Chapter 2

Information Technology Implementation Prioritization in Supply Chain: An Integrated Multi Criteria Decision Making Approach

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ABSTRACT

The increasing rate of technology growth has resulted in decrease in cost of information. These technologies are helpful in coordinating the activities resulting in effective management of the supply chain. Literature shows that the use of Information Technology (IT) plays an important role in managing the processes of SCM. This has resulted in increasing use of IT in SCM. The computerization of SCM processes, if implemented in one go may result in failure. IT implementation prioritization in supply chain is a major issue before the planner as there is no clear cut formula to solve this problem. This paper considers components of SCM like material management, purchase management, production management, logistics and distribution and customer interface for IT implementation prioritization. Two multi-criteria decision making methods (MCDM) viz. analytical hierarchy process (AHP) and a technique for order preference by similarity to ideal solution (TOPSIS) are used in this paper. The novelty of the paper lies in integration of AHP and TOPSIS methods for IT implementation prioritization. The weights of the criterions and the alternatives are calculated using AHP method which is used as an input for TOPSIS analysis for prioritization of IT implementation.

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INTRODUCTION

One of the key ingredients for business survival in today’s dynamic and eclectic business scenario is information technology (IT). The IT application helps the organizations in becoming more competitive and is an essential ingredient for business survival. Information technology, in any form, has its own inherent tendencies and influences the nature and direction of organizations. It has significantly changed supply chain processes across different organizations and, in many cases, improved competitiveness (Singh et al., 2007). Thompson (1998) discussed physical supply chain and the financial supply chain which exist virtually in all forms of commerce. More recently, Rahman (2004) discussed the information supply chain. The efficiency of supply chain can be improved using the advanced information technology. In the present scenario the ability to effectively manage information within the firm has become critically important because it provides a competitive advantage. It is therefore not surprising that many firms have begun to develop strategies, focusing on using information technology as a resource to facilitate the effective collection and utilization of information (Bharadwaj, 2000).

The rapid development of information technology and the internet, together with the emerging trend towards global logistics systems has prompted an increasing emphasis to be placed on the circulation function of the supply chain (Sanders & Premus, 2002; Trappey et al., 2004; Rahman, 2004). Narasimhan and Kim (2001) proposed that Earl’s classification not only was applicable to the internal value chain of a firm, but could also be extended to the company’s supply chain, linking suppliers, and customers. Several studies have examined the impact of information technology on the supply chain (Byrd & Davidson, 2003; Kearns & Lederer, 2004). Liao et al. (2004) indicated that the effect of implementation of IT functions on a business becomes a critical issue not only theoretically but also in practice. A good control policy must be beneficial for the whole supply chain. The aim of control is to optimize some performance measure, which typically comprises revenue from sales (Saharidis, 2009).

Prior to the 1980s, a significant portion of the information flows between functional areas within an organization and between supply chain member organizations were paper based. In many instances, these paper based transactions and communications were slow, unreliable and error prone. Bowersox and Closs (1996) emphasized on timely and accurate information for American Business. In fact distorted information creates lot of confusion and misbalance the whole chain, form suppliers to end customers. This is in fact boosted the requirement for accurate and timely information.

The paper considers a smelter plant of a company named XYZ which is the largest manufacturers of aluminum in India for the study. Five processes of the plant viz. customer interface, purchase, logistics, production and materials management are considered for the IT implementation prioritization. Two methods multi-criteria decision making methods (MCDM) viz. analytical hierarchy process (AHP) and technique for order preference by similarity to ideal solution (TOPSIS) are used in the paper. The weights of the criterions and the alternatives are calculated using AHP method which is used as an input for TOPSIS analysis. So the paper attempts to demonstrate an integrative method to prioritize various processes for IT implementation.

NEED FOR INFORMATION AND TECHNOLOGY

Every supply chain has an information chain that parallels the flow of products (Andel, 1997). If the information is not relayed at the right time to the right place, there will not be any purchase order, no shipment messages, no payment, no coordinated marketing and sales efforts, and the supply
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