Modeling Supply Chain Performance: A Structural Equation Approach

Rajwinder Singh, School of Management Studies, Punjabi University, Patiala, Punjab, India
H. S. Sandhu, Department of Commerce and Business Management, Guru Nanak Dev University, Amritsar, Punjab, India
B. A. Metri, Management Development Institute, Gurgaon, Haryana, India
Rajinder Kaur, Department of Management Studies, Malout Institute of Management and Information Technology, Malout, Punjab, India

ABSTRACT

Supply chain management (SCM) has become an effective tool now a day to survive in this competitive world. Organizations do their best to improve performance by adopting better supply chain (SC) performance indicators. In this paper 19 key performance indicators (KPI) were identified based on strong literature support in consultation of practitioners and consultants in the field of non-livestock retailing (NLR). NLR is the retailing of agriculture and horticulture products. The technique of factor analysis using principal component analysis with Varimax rotation has classified KPI into four factors as: inventory metrics, customer metrics, flexibility metrics and growth and learning metrics. Structural Equation Modelling (SEM) approach was used to develop and validate a model for measuring SC performance of organized NLR industry based on KPI. The data for analysis was collected from top 10 organized NLR players operating in Punjab, Chandigarh, New Delhi and Gurgaon in India. The results were subjected to rigorous statistical tests for reliability and validity. Finally, these classified KPI were presented in the form of a model to measure SC performance of organized NLR industry using SEM.

Keywords: Assessment of Performance Measures, Competitive Advantage, Key Performance Indicators (KPI), Non-Livestock Retailing (NLR), Organizational Performance, Structural Equation Modeling (SEM), Supply Chain Management (SCM), Supply Chain Performance Metrics

INTRODUCTION

Non-Livestock Retailing (NLR) is defined as the sale of agriculture and horticulture products directly to the consumers in small quantities. The success of NLR industry shall be monitored by selective sets of key performance indicators (KPI) to measure supply chain (SC) performance. This is due to the reason that intense market competition has shifted to SC vs. SC competition. Also, providing a long list of KPI shall overload the managers resulting in

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inefficiency. Hence, measuring supply chain performance (SCP) is one of the key managerial tasks associated with wide range of activities of planning, organizing, motivating the workforce and controlling events.

Saad and Patel (2006) classified the SCP measurement literature in four phases. The first phase (Early-1980s) focused on stock return and production cost. This approach was criticized due to consideration of financial indicators only. The critics argued that focus on financial indicators only, are a short-term thinking for the organizations (Hayes & Garvin, 1982; Kaplan, 1983). The second phase (Late-1980s) focused on throughput time and physical cost. The criticism of second phase performance measures continued due to lack of human elements (Clinton & Hsu, 1997; Upton, 1998). The third phase (Early-1990s) concentrated on market share and total cost; again this phase failed to address soft issues. The fourth and last phase (Late-1990s) identified customer satisfaction and value added as SCP measures. These phases not only indicate the shift from financial measures to non-financial measures but also indicate the need to develop a better SCP measurement system.

An effective SCP measurement system plays an important role to diagnose the problem but, the selection of right KPI is a challenging task. In the early stage of high technology organizations, managers focus on reliability, speed and efficiency. Whereas in the different stages the KPI are also different i.e. in growth stage-market share; maturity stage-industries price, production cost and capacity utilization; and in the decline stage/aging stage-respective cash flow metrics are used (Bhasin, 2008). Here, it is pertinent to mention that organized NLR in India is in the growth stage so; developing a SCP measurement model shall be applicable to this segment of the industry as a whole.

The food and grocery retailing is one of the emerging sector in India having the market share of 59.5%. However, organized retailing shares only 1.1% of the total food and grocery retailing. It is generally seen that major retailers regularly open retail stores and after some time some of them get closed. This problem has attracted the attention of many academicians and researchers to find solution for the same. During discussion with the retailers and academicians it was identified as a SCP failure. The reason for performance failure was unavailability of an effective SCP measurement model for organized NLR. So, the need was identified to develop a SCP measurement model by selecting limited KPI and arranging them. In this research the relationships among KPI was developed and validated using structural equation modeling (SEM). Here, it is pertinent to mention that the techniques like: factor analysis, correlation, regression etc. shall test, single relationship at a time however; SEM shall be used to test multiple relationships at a time. Keeping in view the advantages of SEM over other techniques it was used to develop and validate the model for measuring SCP of organized NLR.

The remainder of this paper is organized as follows. The second section presents KPI used in this sector based on strong literature support in consultation of practitioners and consultants in the field of organized NLR. The third section focuses on assessment of KPI. The fourth section highlights the classification and location of KPI. The fifth section focuses on database and research methodology. The sixth section focuses on discussion and limitations. In the last section we concluded the results and future research space has been discussed.

**KEY PERFORMANCE INDICATORS**

Measuring SCP leads to informed decision making to track and tracking of efficacy and efficiency failure. It leads to more informed decision making with regard to chain organization. The aim of implementing a performance measurement system (PMS) is to improve corporate performance. Venkatraman and Ramanuja (1986) identified corporate performance as financial performance and operational+financial performance. Lin et al. (2005) identified three dimensions of corporate performance as; prod-
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