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MODELLING LINKAGES OF LOGISTICS PERFORMANCE IN THE SUPPLY CHAIN - A STUDY OF THE INDIAN TEXTILE INDUSTRY

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Abstract

Few attempts have been made, to measure logistics effectiveness, in the supply chain of manufacturing industries. In order to fill the void, the present paper proposes to conceptualize the role of logistics effectiveness, as a dimension of logistic performance, in the supply chain of the textile industry. A conceptual research model, determining linkages, amongst logistic effectiveness as a dimension of logistics performance and competitive capability and organizational performance, is proposed in the study. A structured questionnaire was administered to 113 respondents, from 65 Home Textiles enterprises, located across the country. Structural Equation Modelling (SEM) technique was used, to examine the relationships among the variables considered in the study. The paper presents a hypothesized model, proposing linkages of logistics effectiveness with competitive capability, leading to enhanced organizational performance. The study found that performance in enterprises can be enhanced, with the introduction of other explanatory variables like competitive capabilities.

Keywords: *Logistics Performance, Textile Industry, Competitive Capabilities, Organizational Performance.*

JEL Code: *M2, M20, M29*

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1. Introduction

In today's competitive world, as businesses seek to excel in performance by effectively managing the logistics, it can lead to developing new competencies, for achieving cost leadership and differentiation in the market place. In this scenario, managing logistics no longer remains an operational or tactical concern but becomes an integral part of a company's strategy to gain competitive advantage. A growing awareness, that competitive advantage comes from the delivery process as much as from the product, has been instrumental in upgrading logistics from its traditional back room function to a strategic boardroom function (Razzaque and Shang, 1998).

Further, the growth of Multi-National Companies (MNCs) led to designing of value-creation systems, that are in a position to utilize, worldwide resources and meet the demands of the global customers, thereby further accentuating the importance of logistic services in the firm (Fawcett et al., 2011). By definition, the logistics process, over its entire span, pertains to the flow of goods, services and information between, what the **Council of Supply Chain Management Professionals (2013)** calls, 'the point of origin' to 'the point of consumption', in order to meet the customers' requirements. Getting the product, at the right time, to the right place and at the lowest cost, is increasingly becoming the benchmark for defining competitive advantage.

A unique feature of the Indian textile and logistics landscape is that both sectors are highly fragmented, with a transport sector predominantly in the unorganized sector. These features impose incredible challenges on manufacturing competitiveness in the textile industry as businesses seek to despatch their merchandise to the market place. The growing recognition of the importance of logistics performance, has led many scholars to explore its linkages with organizational performance. Despite available evidence, doubts remain concerning the strength

of the direct linkage between logistics performance and organizational performance (Fugate, et al., 2010). Considering the above, there is a need to understand the effectiveness of logistics performance, as a key strategic resource differentiator, in acquiring competitive capability and impacting organizational performance in the overall supply chain.

2. Review of Literature

The evaluation of performance in an organization is a vital managerial function, as it is in relation to how a goal is met (Mentzer and Konrad, 1991). A goal is seen as being composed of both future attainments and an allocation of currently generated efforts (A.T.Kearney, 1985). Considering these aspects, performance measures play an important role in the management of any organization (Griffis et al., 2007). The importance of analyzing performance in the context of logistics was first shown in the work of Bowersox and Closs (1996). Later studies showed that the study of logistic performance is imperative in making an assessment of the achievements of the goals by an organization (Fugate, et al., 2010; Stank et al., 2003). The definition of logistics effectiveness was given by Mentzer and Konrad (1991), as "the extent to which goals are accomplished" and was also seen by them as "the ratio of resources utilized against the result derived". Fugate, et al., (2010) in a later work, argued for a simultaneous pursuit of Logistics Effectiveness, along with Logistics Efficiency and the newly developed concept of Logistics Differentiation (Langley and Holcomb, 1992). To gain insights into the level of discourse relating to logistics performance measurements, Thomas Hamilton (2015) reviewed logistics performance literature, in terms of Logistics Effectiveness, Logistics Efficiency and Logistics Differentiation and found that logistic effectiveness was a major component of logistic performance, engaging the attention of scholars and practitioners alike. Supply chain logistics, which used to be viewed as a cost cutting mechanism, is now being viewed as growth

drivers to open new markets, develop new products and respond to competitive threats (**Taylor and Paul, 2011**). Organizational performance is a multifaceted measure for analysing the outcomes of a firm's business strategy (**Khor and Mohamed, 2012**). A survey of the literature indicates that organizational performance has been understood as a mix of market and financial performance (**Flynn et al., 2010; Frohlich and Westbrook, 2001**). An additional measure, namely customer satisfaction, has been included in this research as literature shows its link with financial performance and overall organizational performance, by cultivating loyalty within the customer base (**Reichheld, 2009**).

