

An Analysis of Supply Chain Collaboration and Its Impact on Firm Performance

An Integration of Social Capital, Justice, and Technology Use

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Abstract: Collaboration has become a critical component to fulfill the need for integration in the supply chain. From a discussion of the literature, there are two major underlying concerns arising in the collaboration, organization's sharing behaviors and technology use behaviors. In expectation confirmation theory, an organization's sharing behaviors may initially mean a pre-expectation of common resources available in the supply chain and further, a perceived fairness between participants for the willingness to participate in the partnership. Social capital theory and justice theory, in essence, explain the two beliefs of supply chain members as the IS success model defining the belief of technology use. This study integrates the three key issues to examine collaboration in a comprehensive and unique way and its role in affecting focal firm performance. Empirical findings have led to better understanding of the relative effects of the three issues and a well-achieved organizational performance.

1 INTRODUCTION

Collaboration is recognized as a critical component for the smooth flowing of an efficient supply chain (Kwon and Suh, 2005; Richey et al., 2012). It is characterized by the sharing of information, knowledge, risk, and profits across the supply chain (Mentzer et al., 2000; Smith et al., 2007). According to previous research, two major concerns arise in collaborative behaviors, organization's sharing behaviors (Smith et al., 2007; Omar et al., 2012) and technology use behaviors (Gunasekaran and Ngai, 2004; Subramani, 2004).

An organization's sharing behaviors, in essence, relates to a decision of two issues. In expectation-confirmation theory (ECT), this behavior initiates a pre-expectation of common resources available in the network and further realizes a perceived fairness between partners for the indication of their willingness to join the alliance (Oliver, 1981; Bhattacharjee, 2001).

In the pre-expectation issue, social capital theory (SCT) has been widely discussed in the supply chain as social capital can be seen as a common resource

developed by supply chain partners for creating unique value among competitors (Min et al., 2008; Villena et al., 2011). Therefore, when individual members own more resources in the supply chain, they may lead to higher cooperative atmosphere and behaviors. In the perceived fairness issue, justice concept may explain the willingness of supply chain partners to participate in inter-firm behaviors when it is well perceived (Griffith et al., 2006; Sun et al., 2009). Narasimhan et al. (2009) argued that relational behaviors are motivated through the perceived justice exercised by the more powerful members in the exchange of resources. Further, if reward is not forthcoming, the exchange behaviors will cease to exist. Few studies have been performed on both the pre-expectation and perceived fairness issues with collaborative behaviors (Kankanhalli et al., 2005).

In the technology use issue, the Delone and Mclean's IS success model (D&M Model) has been widely used in various IS contexts to explore user acceptance (Venkatesh and Bala, 2008). However, it has not been widely applied in supply chain technologies (Zhang and Dhaliwal, 2009). When supply chain members perceive satisfaction on the

use of IOS, they may further stimulate their willingness to participate in collaborative behaviors (Sahin and Robinson, 2002). Finally, performance impact is the ultimate concern for the success of collaboration in a supply chain. In this study, we examine performance impact in terms of a focal firm performance in managing its partners.

Grounded on SCT, justice, and D&M Model, this study proposes a novel research model to explore the antecedents of collaboration and its impacts on firm performance in a complete manner.

2 LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Based on the above discussion, Figure 1 provides a pictorial depiction of this research model. The followings discuss the theoretical bases and development of relevant hypotheses.

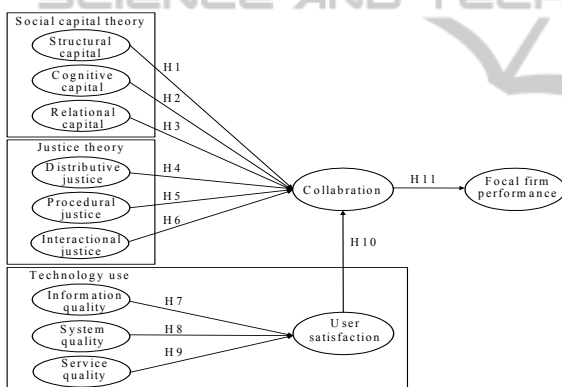


Figure 1: Research model.

2.1 Antecedents of Collaboration

The supply chain is not a chain of businesses with one-to-one, business-to-business relationships, but a network of businesses and relationships (Lambert et al., 1998). Collaboration is an approach to managing interdependencies requiring a sharing of knowledge, information, and a much higher level of joint decision-making and goal-setting aimed at enhancing both common and individual advantages (Zacharia et al., 2009). There are two main issues for an organization's sharing behaviors. Based on ECT, it may first consider a pre-expectation of common resources available for network members and then sense a perceived fairness between partners in a decision for their willingness to join the partnership (Bhattacharjee, 2001). A confirmation of an actual

behavior may require consideration of both the beliefs of pre-expectation and perceived outcomes (Chen and Luo, 2008). Finally, many studies on supply chain have shown the effect of IOS on participating in collaborative behaviors through member satisfaction with system use (Sahin and Robinson, 2002). The D&M model is an important theory to define the relationship structure and understand technology use behaviors in the supply chain context (Delone and Mclean 2003).

