified as the most influential factor. These results provide a practical basis for the company to enhance its supply chain efficiency, leading to potential cost savings and a competitive advantage.

Keywords: supply management, transportation, warehousing, information technology, lead time

## INTRODUCTION

The dynamics of supply chains have been profoundly altered by electronic commerce and related digital commerce transaction capabilities. The internet facilitates information exchange on an unusual scale, allowing for data on supplier or customer warehouse inventory levels and critical customer order patterns to be found in warehouse management systems (Wang et al, 2022). Information referring to the location of important supply chain assets, such as products or vehicles, is usually stored. Logistics is often defined as the art of bringing the right amount of the right products to the right place, making the efficiency of the supply chain a considerable concern (Donald et al, 2020).

The warehousing role is critical in a supply chain, as it operates as a node linking material flows between the supplier and consumer (George, et al 2019). Due to the competitive market environment, companies are continually striving to enhance their warehouse operations. Efforts to increase customer service standards have resulted in changes in warehouse positions. Challenges are created by supply chains becoming more international and long, multinational operations becoming more demanding, and rapid technological advancement (Attaran, M. 2020). To tackle these issues, organizations are implementing new ways such as warehouse management systems (WMS), which is an applications program that controls the transportation and storage of goods inside a warehouse, as well as the shipping, receiving, put-away, and picking procedures (Kaupa et al, 2021). A WMS is a database that uses computer software to increase warehouse efficiency and inventory quality through warehouse transactions. As a result, this system directs and optimises stock based on real-time utilization statistics.

The growth of information technology (IT) presents both opportunities and challenges for logistics, especially as internet retail increases. Companies accepting orders from customers across borders often turn to third-party logistics operators for the physical flow of goods. Investment in technology within supply chain management has been found to have a beneficial impact on the efficiency of logistics performance in businesses. Integrating technology helps in reducing lead time and improves logistics efficiency (Nag et al, 2021). Technology integration

is crucial for effective supply chain management and is significantly important for firms to achieve and sustain a competitive advantage (Khuntia, 2021).

The supply chain's performance is also influenced by the lead time and review period. Lead time is defined as the total time between receiving an order and receiving the products, encompassing both order lead time and delivery lead time (Liu,et al, 2021).

## Problem Statement and Research Gap

Cold Transport Sdn Bhd operates in a highly competitive and demanding sector cold transport logistics where the efficient supply management system is paramount for preserving product integrity and meeting time-sensitive customer demands. While the general importance of transportation, warehousing, information technology, and lead time is established in the literature, there is a lack of specific, quantitative empirical evidence detailing the influence and relative importance of these four factors within the context of a Malaysian cold transport logistics company. This study aims to fill this academic gap by quantifying these relationships to provide actionable insights.

## Research Objectives and Hypotheses

Therefore, this study aims to explore the factors that influence the application of an efficient supply management system at Cold Transport Sdn Bhd. It specifically focuses on examining the relationship between transportation, warehousing, information technology, and lead time in ensuring supply chain efficiency within the company.

Hypotheses:

Ha1: There is a positive linear relationship between transportation and the efficient supply management system at Cold Transport Sdn Bhd

Ha2: There is a positive linear relationship between warehousing and the efficient supply management system at Cold Transport Sdn Bhd

Ha3: There is a positive linear relationship between information technology and the efficient supply management system at Cold Transport Sdn Bhd

Ha4: There is a positive linear relationship between lead time and the efficient supply management system at Cold Transport Sdn Bhd

# METHODOLOGY

This study employs a quantitative research method to address the research objectives and questions. Quantitative research involves the collection and analysis of numerical data using statistical techniques to identify patterns, relationships, and trends (Lim et al, 2024). The goal is to examine how the independent variables (transportation, warehousing, information technology, and lead time) affect the efficient supply management system (dependent variable) at Cold Transport Sdn Bhd.

The target audience for this study consists of Cold Transport Sdn Bhd personnel. A sample of N=100 respondents was selected. Data collection was performed over email with standardized questionnaires that included closed-ended questions graded on a five-point Likert scale. A limited number of comprehensive interviews were also performed to triangulate the data and augment validity.

## Measurement and Instruments

The questionnaire was categorized into six sections: Section A (Demographic Profile), Section B (Dependent Variable: Efficient Supply Management System), and Sections C, D, E, and F (Independent Variables: Transportation, Warehousing, Information Technology, and Lead Time, respectively). Each independent variable section (C-F) had 8 questions.

Statistical software (SPSS) was utilized for data analysis. The analysis included descriptive statistics, reliability testing, normality testing, Pearson correlation, and multiple regression analysis. Reliability was assessed using Cronbach's Alpha, with an acceptable threshold typically being $\alpha>0.70$ for established constructs.

