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BUILDING DEPENDABILITY AND BENEVOLENCE TRUST TO ACHIEVE FLEXIBILITY THROUGH JOINT MANUFACTURING ACTIVITIES IN SUPPLY CHAIN

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ABSTRACT

Based on the transaction cost theory, this study proposes a research model that links trust, joint manufacturing activities, and supplier flexibility. In this model, supplier dependability trust and financial alignment are viewed as the key drivers of joint manufacturing activities between manufacturers and suppliers. These joint manufacturing activities, in turn, improve the supplier's ability to achieve manufacturing flexibility. Based on 208 responses from the suppliers in the U.S. and China, this study provides empirical evidences to suggest that supplier dependability trust and financial alignment positively promote manufacturer-supplier joint manufacturing activities. The results also suggest that the joint manufacturing activities enhance supplier flexibility in a significant way.

Key Words: Dependability Trust, Benevolence Trust, Financial alignment, Joint manufacturing activities, Flexibility

1. INTRODUCTION

With intensive global competition, technological change, and demanding customers, the environment for businesses becomes more complex and uncertain [34]. These complexity and uncertainty require supply chain participants to achieve flexibility and to respond to customers' order requirements continuously and innovatively [35]. To successfully achieve flexibility, a supplier must coordinate its actions with its manufacturers or buyers and maintain mobility of the manufacturing processes. This coordination can be implemented partially through joint manufacturing processes between the buyer and the supplier where joint process activities dealing with information flow and material flow are included [9].

Another key factor in coordinating this buyer and supplier relationship is trust [1]. Studies have suggested that trust is important for successful joint operational activities between a manufacturer and its suppliers [19, 23]. Trust between a buyer and a supplier has three levels/dimensions: ability, integrity, and benevolence [29]. Schoolman et al. (2007) point out that a few researches are on benevolence at inter-organizational level, for example, the relationship of

the benevolence on joint responsibility and shared planning [12, 29] and unethical behavior that undercuts benevolence [10]. However, how to build the benevolence level trust is largely ignored by researchers. This study includes the benevolence trust building mechanism, financial alignment, as well as the integrity/dependability trust from a supplier’s perspective.

A research model is proposed to enhance suppliers’ manufacturing flexibility through joint process activities. The model includes three major areas of supply chain management, material flow, information flow, and relationship management. A large-scale data set collected from the U.S. and China is used to empirically test the model. Section 2 builds a theoretical framework including defining constructs and developing hypotheses. Research method is described in Section 3 and analysis and results in Section 4. Section 5 discusses structural equation modeling and hypothesis testing results. Conclusions, limitations, and future research directions are provided in Section 6.

2. THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

Figure 1 describes the research model. This model includes the two higher level trust, dependability trust and benevolence trust in supply chain from a supplier’s perspective. Perceived buyer dependability trust is the supplier’s feeling of dependability trust from buyer while the supplier dependability trust is typically the supplier’ reaction toward the buyer’s dependability trust. Supplier alignment in manufacturing is the mechanism of building the benevolence trust between buyer and supplier. With a higher dependability trust and an effective mechanism of building benevolence trust, the supplier can actively participate in joint manufacturing activities in terms of process improvement and information sharing. The joint manufacturing activities could largely increase supplier flexibilities.