A third dimension, examined in this paper, is the role that competitive capabilities can play, in augmenting the relationship between Logistics Effectiveness and Organizational Performance. Price/Cost, Quality, Delivery and Flexibility are commonly accepted in the empirical literature as important attributes of competitive capabilities (**Wong, W. P., & Wong, K. Y., 2011; Swink et al., 2007; Tracey et al., 1999**). The textile supply chain is a classic example of a buyer-driven value chain (**Gereffi, 2000**) and the business model is what **Bowersox et al., (2002)** term as response-based. In these models, production and delivery of goods start only after the receipt of an order. The clout, in the entire supply chain, spanning from fibre supply, yarn manufacturing, fabric weaving, processing, apparel/home textile, making up aggregators-retailers, is in the hands of the front- end completely (**Singhal, 2003**). A survey of the studies, undertaken in the context of Supply Chain and Logistics in the Textile and Clothing Sector in India, shows that they are limited and have essentially focussed on identifying performance measures (**Jakhar and Barua, 2012; Ramesh and Bahinipati, 2011**) and the need to adopt strategies in terms of the concept of Quick Response. **Anbanandam et al., (2011)** investigated the supply chain challenges in the Indian textile industry and called for effective measures to lower inventories, lower costs,

improve productivity. **Giri and Rai (2013)** suggest that the garment companies need to work on a zone of "strategic fit" between the product and the supply chain. However, there are very few studies, relating to supply chain/logistic practices in the textile and clothing sector in India and their impact on competitive capability and organizational performance of the firm. The present study seeks to fill the gap, by presenting a theoretical conceptual model, for evaluation of logistics performance as a focal construct, in terms of logistics effectiveness and its linkage with organizational performance through the prism of competitive capability.

3. Statement of the Problem

Effective logistic performance has been widely accepted as creating value for a product, by making it available to the right customer, at the right time, at the right place, in the right amount, in the right condition, at the right cost, with the right information (**Rushton et al., 2010**). There is thus a need to understand the linkages between the logistics effectiveness as a dimension of logistic performance and the outcomes of organizational performance and the contribution, if any, of competitive capability in enhancing this relationship, by empirically testing the results.

4. Need of the Study

Logistics is increasingly playing an important role in businesses as markets are becoming global and competition intensifies among the firms, to deliver quality products, at the lowest cost, in the shortest possible time, to specified locations. The textile value chain in developing countries like India is complex with extensive backward and forward linkages. Considering the complexity and challenges associated with this sector, logistic performance optimization becomes valuable for both the manufacturers and retailer. The study proposes to examine how far logistic performance be understood, in terms of logistic effectiveness in the performance of textile organizations, as a key differentiator in the overall supply chain.

5. Objectives of the Study

The main objectives of this study are:

- i. To study the linkages between Logistic Performance as understood specifically in terms of Logistics Effectiveness and Organizational Performance.
- ii. To study the linkage of Logistics Effectiveness as an element of Logistics Performance and Competitive Capability in an Organization
- iii. To study linkage between Competitive Capability and Organizational Performance
- iv. To develop a framework to analyze the linkages of Logistics Performance and Organizational Performance.

6. Hypotheses of the Study

The following alternative hypotheses were developed for the study.

H-1: There is a significant positive relationship between Logistic Effectiveness and Organizational Performance

H-2: There is a significant positive relationship between Logistic Effectiveness and Competitive Capability

H-3: There is a significant positive relationship between Competitive Capability and Organizational Performance

7. Research Methodology

7.1 Sample Selection

In this study, 570 Home textile manufacturing companies, duly registered with the Apex Registering Authority, recognized by the Ministry of Commerce, Government of India, comprised the population. The present study adopted the simple random sampling technique. This method is considered appropriate when the population size is small and the preparation of a sampling frame does not create a problem (Chawla and Sondhi, 2011).

7.2 Source of Data

Respondents comprised Logistics Managers, Export Executives and CEOs,

numbering around 113, representing 65 Home Textile manufacturing companies across the country. Such high level managers were targeted, in the belief that they would be intimately aware of their organization's supply chain function and strategy and the logistics needed to achieve company goals.

7.3 Period of Study

Data were collected, over a period of 9 months and the period of the study was from April 2013 – March 2014.

