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Benefits of using hybrid business models within a supply chain

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ABSTRACT

Today's competition between supply chains (SC) requires optimized strategies in order to satisfy customers' demands. The business models used by the SC members play a big role in this delivery of value to the customer. From here the notion that a mismatch between the intended market and the business model used to address it translates into a poor SC performance. As real-life business environments have become really complex, SC members have been forced to use hybrid business models (that is, the integration of features of two different business models). A review of the literature in the area of supply chain management shows that past research have not paid much attention to this issue. The objective of this paper is to quantitatively evaluate the influence these hybrid business models have on the SC performance. For this purpose, a system dynamics (SD) simulation model is developed and tested under different operational conditions, so conclusions can be derived regarding the benefits of the use of hybrid business models.

1. Introduction

Today's competition among manufacturing enterprises is fought between supply chains (SCs) (Ismail and Sharifi, 2006). In this scenario, competitiveness becomes something holistic (Duclos et al., 2000), as the satisfaction of the end customer is determined by the effectiveness and efficiency of the SC as a whole (Terzi and Cavalieri, 2004). This goal of 'operating as a whole' is the result of the degree of interaction between the members of the SC, which depends on the type of business models used by them (Ngai and Gunasekaran, 2005), i.e. engineer-to-order (ETO), make-to-order (MTO), assembly-to-order (ATO), make-to-stock (MTS), etc. According to Li and O'Brien (1999, 2001) a poor SC performance can be attributed to a mismatch between the intended market and the business model used to address it. As the market changes from being sales- to being market-oriented (Vonderembse et al., 2006), an adequate response requires shifting between business models (Olhager, 2003). Due to the fact that this last is not a trivial task, in real-life business environments SC have been forced to use hybrid business models. Sen et al. (2004) classifies these hybrid business models as serial/horizontal (companies within the SC adopt either business models A or B, in series), or parallel/vertical (companies within the SC adopt business models A and B, in parallel and in some proportion). Next section reviews the literature in the area of hybrid business models. In Section 3, a quantitative model is developed focusing in the case of parallel/vertical integration of the MTO and MTS business models. In Section 4, the quantitative model is tested under different operational conditions in order to evaluate the influence of hybrid business models on the performance of the SC. Finally, Section 5 presents conclusions and future research.

2. Literature review

Several authors have worked in the past, in the area of business models: (Fogarty et al., 1991) called them production positioning strategies, Oden et al. (1993) considered them as methods of response to customer

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demand, and Hendry and Kingsman (1999) proposed a classification of them. Regarding the use of business models, Hax and Candea (1984) proposed customer service and total cost as the criteria to decide between MTS and MTO business models. Hendry and Kingsman (1989) compared MTO and MTS environments with regard to production planning techniques. Guerrero (1991) focused on ATO environments on which component parts are produced according to the forecast demand and assembled into final products based on actual demand. Fumero and Vercellis (1994) proposed a hierarchical planning approach for companies using the ATO business model. Handfield and Pannesi (1995) developed a framework for analyzing time-based strategies in MTO environments. Bilas (1996) discussed the production scheduling in MTO and ATO environments. Caputo (1996) outlined various types of buffers for MTO environments with various types of demand. Dellaert and Melo (1996) focused on the lot-sizing problem in a MTO environment. Bridleman and Herrmann (1997) discussed SC management and scheduling in MTO environments. Federgruen and Katalan (1999) dealt with the problem of stochastic economic lot scheduling in mixed MTO and MTS environments. Rajagopalan (2002) provides a heuristic procedure to solve the problem of batch sizes for MTO–MTS environments. Tsubone et al. (2002) state that even though changes in market demand requires organizations to operate under both MTO and MTS environments, there are few studies on the systematic combination of both: while authors like Samadhi and Hoang (1995), Sipper and Bulfin (1997), and Vollman et al. (1997) discuss the differences between them, authors like Williams (1984), Kogan et al. (1998), Nguyen (1998), and New and Szwejczewski (1995) focus on the issues of combining them, and Soman et al. (2004) present an elaborate literature review of combined MTO–MTS situations. In general, the main limitation of the past research is that it has focused on improving one business model, or comparing business models to see which performs better under certain circumstances, but have not paid much attention on the integration of business models. Two authors that have addressed this last issue are Li and O'Brien (1999, 2001) and Sen et al. (2004). Next section reviews their work and relates it to our research proposal.

3. Model proposal

3.1. Integration ratio X

In order to represent the degree of parallel/vertical integration of a hybrid business model, we introduce the concept of the integration ratio X, based in the ideas of Li and O'Brien (1999, 2001) and Sen et al. (2004) (Table 1):

- Li and O'Brien (1999, 2001) consider the expected lead time (ELT) of a company, to be dependent on the type of business model used (denoted by the values taken by the variables qsl and qpl shown in Table 1). It must be noted that this ELT must be understood as an equivalent to the response time, as proposed by Yucesan and de Groote (2000), the time between the reception of a customer order and the time of delivery: for an MTO environment, response time is virtually equal to the lead time; for an MTS environments, response time is reduced by holding inventory.
- Sen et al. (2004) consider the expected inventory cost (TEI) of an *N*-partners supply chain, to be dependent on the type of business model used by each partner (denoted by the yn% proportion of MTS and 1−yn% proportion of MTO in Table 1).

When qsl, qpl, and yn% are compared, we notice that they play a similar role. Our proposed integration ratio *X* follows the same idea. It must be noted that neither Li and O'Brien (1999, 2001) nor Sen et al. (2004) offer an explanation of how an hybrid model operates when implemented. In this paper we understand the integration ratio *X* as an indicator of the level of customer feedback (Table 2) as proposed by Miltenburg and Saparling (1996).

If we attend to the basic questions a business model answers—who is the customer and what does the customer value, so value can be delivered to customers at an appropriate cost (Chung et al., 2004)—then the hybrid business model would contain a mixture of customer- and forecast-based activities. This notion of an hybrid business model can be related to the concept of customer-order decoupling point (CODP), which is defined as the point in the manufacturing value chain where product specifications typically get frozen and the product

Table 1
Expected lead time and inventory cost of a SC.

Expected lead time of a SC, adapted from Li and O'Brien (2001)		Expected inventory cost of a SC, adapted from Sen et al. (2004)	
ELT =	qsl*SL+qpl*PL	TEI =	$\sum_{n=1}^{n=N} yn\% * MEIn * bn * T$
qsl, qpl ⇒	Type of business model: MTO or MTS	yn% ⇒	proportion of MTS business model
SL ⇒	lead time from supplier	MEIn ⇒ ;	mean expected inventory at nth partner
PL ⇒	lead time from production	Bn ⇒	inventory cost per unit at nth partner
for MTO, ELT =	SL+PL	*T* ⇒	time period of planning
and,	qsl = 1, qpl = 1	for MTS, yn% =	1
for MTS, ELT =	0+0	for MTO, yn% =	0
and,	qsl = 0, qpl = 0		