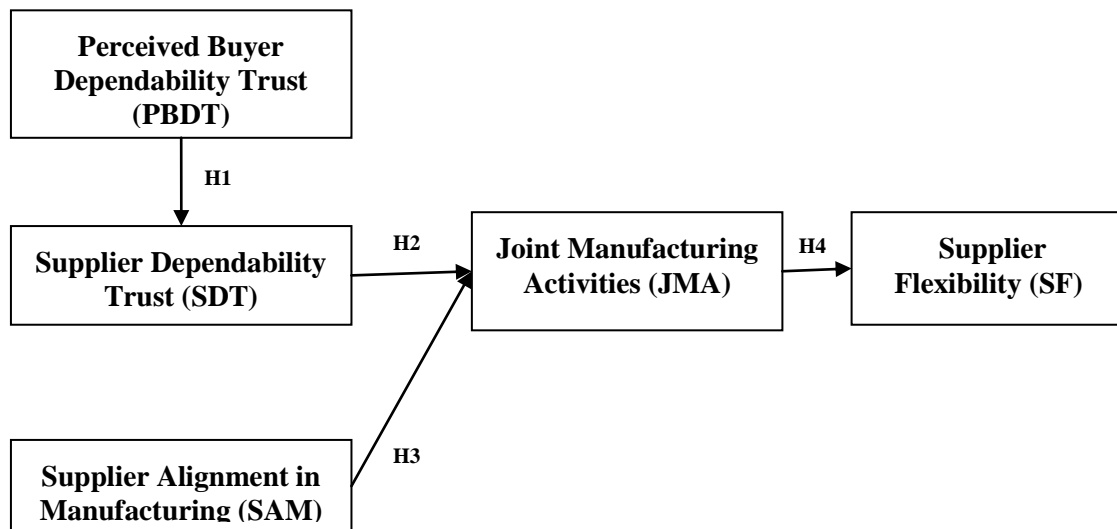


Figure 1: Research Model

2.1 Trust

Trust is a very important factor for buyer-supplier relationship [9]. Trust is “the willingness of a

party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party” [22, p. 712]. Trust has been researched at the levels of teams [22], within organizations [24], and between organizations [23]. Trust, in the management literature, has three dimensions: ability, integrity, and benevolence [22, 29]. Supply chain researchers have identified a similar structure of trust between a buyer and a supplier including contractual, dependability, and goodwill [12, 28]. Contractual or ability refers to the capability of fulfilling contracted requirements such as quality, quantity, and price; dependability or integrity defines how well a buyer or a supplier is consistent or reliable; goodwill or benevolence measures how a buyer or a supplier cares about the other party’s interests [12, 29]. In a relatively stable industry such as automotive industry, a supplier needs to go through a comprehensive evaluation process to be qualified by an automaker or a manufacturer. Once the supplier and the manufacturer enter into a supplying/purchasing agreement, the contractual level trust is, thus, satisfied.

Another issue of defining trust is the direction of trust. Most previous empirical research on trust focuses on buyer’s trust [10, 19] or supplier’s trust [19]. McCutcheon and Stuart (2000) explored buyer and supplier behaviors for pursuing alliance-like relationships through interviews with managers in fifteen manufacturing and service firms in Germany [23]. Through their interviews, they found that trust-building actions were mostly initiated by buyers. Supplier trust is defined as a supplier’s perception that the buyer is “honest, reliable, open, and respects the confidentiality of information” to the supplier [19].

This study proposes that there are three parts in the trust linkage between a buyer and a supplier: buyer’s trust toward supplier, perceived buyer’s trust by supplier, and supplier’s trust toward buyer. Perceived buyer dependability trust is defined as the degree of reliability of buyer perceived by supplier while supplier dependability trust is defined as the degree of reliability of supplier toward buyer. The buyer can show dependability trust toward the supplier through reliable and continued orders and on-time payment. The supplier would react to the buyer with dependable trust through reliable and on-time delivery and product quality. Therefore, the hypothesis between buyer’s trust and supplier’s dependability trust is proposed as follows:

H1: The higher the perceived buyer’s dependability trust, the higher the supplier dependability trust toward the buyer.

2.2 Joint manufacturing activities

When a supplier has higher dependability trust toward the buyer, the supplier has a higher intention to work with the buyer to achieve the higher level of integration through free and frequent process information sharing and joint process improvements. Corsten and Kumar (2005) argue that a high level trust causes a high level of free information sharing [5]. From a transaction cost perspective, when a mutual trust exists, the buyer and the supplier have confidence in the received information and this confidence, thus, helps decrease the approving and checking cost of the information [15]. Klein (2007) provides the empirically supporting evidences that higher supplier trust causes higher level of information or knowledge exchange since trust decreases the fear of spilling out information and knowledge [13].