7.4 Tools used for the Study

Primary data were collected, by using a structured questionnaire and personal interviews. Secondary data were also collected, using annual reports, trade literature and industry data base. Data were analysed by SPSS software and AMOS.

8. Data Analysis

This section deals with the reliability and validity analysis, developing the structural equation model and testing of the hypotheses.

8.1 Reliability and Validity Analysis

Reliability and validity analysis of the instrument, through which the data were collected and compiled, is an important step before the data analysis. Composite Reliability (CR) should be greater than 0.7 and Average Variance Extracted should be greater than 0.5. Average Variance Extracted should also be greater than the Maximum Shared Variance (MSV) (Fornell and Larcker, 1981). The range of CR in the study was from 0.770 to 0.980, which was more than 0.7. The range of AVE was from 0.506 to 0.960, which was more than 0.5. For all the constructs, the AVE was higher than MSV. The Cronbach's Alpha was also above the accepted value of 0.70. Thus, the analysis indicated that all the values were within the range of accepted values. Hence the instrument was found to be reliable and valid (Table-1).

8.2 Structural Equation Modeling (SEM)

Structural Equation Modeling (SEM) was the main data analysis method, used in this research. SEM is a multivariate, statistical technique, largely employed for studying relationships between latent variables (or constructs) and observed variables that constitute a model (Qureshi and Kang, 2015). It is a rigorous and powerful statistical research technique that can easily assess validity and rigorously test the hypotheses (Anderson and Gerbing, 1988).

8.3 Model Fit Indices

Evaluation of model fit is an important step in the SEM analysis. Accordingly, goodness-of-fit indexes, including chi-square statistics, the Root Mean Square of Approximation (RMSEA), Goodness of Fit Index (GFI), Comparative Fit Index (CFI), and Standardized Root Mean Square Residual (SRMR). All fit values, namely, Goodness of Fit Index and Comparative Fit Index, Adjusted Goodness of Fit Index (GFI, CFI, AGFI), should be more than 0.9. Further, all error values, and practical fit indexes like Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR) should be less than 0.1 for a good model fit (Hair et al., 2009). Table-2 shows all values to be above the accepted values, thus showing a good fit (GFI = 0.976, CFI = 0.997, SRMR=0.0375, RMSEA=0.043).

8.4 Hypotheses Testing

All hypotheses were tested after the construction of the SEM Model. The path coefficients, testing the relationships between the latent variables in the structural model, are displayed in Table-3. In terms of the support for the three hypotheses, it is established that Logistics Effectiveness recorded a positive relationship with Organizational Performance, as the regression weight was 0.28, with 't' value of 1.93 and the relationship was significant at 0.1 level. Thus, Hypothesis-1 (H-1) was

accepted. The relationship between Logistics Effectiveness and Competitive Capability, was also found significant, at 0.05 level, with a regression weight of 0.44 and 't' value of 2.14. Hence the Hypothesis-2 (H-2), stating that there is a significant positive relationship between Logistics Effectiveness and Competitive Capability, was also accepted. Hypothesis-3 (H-3), stating that there is a significant positive relationship between competitive capability and Organizational Performance, was also accepted as the relationship was found to be significant, at the 0.01 level, with a regression weight of 0.47 and 't' value of 3.61. The R² value results, as shown in Table-4, indicated that logistic effectiveness could explain 38% of the total variance of competitive capabilities. Similarly, logistic effectiveness and competitive capabilities could explain 56.5% of the variance of organisational performance. Considering the limited number of variables involved, the proposed structural model was found to be effective and all the three alternate hypotheses were accepted.

8.5 Comparison with Alternate Model

An alternate model was also estimated, by removing the link between the logistic performance, measured as logistic effectiveness and competitive capabilities. At one degree of freedom for $p=0.05$, the chi square difference must be more than 3.84, but, at 5% level of significance, the rival model was a poorer fit than the proposed model (Anderson and Gerbing, 1988). As shown in Table-5, Chi-square difference, between the proposed model and alternative model, was 6.20 at $p<0.05$ level. As this value was more than 3.84, at 5% level of significance, the rival model was proved to be a poorer fit than the proposed model. Hence the earlier model was accepted.

9. Findings of the Study

There are several notable findings in this study. The suggested model articulates the significant effects of different essential variables

that had received marginal attention in the past studies. In this sense, the model, proposed in this research, was totally new in comparison with the former studies done on any such model / models. Thus, the analysis showed that the model proposed in the paper has greater methodological rigour and can be used as a framework for understanding the relationship between the dimension of logistic effectiveness and competitive capability and organisational performance. It also revealed that logistic effectiveness can significantly impact organisational performance through the prism of competitive capability.