**TABLE 1-** Reliability Test Results

| Variables | Cronbach's Alpha Value | Result |
|---|---|---|
| Efficient Supply Management System | 0.71 | Acceptable |
| Transportation | 0.785 | Good |
| Warehousing | 0.787 | Good |
| Information Technology | 0.683 | Acceptable (Exploratory Study) |
| Lead Time | 0.797 | Good |

TABLE 1. Most of the variables (Transportation, Warehousing, Lead Time, and Efficient Supply Management) show acceptable to good internal consistency, meaning the items in the questionnaire for these variables are reliable. The Information Technology variable has a Cronbach's Alpha of 0.683, which is slightly below the standard threshold of 0.70. However, in social science research, values above 0.6 are sometimes still considered acceptable, especially in exploratory studies or pilot studies.

## RESULTS AND DISCUSSION

TABLE 2. The researcher delivered 100 surveys, and all 100 respondents answered. The respondent demographics, based on gender, race, age, years of employment, and department, are displayed below:

**TABLE 2-**Demographic Characteristics of Respondents

| | Characteristics | Frequency | Percentage % |
|---|---|---|---|
| **Gender** | Male | 37 | 37.0 |
| | Female | 63 | 63.0 |
| | Total | 100 | 100.0 |
| **Races** | Malay | 82 | 82.0 |
| | Indian | 6 | 6 |
| | Chinese | 10 | 10.0 |
| | Others | 2 | 2.0 |
| | Total | 100 | 100.0 |
| **Age** | 20-30 | 70 | 70.0 |
| | 31-40 | 25 | 25.0 |
| | 41-50 | 3 | 3.0 |
| | 51 Above | 2 | 2.0 |
| | Total | 100 | 100.0 |
| **Years of Working** | < 1 years | 36 | 36.0 |
| | 2-5 years | 46 | 46.0 |
| | 6-10 years | 5 | 13.0 |
| | > 10 years | 13 | 5.0 |
| | Total | 100 | 100.0 |
| **Department** | Finance | 6 | 6.0 |
| | Transport | 12 | 12.0 |
| | Compliance | 17 | 17.0 |
| | Security | 3 | 3.0 |
| | Warehouse | 27 | 27.0 |
| | Human Resource | 27 | 27.0 |
| | Information Technology | 8 | 8.0 |
| | Total | 100 | 100.0 |

The demographic analysis for this study, based on a census of 100 employees from Cold Transport Sdn Bhd, revealed several key characteristics of the respondent pool. The workforce showed a higher representation of females at 63.0% compared to males at 37.0%. Racially, the group was predominantly Malay, accounting for 82.0% of all respondents. In terms of age, the company's personnel leaned toward younger employees, with the majority (70.0%) falling into the 20 to 30 years old bracket. Experience levels were concentrated in the medium

term, as 46.0% of employees reported having worked for the company for 2 to 5 years. Finally, the distribution by department highlighted that the Warehouse and Human Resource sectors were the most represented, each contributing 27.0% of the survey responses, followed by Compliance (17.0%), Transport (12.0%), Information Technology (8.0%), Finance (6.0%), and Security (3.0%)

TABLE 3. Descriptive statistics were used to evaluate the central tendency, dispersion, and distribution of the variables. All variables showed a mean score above 4.47 (on a 5-point Likert scale), indicating a general agreement or high association with the importance of these factors.

**TABLE 3-**Descriptive Statistics

| Variable | Mean | Standard Deviation | % High (3.68-5.00) | Skewness |
|---|---|---|---|---|
| Efficient Supply Management (Y) | 4.4775 | 0.34878 | 98.00% | -1.508 |
| Warehousing (X2) | 4.5488 | 0.36233 | 100.00% | -0.88 |
| Transportation (X1) | 4.525 | 0.37352 | 96.00% | -0.703 |
| Information Technology (X3) | 4.515 | 0.33817 | 97.00% | -0.667 |
| Lead Time (X4) | 4.5038 | 0.39825 | 100.00% | -1.162 |

All skewness values fall within the acceptable ±2.0 range recommended by George and Mallery (2003), indicating a reasonably normal distribution. Notably, warehousing and lead time had the highest agreement, with 100.0% of respondents falling into the high category.

TABLE 4. Pearson product-moment correlation coefficients (r) were used to investigate the bivariate relationships between the independent variables and the Efficient Supply Management System (Y). An adjusted alpha ($\alpha$ adjusted =0.0167) was used for testing all the null hypotheses.

**TABLE 4-**Correlation Analysis

| Relationship | Pearson's r | p-value | Significance | Conclusion |
|---|---|---|---|---|
| Transportation (X1) and Y | 0.682 | 0 | Significant (p<0.0167) | Ha1 is Supported |
| Warehousing (X2) and Y | 0.681 | 0 | Significant (p<0.0167) | Ha2 is Supported |
| Information Technology (X3) and Y | 0.681 | 0 | Significant (p<0.0167) | Ha3 is Supported |
| Lead Time (X4) and Y | 0.663 | 0 | Significant (p<0.0167) | Ha4 is Supported |

The strongest linear relationship was found between Transportation (X1) and Y (r=0.682, p=0.000), while Lead Time (X4) and Y showed the least linear correlation (r=0.663, p=0.000). All four hypotheses (Ha1, Ha2, Ha3, and Ha4) were accepted as a significant positive correlation exists with the efficient supply management system.

