

ACHIEVING BUILD-TO-ORDER SUPPLY CHAIN CAPABILITY THROUGH SUPPLIER PARTNERSHIP PRACTICES DRIVEN BY SUPPLY CHAIN ALIGNMENT

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ABSTRACT

Build-to-order Supply Chain (BOSC) is viewed by many researchers as an effective way to achieve high customer value. This research proposes that BOSC capability can be achieved through supplier partnership practices. This research also applies social dilemma theory and resource dependency theory in buyer-supplier links in the supply chain context; A buyer's structural solutions (i.e., supply chain alignment) perceived by the supplier can increase the frequency and range of supplier partnership practices. The 208 responses used in this study were collected from tier 1 and tier 2 auto suppliers in North America and China. Structural Equation Model is used to analyze those data. Two hypotheses are significant with high effect sizes.

Key Words: Build-to-order Supply Chain, Supply Chain Alignment, Supplier Partnership Practices, China

1. INTRODUCTION

With intensive global competition, technological change, and demanding customers, the environment for businesses becomes more complex and uncertain (Doll and Vonderembse 1991; Wang et al., 2006). This environmental uncertainty calls for customer-oriented strategies that require all members within a supply chain to understand and meet the needs of their direct customers and to satisfy the ultimate customers of the supply chain (Day, 1995). This requires supply chain participants to achieve flexibility and continuous and innovative responsiveness (Koufteros et al., 2005; Zhang et al., 2006a). Build-to-order supply chain (BOSC) strategy helps firms to achieve flexibility and responsiveness, which enables companies to deliver products that customers have ordered (Tu et al., 2004; Gunasekaran and Ngai, 2005).

According to a literature review on BOSC, Gunasekaran and Ngai (2005) point out gaps in the BOSC literature including defining and specifying the content domain of the BOSC construct, developing an integrated model for business strategy and operations strategy, economic factors, market factors, and competitive factors, and defining measures of performance. In order to fill some of the above research gaps, this study addresses the following questions: How to achieve BOSC capabilities?

Supply chains require frequent and intense interactions between buyers and suppliers to respond to the fast changing environment (Fine et al., 2005; Gunasekaran and Ngai, 2005). Therefore, this study identifies supplier partnership practices. This study also develops an integrated model to illustrate the causal relationship between supplier partnership practices and BOSC capabilities. According to social dilemma theory and resource dependency theory (Zeng and Chen, 2003), the reciprocity payoff structure between buyer and supplier (i.e., supply chain alignment) is an effective way to increase the level BOSC practices. Supply chain alignment strongly binds buyers and suppliers along three dimensions: operations strategy (i.e., relative strategic importance of cost, quality, delivery, and flexibility), responsibilities (i.e., responsibility allocations), and financial benefits (i.e., sharing costs, risks, and benefits). Therefore, supply chain alignment leads to effective and efficient activities of supplier partnership practices (Lee, 2004; Li et al., 2006). Therefore, the main objectives of this research are to explore: (1) the direct effects of supply chain alignment on the supply chain partnership practices and (2) the direct effects of supply chain partnership practices on build-to-order supply chain capability.

This study collected data in North America and China. Few researches in the past have collected data from the Chinese auto supply chain. One contribution of the study is helping researchers to understand the Chinese auto market and China suppliers.

2. THEORETICAL FRAMEWORK AND HYPOTHESES

Since supply chain practices are broad and there is no consensus among researchers, a valuable way to define and measure supply chain practices to benefit researchers and practitioners is to define supply chain practices to target a specific supply chain strategy. Build-to-order supply chain strategy is a state-of-the-art supply chain strategy because it focuses on a supply chain's responsiveness toward customers and its own efficiency and effectiveness. This study explores and defines Supplier Partnership Practices. Partnership with suppliers allows quick information sharing within a supply chain. It also increases the scope and frequency of joint problem-solving to improve both products and processes.

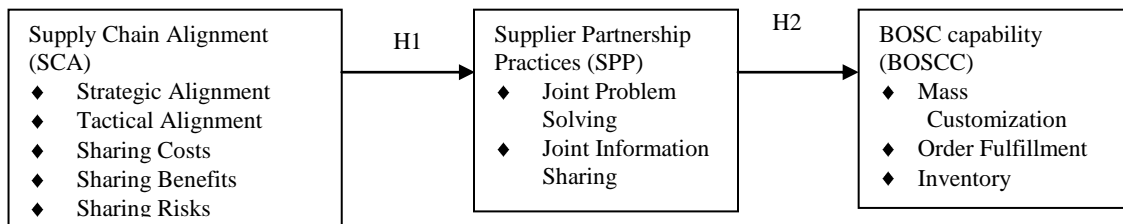
The supplier partnership practices described above should be guided by an interaction mechanism to involve both buyers and suppliers with proactive participation because buyer and supplier are different parties in an alliance. However, the interaction mechanism, which is between a buyer and its suppliers to pursue supplier partnership practices, has not been clearly explored and empirically tested (McCutcheon and Stuart, 2000; Goffin et al., 2006). The model is based on social dilemma theory from economics and resource dependency theory from management.

