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Supply chain reengineering using a core process analysis matrix and object-oriented simulation

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Abstract

To satisfy and respond quickly to customers' demand, many companies are now aggressively focusing on supply chain management in order to strengthen their competitiveness. This paper proposes an integrated business process reengineering (BPR) framework for improving performance. There are several steps in this framework: creating vision, identifying core processes to be redesigned, analyzing current core processes, designing for innovation, evaluating the new processes, selecting the best, and transforming and implementing the resulting design. A core process analysis matrix is proposed for identifying the critical processes. System simulation is useful in measuring the performance and predicting the effect of change on the system. To reduce the risk of BPR, an object-oriented simulation framework is developed for evaluating and analyzing the reengineering proposals. This paper uses a case study to show the value of the method. © 2002 Elsevier Science B.V. All rights reserved.

Keywords: Supply chain management; Business process reengineering; Strategic alliances; Object-oriented simulation

1. Introduction

Today, companies face severe competitive challenges. The agility of a company's response to customer demand has been recognized as a critical success factor in meeting competition. Supply chain management (SCM) is an effective way to do this. The scope of a supply chain depends on the number of firms involved.

Stronger and more sophisticated customer demands, increasing competitive pressure, and the ever-changing market environment are forcing companies to rethink the way they perform operations. One modern management strategy is business process reengineering (BPR). A number of similarities exist between BPR and SCM [10]. Both need fundamental rethinking and consideration of strategies and are process-based; also they generally reduce the duration of the processes. Of course, information technology is used as a catalyst for both. Supply chain reengineering aims to overcome the uncertainty associated with various aspects of the chain, including the changing needs and demands of customers, the quality of the information, and inherent delays that affect purchasing and ordering decisions.

2. Supply chain management and business process reengineering

BPR is "the fundamental rethinking and radical redesign of an entire business system—business

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processes, job definitions, organizational structures, management and measurement systems, values and belief—to achieve dramatic improvements in critical measures of performance (cost, quality, capital, service, speed)'' [15]. Davenport and Short [8] regard business process redesign as ''the analysis and design of work flows and processes within and between organizations.''

A great number of BPR methodologies have been presented [21,29]; most of them involve a series of procedural stages, including envisioning, identifying processes, evaluating processes, designing, and implementing, etc. [8,14]. In the context of BPR evolution, Stephens et al. [25] say that BPR passes through three stages. Stage 1 is department focused; enterprise-wide solutions are emphasized at stage 2; and the efforts are supply chain focused to go outside the organization in stage 3. Due to the high risk of BPR, Kim and Kim [20] use a computerized simulation method of BPR model to estimate changes.

SCM is defined in many ways [3]. The International Center for Competitive Excellence defined it to be [7]: ''... the integration of business processes from end user through original suppliers that provides products, services and information that add value for customers.''

The supply chain can be regarded as a business process to construct enterprise-wide schemes [5]. Hewitt [16] believes that the supply chain is of particular interest, because it is regarded as 'core' or 'strategic' within the overall enterprise process. A number of researchers have presented methods for supply chain redesign [4,17]. Stevens [26] addressed a supply chain integration model, Abrahamsson and Brege [1] focused on structural changes on supply chain of a single firm, Towill [27] used systems dynamics modeling, analysis, and simulation to develop a methodology for supply chain reengineering.

3. Inter-organizational relations

Recently, more companies have joined inter-organizational relationships to cooperate by sharing either market or resources to enhance their competitiveness and better to service customers. The relationships occur in several ways such as strategic alliances, partnerships, joint ventures, cooperative agreement, outsourcing contract, network organizations, and coalitions.

3.1. Virtual organization

In a virtual organization, complementary resources exist in a number of cooperating companies; they support a particular product effort for as long as it is a profitable endeavor. Business Week defined a virtual company or organization as a new model that uses technology to link people, assets, and ideas dynamically. It is ideal for cooperation between companies. However, a number of factors must be addressed to implement a virtual organization: opportunism, excellence, technology, no borders, and trust.

One of the advantages of forming a virtual organization (VO) is its flexibility [19,22]. The ability to respond quickly is a critical goal. Goldman et al. [12] say that a virtual organization provides for three major needs of agile competition:

1. Creation or assembly of new production resources *very quickly.*
2. Creation or assembly of new productive resources *frequently* and *concurrently.*
3. Access to a wider range of world-class competencies

Williams [30] suggested that there were four types of inter-organizational relationships: hierarchical, solar, centreless, and swingle (sic).

Besides the transformation of organization and management structure, the technology which enables the realization of VO is IT. The collaborative advantage of VO is based on the performance of complex activities conducted frequently and concurrently. Accordingly, the introduction of a VO cannot be successfully implemented in companies without advanced information systems and extensive use of computer networks.

3.2. Strategic alliances

Strategic alliances provide a number of advantages, including faster market penetration, sharing of financial risk, possibilities of technology transfer, and increased production efficiencies [24]. Kanter [18] concluded that the best inter-organizational relationship to promote collaborative advantages tends to