TABLE 5. Multiple regression analysis was used to determine the collective explanatory power of the independent variables and their individual influence on the Efficient Supply Management System (Y). The R-squared (R2) value is 0.508, which indicates that 50.8% of the variation in the Efficient Supply Management System (Y) can be explained by the combination of the four independent variables. Based on the criteria set by Hair, Hult, Ringle, and Sarstedt (2014) (0.50=moderate), this R2 value is considered moderate. The model is statistically significant (F=24.506, p=0.001).

**TABLE 5**-Multiple Regression Analysis

| Variable | Unstandardized B | Standardized Beta (β) | t-value | p-value | Relationship with Y |
|---|---|---|---|---|---|
| Constant | 1.022 | - | 2.861 | 0.005 | Significant |
| Transportation (X1) | 0.046 | 0.05 | 0.431 | 0.667 | Not Significant |
| Warehousing (X2) | 0.21 | 0.218 | 1.881 | 0.063 | Not Significant |
| Information Tech. (X3) | 0.223 | 0.216 | 1.659 | 0.1 | Not Significant |
| Lead Time (X4) | 0.285 | 0.326 | 3.171 | 0.002 | Significant |

The linear regression equation is:

**Y (Efficient Supply Management System) = b0 + b1(X1) + b2(X2) + b3(X3) + b4(X4) + e**
Y = Efficient Supply Management System
b0 = Constant (Intercept)
b1-3 = Estimates (Regression coefficients)
X1 = Transportation
X2 = Warehousing
X3 = Information Technology
X4 = Lead Time
e = Error

The variable with the highest standardized beta coefficient is Lead Time (X4) (β=0.326, p=0.002), which is also the only independent variable found to have a statistically significant individual effect on the Efficient Supply Management System (Y) in the multiple regression model. This indicates that lead time is the most influential factor.

## Discussion

This study utilized a quantitative method, gathering data from N=100 employees of Cold Transport Sdn Bhd, and processing it using SPSS software The analysis involved descriptive statistics, Pearson Correlation, and multiple linear regression.

## Summary of Key Findings

The Pearson Correlation analysis confirmed that all four independent variables Transportation (r=0.682, p=0.000), Warehousing (r=0.681, p=0.000), Information Technology (r=0.681, p=0.000), and Lead Time (r=0.663, p=0.000)—have a significant positive correlation with the Efficient Supply Management System. This means that improvements in any one factor are positively associated with an increase in supply management efficiency.

However, the multiple linear regression provided a more nuanced view. When controlling for the effects of the other variables, Lead Time (X4) emerged as the most influential and only individually significant factor (β=0.326, p=0.002). The findings suggest that focusing on reducing the time between order receipt and product delivery is the most effective singular strategy for enhancing overall supply management system efficiency at Cold Transport Sdn Bhd This is consistent with literature highlighting the impact of lead time on supply chain performance (Liu, et al, 2021).

The other variables, Warehousing (β=0.218, p=0.063) and Information Technology (β=0.216, p=0.100), showed moderate standardized beta coefficients but were not individually statistically significant at the α=0.05 level, suggesting their influence is strong but perhaps more interdependent with other variables not measured. Transportation (β=0.050, p=0.667) was found to have the least effect in the regression model, despite showing the highest simple correlation. This diminished effect in the multiple regression, after controlling for the other factors, suggests that the transportation improvements may be less critical for driving overall *system* efficiency compared to lead time, perhaps due to the nature of Gold Cold Transport's current operations.

## Implications and Recommendations

Given the significance of the collective model and the dominant role of lead time, management must prioritize the implementation of an effective supply management system. Specifically, they should devise ways to enhance the efficiency of the supply management system over time, with a sharp focus on processes that directly impact Lead Time. Implementing advanced WMS and IT systems, for example, is often cited as a key strategy for reducing lead time in logistics (Nag et al, 2021; Kaupa et al, 2021).

## Future Research

Future researchers are encouraged to adopt a qualitative methodology to examine perceptions of an effective supply management system, which would yield distinct insights and enhance the comprehension of the efficacy of the system from an employee perspective. Furthermore, future studies could investigate additional factors that contribute to an efficient supply management system beyond the four variables studied here.

# CONCLUSION

This study successfully achieved its primary objective: to determine the relationship between transportation, warehousing, information technology, and lead time with an efficient supply management system. All four factors were found to have a significant positive correlation with the efficient supply management system, supporting hypotheses Ha1 through Ha4.

However, the multiple regression analysis revealed that Lead Time is the most influential and significant factor when all variables are considered together. This finding provides a clear strategic direction for Cold Transport Sdn Bhd to focus its improvement efforts to achieve maximum enhancement in its supply chain efficiency.

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