Joint manufacturing process improvements include sharing manufacturing technology and skills

between the manufacturer and the supplier. During joint manufacturing improvement processes, there exists intensive knowledge sharing. A firm's knowledge acquisition and knowledge management are the foundation of its distinctive competence [3]. Without trust, neither the manufacturer nor the supplier has any intention of sharing knowledge with the other party about the manufacturing processes [26]. Liker and Choi (2004) find that high trust between a manufacturer and a supplier can increase the frequency and range of joint manufacturing activities, according to their case study of automotive suppliers in North America [20]. Within a supply chain, the supplier and the manufacturer tend to send employees to each other's facilities because some problem solving activities require on-site observations of the problems. These on-site visits allow the visiting employees to solve problems faster than long-distance interactions even with today's information technology. Based on the knowledge-based view of enterprises [36], implicit knowledge is hard to be communicated through language. Therefore, these on-site visits are needed for problem solving and coordination. Through these visits, the supplier can understand the requirements of the manufacturer. This practice also allows the manufacturer to have certain assurance of the quality of the product before the components arrive at the manufacturer's facility, saving time and lowering costs. Dyer et al. (1998) have identified that a key success factor of supply chains is the frequent visits between suppliers and manufacturers for Japanese companies [6]. Frequent visits do generate costs for the supply chain, but are considered to be worth the cost. Without trust and sacrifice for long-term benefits, the cost issue would impede the frequency of valuable visits [4]. Therefore, the following hypothesis is proposed:

H2: The higher the level of the supplier's dependability trust toward the buyer, the higher the level of joint manufacturing process activities.

2.3 Benevolence trust and financial alignment

Schoorman et al. (2007) point out that a few research is on the benevolence dimension of the trust at the inter-organizational level [29]. Among a few recent empirical research on the benevolence in buyer-supplier relationship, Johnson et al. (2004) focus on the relationship of the benevolence on activities such as joint responsibility and shared planning while Hill et al. (2009) suggest that unethical behavior can undercut benevolence [10, 12]. However, how to build the benevolence level trust is largely ignored by researchers. Benevolence is a higher level trust than the dependability trust [28]. The building process for benevolence is complicated and different from that for dependability trust [23]. Through their case studies, McCutcheon and Stuart (2000) report that the developing process for goodwill or benevolence trust is affected by the benefits and the risks perceived by the supplier. This study contends that the trust-building process should involve both the buyer and the supplier and should include the factors of cost, benefit, and risk [23].

Financial alignment is identified as an effective building mechanism for benevolence trust. Financial alignment refers to sharing costs, benefits, and risks between buyer and supplier (Lee, 2004). Financial alignment activities are not common in regular contracts between the buyer and the supplier. It is a mutual understanding of caring about each other's financial performances for the buyer and the supplier. Through this mechanism, the buyer and the supplier can continuously build up benevolence trust. McCutcheon and Stuart (2000) find that the supplier's view of potential benefits influences the supplier's partnership behavior [23]. Both the buyer's and the

supplier's actions drive the mutually beneficial alliance. Therefore, following hypothesis is proposed:

H3: the higher the level of financial alignment between the buyer and the supplier, the higher the level of joint manufacturing activities.

2.4 Supplier flexibility

Researchers have found that partnership practices, which include frequent interactions between manufacturers and suppliers, can improve both manufacturers' and suppliers' performances. Lambert and Knemeyer (2004) remind firms to identify and build the true partnerships, which have high trust and frequent and deep joint activities, different from "so-called partnerships", which tend to have low trust and limited interactions [16]. Lee (2004) focuses on joint operations, information sharing, and knowledge transference between suppliers and manufacturers in building up effective and efficient supply chains [17]. Liker and Choi (2004) propose a "supplier-partnering hierarchy" package, which consists of trust between manufacturers and suppliers, which encourages extensive joint activities and builds "deep supplier relationships [20]."