10. Conclusion

The present study advances, research on Logistics Performance, by developing a model and providing empirical evidence, to explain the effects of logistics effectiveness on organizational performance and the mediating effect of competitive capability on this relationship. Relying on the Resource Based View (RBV), this study developed a novel approach to enhance the organizational performance. The mediating effect of competitive capability on logistics performance, was clearly demonstrated in the structural path analysis. Merely being in possession of tangible assets like logistics services, is not adequate. Management must know how to leverage them to their advantage. Findings from this study can provide guidelines for managers, to direct their management actions, on improving capabilities through logistics performance.

11. Suggestions

The results suggest that conceptual arguments, linking logistics effectiveness, competitive capabilities and organizational performance, are valid. A contributing point of this study is that by expanding competitive capabilities, logistic effectiveness can enhance organizational performance. On a practical front, the findings of this study show that managers need to understand that the limited resources, available to organizations, need to be deployed in a manner as to enhance competitive capability.

Developing logistics effectiveness, to deliver products quickly to the customers, customizing product lines and delivering new products, in a competitive manner, will expand capabilities and enhance performance.

12. Limitations of the Study

An important limitation of this study was that the data were based on managerial perceptions. Although most respondents were senior executives and the questions were well designed and clear, bias arising from respondent subjectivity and misunderstanding was a possibility. Further, the sample size was small and restricted to a segment of the textile industry. The study also did not account for the views of customers on logistics effectiveness.

13. Scope for Future Research

The theoretical construct, so developed, can be used to study logistic practices in other sectors like Pharma, FMCG, and E-Commerce. Because the survey data were collected only from manufacturers, future studies can broaden the scope, by collecting data from various service providers. Future studies should also seek a deeper understanding of logistic performance, as a second order formative concept as most of the studies including the present one, rely on first order reflective attributes.

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Table-1: Reliability and Validity Analysis

Constructs	Composite Reliability (CR)	Average Variance Extracted (AVE)	Maximum Shared Variance (MSV)	Average Shared Variance (ASV)
Logistic Effectiveness (LEF)	0.854	0.506	0.206	0.108
Competitive Capability (CC)	0.870	0.700	0.689	0.428
Organizational Performance (OP)	0.980	0.960	0.711	0.442
Cost Leadership (CLE)	0.810	0.590	0.533	0.273
Customer Service (CS)	0.77	0.560	0.549	0.410
Organizational Flexibility (OFL)	0.960	0.900	0.711	0.499
Financial Performance (FNP)	0.880	0.660	0.559	0.367
Customer Satisfaction (CSN)	0.830	0.610	0.533	0.364
Market Performance (MKP)	0.780	0.540	0.531	0.332

Source: Primary Data (output of AMOS/SPSS)

Table-2: Model Fit Indices

x ²	x ² /df	p-value	GFI	CFI	SRMR	RMSEA
9.689	1.211	0.288	0.976	0.997	0.0375	0.043

Source: Primary Data (output of AMOS)

GFI: Goodness of Fit Index **CFI:** Comparative Fit Index **SRMR:** Standardized Root Mean Square Residual
RMSEA: Root Mean Square Error of Approximation.

Table-3: Path Coefficient Testing the Relationship between Latent Constructs

Hypothesis	Positive Hypothetical Path	Standardised Weight	't' value	'p' value	Hypothesis Test
H ₁	LEF → OP (H ₁)	0.28	1.934	0.1 ⁺	Supported
H ₂	LEF → CC (H ₂)	0.44	2.14	0.05*	Supported
H ₃	CC → OP (H ₃)	0.47	3.67	0.01**	Supported

Source: Primary Data (Output of AMOS)

z Significance at 0.1 level * Significance at 0.05 level ** Significance at 0.01 level

Table-4: Squared Multiple Correlation (R²) for Latent Variable

Construct	Squared Multiple Correlation
Organisational Performance	0.565
Competitive Capabilities	0.38

Source: Primary Data (Output of AMOS)

Table-5: Comparison of Proposed Model with Alternate Model

	Chi-square	df	Chi-sq. diff.	SCDTs p<0.05
a) Proposed Model	9.689	8		
b) Remove the link				
Logistic Performance → Competitive Capabilities	15.889	6.200	1.000	significant

Source: Primary Data (Output of AMOS) SCDTs: Sequential Chi-square Difference Tests