Electronic Broker Impacts on the Value of Postponement in a Global Supply Chain

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INTRODUCTION

As global sourcing increases (Kotabe, Murray & Javalgi, 1998), decisions about supply chain design become more complex. For multi-national corporations with international product lines and supply chains, the careful designation of vendors, services and components, timing and transportation has continually broadened to include an ever-enlarging landscape of contingencies and alternatives. Further magnifying the scope of this task is the rapid deployment of Information Technology, which has lowered transaction costs (Williamson, 1975) and raised flexibility in global sourcing operations. Thus, increases in global sourcing requires that the stream of research involving issues of supply chain management must necessarily continue to grow.

The use of information technology is an important research issue for global supply chain management. A supply chain involves a sequence of organizations, each fulfilling some function, as part of an overarching process of providing value to the customer. Increasingly, customers are pressuring suppliers to reduce costs and increase quality. Such pressures are being felt by each organization within a supply chain. At the same time, reduced transaction costs have enabled the formation of global supply chains. Yet, coordination is more problematic in a global supply chain. To support the interactions among globally distributed organizations, information strategies and information technologies have become critical issues.

To date, supply chain management has already received some considerable attention. Beginning with early research on channel structure (Bucklin, 1965; Dixon & Wilkinson, 1986) and coordination (Gaski, 1984; McGuire & Staelin, 1986), the scope of supply chain considerations has
broadened to include, for example, communication strategies in supply chains (Mohr & Nevin, 1990), multi-market coordination issues (Anand & Mendelson, 1997), as well as material management concerns (Lee & Billington, 1992). Global supply chain management considerations now reach across the personal computer industry, clothing, and the automobile manufacturing industry, to name a few (Feitzinger & Lee, 1997; Fisher, Hammond, Obermeyer & Raman, 1994; Fuller & O’Conor, 1998). And the role of information technology is now recognized as an important and valuable component of supply chain effectiveness (Malone & Crowston, 1994).

Of particular interest in this paper is the role of information technology in delayed product differentiation in a global supply chain. The value of delayed product differentiation was originally posited by Anderson, who suggested that demand information might be used later in the distribution channel where it was presumed to be more accurate to guide the form, identity and distribution of products. This stream of research has continued, so that recently Lee and Tang (1997) have modeled the costs/benefits of redesign strategies for delayed differentiation, and Anand and Mendelson (2000) have modeled delayed differentiation in a supply chain to analyze the effects of information in postponement strategies.

In this paper, we employ a simulation approach to analyze the impact of an electronic broker (Elofson & Robinson, 1998; Robinson, 1997) on the value of postponement in a supply chain (defined as the difference in profits between early and late product differentiation). We focus on the impact of an electronic broker because it increases the precision of demand information, and in doing so may affect postponement strategies in the distribution channel. We assume that the organizations in the supply chain are distributed; however, the results also apply to geographically localized supply chains that have time delays in their channels. This paper is organized as follows: In the next section, we discuss the issues related to delayed product differentiation. In the following section, The Electronic Broker Model, we describe our electronic broker model, called a customer mass-production broker. In Impacts of an Electronic Broker, we list hypotheses that are later tested. In Methodology, we discuss the methods we use to test our hypotheses, the use of simulations as well as the benchmarking of our model. In Experiments, we present the results of our study. Finally, in the Discussion section, we discuss the implications of our research findings.

THE VALUE OF POSTPONEMENT

Demand uncertainty is increasing in a number of markets. Because of increased product proliferation, diminished lead times, global differences in product specifications and preferences, the requirements for firms to produce more product variations with less forecasting information are increasing. Anand and Mendelson point out that these developments are particularly salient for fast clock-speed industries such as hi-tech, as well as industries with long production and lead times such as the fashion industry (Anand & Mendelson, 2000). Product proliferation has a large impact on hi-tech industries because quickly diminishing value of inventories makes managing the supply chain through maintaining large amounts of safety stock highly expensive. In the case of the fashion industry, long production lead times require that the creation of clothing is done before sufficient demand information is available for making style decisions that are compatible with the upcoming seasons.

One consideration in obviating the demand uncertainty problems associated with the above examples is known as postponement, or delayed product differentiation (Shapiro & Heskett, 1985; vanDoremalen & Flueren, 1991; Zinn & Bowersox, 1988; Zinn, 1990; Lee & Tang, 1997). Under postponement, the differences that make up product variety are added as late in the supply chain as is possible, in order to take advantage of better and more recent demand information. Thus, with postponement, laser printers sent to Europe are not fitted with the appropriate power supply until after their destination is decided. So, too, with the laser printers that are sent to locations in the United States, with the appropriate power supply added later as well.

The difference in profits between early differentiation (e.g., making finished laser printers before their destination is identified) and delayed differentiation (e.g., making finished laser printers only after their destination is identified) is known as the value of postponement. The value of postponement for a given production process is contingent on a variety of factors such as demand correlation, demand variation, demand pooling, and information precision and timing (Anand & Mendelson, 2000). So, for example, in the case of demand correlation, the value of postponement is very small when product demand is highly correlated (e.g., when roughly equal demand exists for both European and American versions of a laser printer, making the demand for one region’s products a good predictor of the demand for another region’s products). Concerning demand variation, when overall product demand changes sharply from period to period, the value of postponement is high.

In the remaining sections, we consider the impact of an electronic broker on the value of postponement, and juxtapose our finding to those of Anand and Mendelson’s analytical results.

THE ELECTRONIC BROKER MODEL

The model of an electronic broker used in our research is based on the Custom Mass Production (CMP) model discussed in Elofson & Robinson (1998). Fundamentally, the model entails joining together buyers with locally unique preferences, in a global electronic format, to form a market that suppliers can serve in a cost-effective way. The model was characterized as an electronically brokered CMP channel that allowed buyers to acquire customized products at prices