Chapter 19

Cost Framework for Evaluation of Information Technology Alternatives in Supply Chain

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ABSTRACT

Organizations are often facing the problem of determining the degree of investment in building information links with their suppliers and buyers to reduce costs, lead times, and quality problems, improve timely customized delivery, increase asset utilization, and improve corporate profitability. One of the critical enablers for an efficient and effective supply chain is timely planning and information processing across the entire value-added chain. This paper presents an analytical model for selecting the right mix of analytical software and hardware alternatives at various planning and execution levels of an organization to remain competitive in a supply chain. Factors such as quality, reliability, flexibility, timeliness and organizational compatibility have been quantified into cost components that form the weighted cost function. The weights of the various cost components of software and hardware are derived from pair-wise comparison. These weights account for the relative importance of alternative supply chain strategies for an organization. A numerical example is presented to demonstrate the applicability of the proposed framework and exhibit the efficacy of the procedures and algorithms.

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1. INTRODUCTION

Survival of organizations in today’s global competitive business environment demands better information flow together with easier and timely access to required information (Lau & Lee, 2000). Information integration across the functional areas of the organization is said to be a very important factor in achieving effective supply chain management (SCM). Many organizations are currently investing in new information technology (IT) systems in order to design and operate supply chain networks (Talluri, 2000). Prahalad and Krishnan (1999) argue that software applications are rapidly emerging as the company’s “digital nervous system” and the software is increasingly determining the nature of the experience customers, employees, trading partners and investors have with the company. However, they also identified the potential problems that can occur when systems are incompatible and commented that trading knowledge becomes almost impossible when systems are not compatible. Despite the unprecedented advances in information technology, the quest for effective solutions to deal with corporate issues in terms of organizational structure, human resources, supply chain strategy and business process, still remains as a daunting task amongst practitioners and academicians. Information is converted into knowledge by means of the analytical IT, which is the basis for decision-making (Shapiro, 2001). Organizations have been investing heavily in building information links with their suppliers and buyers to reduce costs, lead times, and quality problems, and improving timely customized delivery without fully considering the degree to which this investment is justified.

The conventional justification approaches that are purely based on accountancy frameworks lose much of their relevance in the acquisition of IT for SCM. Instead, intangible long-term factors such as flexibility, organizational compatibility need to be incorporated in the selection of IT for coordinating the supply chain. Most of the reports on IT acquisition in organizations project a difference in the pre-implementation and post-implementation costing structure of up to 50% (Strassmann, 1990). This is primarily because of the failures to consider the indirect costs associated in the pre-implementation stages. Hence, any evaluation model demands an integrated approach by considering various direct and indirect costs associated with software and hardware in the supply chain. Furthermore, technology affects every link in the supply chains and its potential benefits can only be realized if it is compatible with the organizational infrastructure. In order to acquire appropriate technologies for effective design and operation of its supply chain, it is necessary for an organization to consider the appropriate mix of information technologies at strategic, tactical and operational planning levels. The proposed model is an attempt to evaluate alternative technologies and invest in those technologies that most closely meet the goals of the company incorporating costs, quality, flexibility, compatibility, and time. The measurement of these factors is considered as fundamental in the success of SCM endeavors because they represent competitive priorities in which companies must achieve excellence (Talluri, 2000).

We propose an analytical model for the evaluation of analytical software and hardware alternatives in the context of supply chain. We define IT into two components: Hardware and Software. Hardware refers to the physical means of carrying out the tasks to achieve objectives or goals whereas software is a set of rules, guidelines, and algorithms necessary for using the hardware; know how. There are various software providers for different levels of planning mostly calling themselves enterprise systems applications providers like SAP, IBM, Microsoft, etc. (Lapide, 1998).

The remainder of this paper is organized as follows: The second section presents literature review followed by problem description and mathematical modeling framework in the section three. The section four provides an illustrative example. The last section concludes along with the future research directions.