Social dilemma theory has two main parts: (1) one member in a social group will get higher payoff if the member chooses to defect because this member can get a larger portion of the pie made by the group than the portion that the member deserves to get; (2) if all members choose to cooperate, the pie will become bigger and thus the actual gain of each member will increase although the percentage gained by each member has not changed (Dawes, 1980). Social dilemma theory describes the potential short-term decision of a member in an alliance, which will lead to a long-term failure of the whole alliance and thus the failure of the member. In contrast to the social dilemma theory, resource dependency theory focuses on the long-term view of members in

an alliance to emphasize the importance of cooperation in an alliance. In the supply chain context, when manufacturers and suppliers communicate with one another and make joint or related decisions, both can remove part of the environmental uncertainty and have higher benefits (Powell, 1990). Therefore, members in a successful supply chain should have a long-term view to choose cooperation instead of competition. Researchers have been finding different ways to enable members in an alliance to have a long-term and cooperation view rather than a short-term and competition view. Zeng and Chen (2003) propose a model to drag members in an alliance out of the social dilemmas to enhance partner cooperation. The model uses structural solutions that were developed by previous researches (Komorita and Parks, 1994; Messick and Brew, 1983; Yamagishi, 1986). Structural solutions focus on reciprocity system building and include changing allocation rules (Chen; 1999; Rapoport and Amaldoss, 1999) and minimizing greed or fear of competition of other parties (Holm et al., 1999; Doz, 1996).

A research model on a partner practice generating mechanism in BOSC is built in Figure 1. The model includes two parts: (1) the buyer’s structural initiatives (i.e. supply chain alignment) increase the buyer’s and supplier’s participation in supplier partnership practices, and (2) more supplier partnership practices increase the BOSC capability.

Figure 1: Theoretical Model



This study then uses the following constructs to measure each of the above concepts in Table 1, which summarizes definitions and relevant literature of those constructs.

3. RESEARCH METHODOLOGY

As described in Section Two, there are two hypotheses to be tested and three constructs to be developed or adopted from previous research. In this study, there are four stages of construct development: (1) In the first pre-pilot stage, the definition and items of each construct are first generated from a broad literature review; (2) then, the potential items are given to two practitioners and five academicians for a pretest, whose purpose is to clarify the instructions and the questions in the questionnaire; according to their feedback, the items are modified, included, or discarded to ensure the content validity of the instruments; (3) the third stage is the pilot study; in this stage, a small sample of respondents is used to answer the surveys; the reliability and validity of the instruments can be evaluated and then the instruments are refined; (4) the fourth stage is testing validities and reliabilities of all instruments through analyzing large-scale survey data.

Content validity is the first consideration in developing a measurement. In order to ensure content validity, items of a construct should cover the main domains of the construct (Churchill, 1979). It is through a broad literature review and interviews with practitioners and academicians in the research field that items generated in the research can largely be ensured to have content

validity. This study generates initial items of each construct through a broad literature review listed in Table 1.

After the items were generated, the questionnaire was first sent to five academicians and two practitioners to check the consistency of each item with the definition and the content of corresponding constructs as well as the accuracy of the wording in the questionnaire. According to their feedback, items were added, modified and eliminated. The three constructs were purified by testing reliability and convergent validity.

Table 1: Constructs

Construct	Definition	Items /Subconstructs	Literature
Supply Chain Alignment	The level of agreement within an supply chain regarding the relative strategic importance of cost, quality, delivery, and flexibility, responsibility allocation, and sharing costs, risks, and benefits	<ul style="list-style-type: none"> • Strategic alignment • Tactical alignment • Financial alignment-sharing costs • Financial alignment-sharing benefits • Financial alignment-sharing risks 	Skinner, 1974; Boyer and McDermott, 1999; Lingle and Schiemann, 1996; Venkatraman and Camillus, 1984; Galbraith and Nathanson, 1978; Lorange and Vancil, 1977; Stonich, 1982; Robinson, 1999; Lindman et al., 2001; Narayanan and Raman,2004; Lee, 2004; Cao and Dowlatshahi, 2005
Supplier Partnership Practices	The degree of joint activities of partners within a supply chain on the information flow and the material flow	<ul style="list-style-type: none"> • Joint operation practices • Information sharing practices 	Dyer et al., 1998; Daft and Lengel, 1986; Narayanan and Raman, 2004; Liker and Choi, 2004; Lee, 2004; Li, 2002; Lambert and Knemeyer, 2004
Build-to-order Supply chain Capabilities	Ability of a firm to produce varieties of customized products on a large scale to fulfill customer orders efficiently at a reasonable cost through technical and managerial innovations	<ul style="list-style-type: none"> • Mass customization • Order fulfillment • Inventory 	Pine, 1993; Tu et al. 2004; Gunasekaran and Ngai, 2005

After the modification of the instruments, a large-scale survey was conducted to have a sample of data for the instrument validation and the hypothesis testing.

