Available online at www.sciencedirect.com
SCIENCE DIRECT®
Int. J. Production Economics 98 (2005) 41–55
international journal of production economics
www.elsevier.com/locate/dsw

Supply network dynamics as a source of new business

Ari-Pekka Hameri[a,*], Antti Paatela[b]

[a]Business School of Lausanne, Ecole des Hautes Etudes Commerciales, University of Lausanne, BFSH-1, CH-1015 Lausanne, Switzerland
[b]Helsinki School of Economics and Business Administration, Runeberginkatu 14-16, P.O. Box 1210, FIN-00101 Helsinki, Finland

Received 6 October 2003; accepted 16 September 2004
Available online 11 November 2004

Abstract

Supply networks where operational control extends well over organizational boundaries have emerged in industries producing relatively complex and customized products with tight profit margins. Products like ships, automobiles and telecommunication systems incorporate complex design and engineering skills that are produced through a tier-structured, multi-level supply networks. Efficiency in these networks has stemmed from specialization and cost efficiency in individual value adding operations. This paper demonstrates how supplier networks have evolved and how the inherent dynamics of these networks generate constantly new business opportunities for fast moving companies with a clear focus on operational efficiency. We use action research methodology on cases from the shipbuilding and constructions industry to document some of the dynamic features of supply networks. This insight is then applied to the electronics manufacturing services business to explain the fundamentals of successful operations in this highly competitive business with ever narrowing margins. In this dynamic market of contract manufacturing companies with constant focus on the reduction of production lead times by incorporating value added operations either physically or logically to maintain and recreate profitable business. To succeed in doing this, issues related to industrial parks, local tacit knowledge and reverse/repair logistics must be managed in cross-organizational manner. We conclude that there is an ever-changing limit to the expansion of supplier networks through specialization and cost efficiency, and that at one point contracting and integrating parts of the supply network will create operationally outperforming business models that further boost the inherent dynamics of supply networks.

Keywords: Lead time; Operations management; Supply networks; Supply chain management; Contract manufacturing

1. Introduction

Improving productivity through the reduction of process lead times is a well-established fact in manufacturing studies. The faster the value-adding process the more efficient the manufacturing unit. These benefits stem from reduced capital bound to

*Corresponding author. Tel.: +41 21 692 3460; fax: +41 21 692 3495.
E-mail addresses: ari-pekka.hameri@hec.unil.ch (A.-P. Hameri), pa2@iki.fi (A. Paatela).

0925-5273/$ - see front matter © 2004 Elsevier B.V. All rights reserved.
doi:10.1016/j.ijpe.2004.09.006

operations, uniformity in output, i.e. low variation and therefore outstanding quality, together with improved capability to react on market fluctuations. At the same time increased specialization has directed companies to focus on their core operations and competencies with the evident aim to be cost efficient and innovative in an ever-narrowing technical know-how and product offering. Producing value to the end-customer has become more and more a joint effort that takes place in company networks, where flexibility and fast response to demand changes are crucial for survival. The more complex the products to be produced the more collaboration with suppliers and partners is required. What will follow in this paper is based on the two fundamentals and challenges of operations management: lead time reduction and management of multi-tier supply chains.

The benefits of lead time reduction have been well documented and grounded in mathematical principles forming the foundations of operations management (Hopp and Spearman, 1996; Suri, 1998). These principles explain the relationships between lot sizes, utilization and lead time. In addition, when variation in lead times is introduced to the system, the principles predict its negative impact on operational performance and output of the process. Various operations management approaches have also focused on lead time reduction. Perhaps the best known is the 1980s Just-in-Time movement with its emphasis on inventory and waste reduction in general; yet it still had a strong impact on lead time reduction and well-documented processes to reduce capital bound to operations (e.g. Hall, 1983; Schonberger, 1982; Womack et al., 1990). This was accompanied by optimized production technology, which spotted bottlenecks as the limiting resource for total output of the system (Goldratt and Cox, 1984). In the 1990s the time-based competition was winning ground (Stalk and Hout, 1990), after which arrived agile and lean manufacturing (Womack and Jones, 1996). The underlying aim of the above-mentioned approaches to improve productivity has focused in one way or another on the reduction of process lead times. The mathematical principles are clear and simple and most successful changes in manufacturing processes, be it cell production, preventive maintenance, product layout, focused factories, set-up time reduction, etc., can be traced down to their favorable impact on lead times.

More and more of the end-product value is delivered through a tier-structured supplier network with multiple connections to other value networks (Williams et al., 2002). Reduction of lead times has direct implication on the overall performance of the supply chain (Lee et al., 1997). Since Forrester's (1961) nonlinear simulations on information and delivery delays in supply chains, which helped us to understand information distortion and order batching leading to ever longer lead times and inventory build up, the importance of supply chain management has been continuously increasing. Partnering with suppliers, which was already emphasized by the JiT approach, instead of keeping them at arms-length has become more popular; yet the practices vary and should depend on the concerned industry and on the products made and delivered (Bensaou, 1999). At the same time companies are increasingly focused on their core competencies and aim toward scale and low costs in their operations. Along this development the emergence of even more structured supply networks have boosted the trend toward more modular product design (Schilling, 2000; Garavelli, 2003). Supply networks have clustered around certain technologies and services, which are consumed by one or several industries. Boundaries between companies are becoming transparent and focus is on the management of strictly defined interfaces, while leaving the modules and their internal workings to be managed autonomously by the supplier (Ashkenas et al., 1995). Supply networks show emergent behavior with all characteristics of a complex adaptive system (Choi et al., 2001; Chung et al., 2004), and therefore their management is difficult, especially if information delays exist and lead times are long and variable. At the same time new networking technologies are easing this structural transformation of supplier networks (Frohlich and Westbrook, 2002).

Based on the above literature and many documented accounts by the practitioners, indus-