Joint manufacturing processes allow the manufacturer and its suppliers to have balanced production capacities, which would result in the lower overall cost of manufacturing by eliminating unnecessary equipment investments. In addition, sharing knowledge of time-based manufacturing practices between the manufacturer and its suppliers can largely eliminate some costs and increase flexibility and, therefore, enable faster responses to customer demands [32]. Flexibility is originally defined as "the ability to change or react with little penalty in time, effort, cost or performance" [33, p. 73]. In the supply chain context, the capability of switching between options is an important characteristic for manufacturing flexibility [30]. Supplier's manufacturing flexibility is defined as the supplier's capability to manufacturing varieties of products with high efficiency and relatively low extra costs. Therefore, this study proposes the following hypothesis:

H4: The higher the level of joint manufacturing activities between manufacturers and suppliers, the higher the level of supplier flexibility.

3. RESEARCH METHODOLOGY

The measurements of perceived buyer dependability trust and supplier dependability trust are adapted from Li and Lin's (2006) study [19]. The measurement for supplier flexibility is adapted from Tu et al. (2004) [31]. The measurements of supplier alignment and joint manufacturing activity are developed as a part of this research. The methods to develop this instrument include a review of the relevant literature, structured interviews with executives, a pre-test with faculty experts, and a pilot study that involved thirty industry executives. To maintain the page limit of this paper, details of the pilot study are not provided in this paper and are available from the first author. The final survey instruments are provided in the Appendix. All measurement items use a five-point scale ranging from 1 = "strongly disagree" to 5 = "strongly agree". The data were collected in the U.S. and China through a survey questionnaire. The number of respondents who completed and provided usable responses was 208. The response rate is 45.6%.

4. INSTRUMENT DEVELOPMENT

After the large-scale survey is conducted, a sample of data is ready for the instrument validation and the hypothesis testing. Due to the limit of the paper size, the large-scale instrument validation is not reported here. Each construct in this study has good reliability and validity including content validity, convergent validity, discriminant validity, and validation of the second-order construct.

5. HYPOTHESIS TESTING

PLS provides path coefficients, R², and T-statistics through a “boot-strapping” re-sampling method. Path coefficient and R² can be used to assess the significance of each hypothesis while R², which is the proportion of variance caught by the model with each dependent variable, provides a model fit index.

The results of hypothesis testing are listed in Table 1. Perceived buyer dependability trust positively impacts supplier dependability trust, supporting Hypothesis 1. Supplier dependability trust and supplier alignment in manufacturing, which helps to build up supplier and buyer benevolence trust, have positive effects on joint manufacturing activities, supporting Hypothesis 2 and Hypothesis 3. Joint manufacturing activities significantly increases supplier’s flexibility, supporting Hypothesis 4.

Table 1: PLS analysis results

	2	3	4	5
1. Perceived Buyer Dependability Trust	0.577***(H1)			
2. Supplier Dependability Trust			0.222*(H2)	
3. Supplier Alignment in Manufacturing			0.335***(H3)	
4. Joint Manufacturing Activities				0.433*** (H4)
5. Supplier Flexibility				
	R ² 0.33		0.21	0.19

* Significant at 0.05 level
 ** Significant at 0.01 level
 *** Significant at 0.001 level

6. CONCLUSIONS

This study empirically tests the relationship of dependability trust between manufacturers and suppliers for joint manufacturing activities using 208 responses from suppliers in the U.S. and China. The empirical results show that high supplier dependability trust can lead to high joint operational activities including free and frequent information sharing as well as joint manufacturing improvement activities between buyers and suppliers. The results also support that financial alignment increases the level of joint manufacturing activities that lead to higher supplier flexibility.

Appendix and References available upon request from Kun Liao at LiaoK@cwu.edu