

Impact of ERP Implementation on Supply Chain Performance of Transport and Logistics Companies in Sri Lanka

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1. Introduction

The main philosophy of Supply Chain Management (SCM) is to have the right product in the right place, at the right price, at the right time and in the right condition. Therefore, organisations need not only ensure the flow of right information internally, but must also share information with the right supply chain partners at the right time. In order to achieve these goals, organisations need an information system such as an Enterprise Resource Planning (ERP) system. [1]

An ERP system is a business process management software widely used in organisations to maintain information flow along the supply chain. It is generally conceived as an important precursor to supply chain performance and a very useful tool utilised across many industries. ERP implementation began in Western nations in early 90s. However, the adoption and usage of ERP in Sri Lankan Transport and Logistics industry took place at a slow rate. There are relatively less studies available in relation to the use of ERP systems in Transport and Logistics industry globally.

2. Objectives of the study

This study aims to examine the relationship between ERP system implementation and Supply Chain Performance (SCP) in the Sri Lankan Transport and Logistics (T&L) industry.

The main objectives of this research are as follows:

1. To explore various aspects of ERP and SCM.
2. To identify the key ERP system dimensions which improve the SCP of organisations.
3. To investigate the relationship between ERP system dimensions and SCP.

3. Literature Review

3.1. ERP Dimensions

Table 1: ERP dimensions based on literature [2]

Dimension	Description
Integration (I)	Interconnections between functions and hierarchical levels; Interaction between the various processes
Flexibility (F)	Capacity to adapt changing conditions by fully using existing resources
Transversality (T)	Designed in regard to the business processes necessary to achieve objectives

3.2. SCP Dimensions

Table 2: Supply Chain Performance dimensions based on literature [3, 4]

Factor	Description
Reduce order processing time	Transversality of ERP system helps to process customer orders in efficient manner
Improve decision making	ERP provides accurate information available for decision making
Deliver customer orders on time	ERP makes information available within the supply chain so that customer orders are delivered
Increase customer responsiveness	Efficient flow of information helps to gain higher customer responsiveness
Improve information flow across sub - units/ process automation	Information integration within an organisation takes place through supporting core processes by the same system and database
Increase information accuracy	ERP systems improve the timeliness of information and eliminate manual activities involved with keying information from one system to another
Reduce operational cost	ERP systems reduce information system maintenance cost and increase the ability to deploy new functionality and increase the ability to deploy new information system functionality

4. Research Methodology

4.1. Research Framework

Based on literature, this research identifies major ERP dimensions which support information flow and key SCP dimensions which measure the efficiency and effectiveness of the SCP of T&L³ companies. These constructs are used to develop

³ T&L- Transport and Logistics

a series of hypotheses and to propose a model regarding the impact of ERP dimensions on Supply Chain Performance.

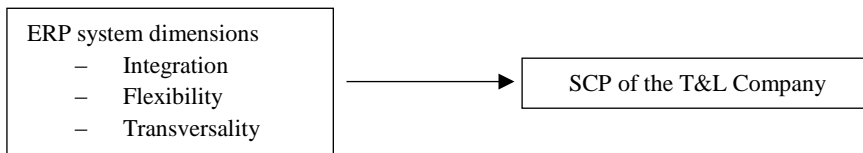


Figure 1: Research Framework

Hypotheses used are as follows:

- H1: There is a relationship between Integration and SCP in Sri Lankan T&L companies.
- H2: There is a relationship between Flexibility and SCP in Sri Lankan T&L companies.
- H3: There is a relationship between Transversality and SCP in Sri Lankan T&L companies.

4.2. Sampling and Data Collection

Judgment sampling method is used for the selection of the sample. A structured questionnaire was designed to elicit the perceptions of the ERP users in T&L companies. The target sample of respondents were selected from the Kompass Company and Business directory and CASA⁴ website. The questionnaire was sent to 396 respondents of 132 companies comprising with Total Logistics Providers, Warehouse and Storage Site providers and Full Haulage Providers.

4.3. Data Analysis

Of the 396 questionnaires, 158 valid responses were received. These responses produced a total response rate of 39 percent which had surpassed the targeted overall response rate of over 20 percent for a valid assessment.