This study collected data from auto suppliers in both China and North America to make it a multinational study because of the importance of these two areas/regions' auto industries in the world: the U.S. is the largest producer and consumer of motor vehicles in the world (Auto Industry BERA, 2004), and in 2006, China became the second largest auto market and the third largest auto maker in the world (People's Daily, 2006). Another consideration in this study is tiers. Since this study is about buyer-supplier relationship, major relationships in auto supply chain include relationships between automakers and first-tier suppliers and relationships between first-tier suppliers and second-tier suppliers. The sample in this study includes both first-tier suppliers and second-tier suppliers. Of 480 mailed or emailed questionnaires, 24 didn't reach the targeted responses because of wrong addresses or names. The number who received the questionnaire is 456. The number of complete and usable responses was 208, resulting in a response rate of 45.6% (calculated as 208/ (480-24)).

4. STRUCTURAL EQUATION MODELING, AND HYPOTHESIS TESTING

The large-scale instrument development in this study includes Convergent validity, Discriminant validity, and Validation of the second-order construct, using the 208 responses. Each of the three constructs in this study has good reliability and validity including content validity, convergent validity, discriminant validity, and validation of the second-order construct.

The structural model is tested using AMOS. Figure 5.3 and Table 5.3 below show the testing results. In Table 5.3, the revised model fit measures are: GFI = 0.982, RMSR = 0.013, NFI = 0.975, and AGFI = 0.956. GFI is higher than the recommended minimum value of 0.90; RMSR is lower than the recommended maximum value of 0.05; NFI is higher than the recommended minimum value of 0.90; AGFI is higher than the recommended minimum value of 0.80. In sum, all model-fit indexes of the revised model are at acceptable levels. Two hypotheses are significant at 0.001 levels. All the relationships in this model have high effect sizes.

Table 2: Structural Equation Modeling Results

Hypotheses	Relationship	Coefficients	Effect Size	t-value	Significant?
H1	SCA→ SPP	0.909	Large	5.98	Yes*
H2	SPP→ BOSCC	0.818	Large	6.54	Yes*
χ^2 /df =0.887; GFI =0.982; RMSR =0.013; NFI =0.975; AGFI =0.956					

* p <0.001

5. SUMMARY, IMPLICATIONS, LIMITATIONS, AND RECOMMENDATIONS FOR FUTURE RESEARCH

The proposed model has two significant hypotheses (i.e., Hypotheses 1 and 2). The model also shows a very good fit to the data. The model fit and the significant hypotheses have great values

to business researchers and practitioners; researchers can use these newly developed instruments for further studies and can expand the exploration of new hypotheses; the supported hypotheses can help business practitioners to make decisions more effectively and efficiently.

Hypotheses 1 is significant with large effect size. This indicates that supply chain alignment has a large effect on supplier partnership practices. Supply chain alignment links buyer and supplier in strategy, tactic, and finance. All activities in supply chain alignment encourage further joint activities of buyer and supplier in operations and information sharing in product development, manufacturing process, quality improvement, and logistics. Supply chain alignment unites buyer and supplier harmoniously, so buyer and supplier can work closely in operations and share information frequently and freely. Dyer et al. (1998) observed the higher frequency of sending employees to the other party's facilities between buyer and supplier with high alignment, which is a key indicator of joint operations and information sharing.

Establishing partnership with suppliers is a key strategy in supply chain management for buyers to start with. Through partnership, buyers can empower suppliers to proactively participate in the supply chain activities, such as joint activities and sharing information. Strongly tied between the buyer and supplier, the alliance can utilize their expertise in an optimized way to have a high level of BOSC capability including mass customization capability, high order fulfillment, and low inventory.

Overall, the results indicate that high levels of supply chain alignment will enhance supplier partnership practices, which will lead to high build-to-order supply chain capabilities. With the large effect sizes of both significant hypotheses, this study has implementation values for supply chain managers.

Although this study has made several contributions to both supply chain theory and industrial practices, there are several limitations, as described below. First, the response number is limited to only 208. Collecting more responses from other countries would make the results of this study more convincing. In addition, 83.2% responses are from China and only 16.8% responses are from North America; it is better to collect more responses from North America if this study is claimed as a multinational study. Second, as in other similar supply chain studies, individual respondents in this study have limited information about the different aspects of their supply chain. Although the author tried to form a team in each supplier to answer a survey at the beginning stage in this study, only a limited number of suppliers used a team to answer. Third, this study uses auto industry as the representative of all industries. Although some previous research used the same approach, it would be better to collect data from all industries.

There are some recommendations for future research. First, this study can be expanded to include buyers' views on build-to-order supply chain to make it more comprehensive. Data from the buyer of each responding supplier can be collected. Second, future research can test hypotheses for different tiers, different industries, and different countries, if enough data could be collected for each tier, each industry, and each country. This may allow researchers to identify tier-specific, industry-specific, or country-specific causal relationships in this model.

References available upon request