Microsoft Excel and IBM SPSS 22 software were used for the analysis. IBM AMOS 21 was used to generate the model in graphical format. The data collected on 5 point Likert scale in the questionnaire were used in the analysis to conduct the Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA).

EFA was conducted to identify the underlying relationships between measured variables of ERP and SC Performance dimensions. A Structural Equation Model

⁴ CASA- Ceylon Association of Shipping Agents

(SEM) was developed to elaborate the relationships among these constructs using CFA. IBM SPSS 22 was used in the data analysis and IBM AMOS 21 was used to generate the SEM graphically.

5. Results

Principal Component Analysis revealed the presence of three components of ERP dimensions with Eigen values exceeding 1: explaining 63.7% of the variance, and three constructs out of seven with Eigen value exceeding 1, explaining 30.5% variance.

Table 3: Factor analysis on ERP System dimensions

Dimension	Construct	Component		
		1	2	3
Integration	I2	0.902		
	I3	0.853		
	I1	0.719		
Transversality	T2		0.837	
	T3		0.837	
	T1		0.501	
Flexibility	F2			0.759
	F1			0.720
Eigen Values		2.138	1.749	1.216
% of Variance		26.725	21.867	15.204
Cumulative %		26.725	48.592	63.797

Table :4 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.588	
Bartlett's Test of Sphericity	Approx. Chi-Square	248.085
	df	28
	Sig.	0.000

*Items with factor loading <0.50 were deleted

Table 5: Factor analysis on SCP dimensions

Construct	Component
	1
S2	.787
S1	.776
S3	.750
S4	
S5	
S6	
S7	
% of Variance	30.579

Table 6: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy. (Acceptable level between 0.51 and 0.90)	0.513	
Bartlett's Test of Sphericity	Approx. Chi-Square	197.824
	df	21
	Sig.	0.000

Items with factor loading <0.50 were deleted. The factors with factor loadings>0.5 were only taken for the developing the structural equation model in CFA.

Table 7: Inter-Item Correlation Matrix

	Integration	Flexibility	Transversality	SC Performance
Integration	1.000			
Flexibility	.031	1.000		
Transversality	.050	.161*	1.000	
SC Performance	.150*	.008	-.047	1.000

*Correlation is significant at the 0.05 level (1-tailed).

In the ERP system, Integration ($r=0.15$, $p<0.05$) has a positive and significant correlation with SCP, Flexibility ($r=0.008$) has a positive but not significant correlation with SCP and Transversality ($r=-0.47$) has a negative but not significant correlation with SCP.

These results indicate that there is a significant relationship between ERP system and SCP.

Table 8: Path Analysis

Path	Standardized coefficient (β)	Critical Ratio	P- value
Integration → SC Performance	0.18	2.003	0.045*
Flexibility → SC Performance	0.057	0.23	0.818
Transversality → SC Performance	0.058	0.579	0.562

According to the model Integration ($\beta=0.18$, $p<0.05$) made the largest unique and statistically significant contribution to the equation, followed Flexibility with ($\beta=0.057$) and Transversality with ($\beta=0.058$) made contribution to the equation that is ($R^2 = 0.04$), whereas the whole model explains 4 percent of the variance in SCP. The analysis concludes that there is a significant relationship between Integration and Supply Chain Performance with a 95% confidence, while there is a relationship between Flexibility, Transversality with Supply Chain Performance.

6. Conclusion

The findings of this study imply that

- ERP systems provide Integration to share real time information across supply chains, to reduce data redundancy and to improve information quality.
- ERP systems provide Flexibility to take quick responses without a significant decrease in system performance and provide capacity to adapt to changing conditions while utilising existing resources.
- ERP systems facilitate Transversality, enhancing the process visibility across the supply chain, make information available along the supply chain and provide a platform to monitor events and activities so as to identify what actions need to be taken within company's supply chain.

Thus, it can be concluded that ERP system implementation helps organisations to achieve better SCP as ERP systems reduce order processing time, improve decision making and help in performing on time delivery of customer orders with the quick information flow.

7. References

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Keywords: *enterprise resource planning; supply chain performance; transport and logistics; information; structural equation model*