2.2 Social Capital Theory and Collaboration

Social capital refers to the resources embedded within the network of human relationships (Nahapiet and Ghoshal, 1998). Scholars of the supply chain have highlighted that social capital reduces the likelihood of conflicts and promotes cooperative behavior in terms of its association with shared vision, trusting belief, and social tie (Lawson et al., 2008; Bernardes, 2010). Collaborative behaviors would be stimulated for partners when social capital is well built in the supply chain (Villena et al., 2011). Social capital theory defines a three-capital structure, structural, cognitive, and relational (Nahapiet and Ghoshal, 1998; Wasko and Faraj, 2005).

Structural capital is related to impersonal configuration of linkages among the network of relations as a whole. It is like an entire network of suitable relations between supply chain partners (Villena et al., 2011). It implies that in a higher structural capital, individual partners may more easily obtain resources or help others when they have more interactions that will raise the willingness to participate in collaboration (Patrashkova-Volzdoska et al., 2003). *Cognitive capital* defines the resources providing shared meaning and understanding between the network members that help individuals share their interactions, common visions, and language over time (Wasko and Faraj, 2005). In the supply chain, when partners want to interact over time with others to share the same practice, and to learn the skills and knowledge, it enhances the likelihood of partners collaborating in the working environment to complete their task (Krause et al., 2007). *Relational capital* is a relation indicating the degree of emotional intensity, commitment, and trust connecting the individuals (Bernardes, 2010). Researchers suggested that a good transaction climate with mutual trust between partners may play a critical role in facilitating their collaboration in the supply chain (Patterson et al., 2003). Accordingly,

we can propose the three hypotheses.

- H1. Structural capital positively affects collaboration in the supply chain.
- H2. Cognitive capital positively affects collaboration in the supply chain
- H3. Relational capital positively affects collaboration in the supply chain.

2.3 Justice Theory and Collaboration

In business management, organizational members view justice as a unified value providing principles that can bind together conflicting parties and create stable social structures (Luo, 2007). The justice concept is widely applied to develop a theoretical foundation to the understanding of relationships between supply chain members (Griffith et al., 2006). Specifically, justice theory provides a suitable framework for understanding the creation of value in collaborative relationships for interorganizational members (Wagner et al., 2010). A higher level of perceived justice for partners motivates the willingness of exchange to strive for collaborative behaviors and relationship continuity (Palmatier et al., 2006). Colquitt et al. (2001) reviewed justice-related studies comprehensively and integrated three major components of justice: distributive, procedural, and interactional.

Distributive justice refers to perceived fairness where individuals assess the fairness of an exchange by comparing their inputs to outcomes to form an equity score (Son and Kim 2008). The distributive justice in terms of input-outcome structure is positively related to the willingness of partner firms to participate in collaborative activities in the supply chain (Griffith et al., 2006). In addition, supplier chain partners intend to pursue their interests in an exchange relationship to gain rewards (Higgins and Ellis, 2009). This can be viewed as an economic policy in the supply chain management. *Procedural justice* refers to the process and the perceived fairness of that process, associated with the allocation of resources for members in limited supply relative to demand (Konovsky, 2000). Procedural justice focuses on the solution of a controversy that must go through a series of formal procedures before the decision is made, and members that should have the right to express their opinions in the procedures (Sun et al., 2009). It can be viewed as a formal policy in the supply chain management (Griffith et al., 2006). *Interactional justice* refers to an individual's perceptions of the quality of interpersonal treatment received in the

decision making process (Cropanzano et al., 2002). Interactional justice is most likely to be obtained when the originators of justice treat the recipients with truthfulness and respect in an exchange process (Luo, 2007). It can be further viewed as a social policy in the supply chain management. Interactional justice may affect the level of commitments of supply chain partners to their decisions regarding relationship-building, and also influence interactions at the firm level (Yang et al., 2008). Arguably, the three relevant hypotheses are thus proposed.

- H4. Distributive justice positively affects collaboration in the supply chain.
- H5. Procedural justice positively affects collaboration in the supply chain.
- H6. Interactional justice positively affects collaboration in the supply chain.

2.4 Technology Use and Collaboration

As SCM importantly raises the issue of digitally enabled features, this study further needs to examine technology use behaviors by the D&M model. The D&M model suggests that three technology components, information, system, and service quality, indicate a direct effect on user satisfaction and system use and further creates net benefits toward IS use (DeLone and McLean, 2003). In a study by Wang (2008), when customers greatly depend on information technology to communicate, gain useful information and execute transactions in an e-commerce environment, information, system, and service quality are the major concerns for user satisfaction toward IS adoption. Accordingly, we put forward the three hypotheses.

- H7. Information quality positively affects user satisfaction in the supply chain.
- H8. System quality positively affects user satisfaction in the supply chain.
- H9. Service quality positively affects user satisfaction in the supply chain.

When supply chain technologies are mainly used to support information sharing between partners in terms of information, physical, and financial flow, user satisfaction with the sharing thereby facilitates collaboration behaviors across the supply chain (Kahn et al., 2006; Smith et al., 2007). An integration of various IS applications with a complete and satisfied basis provides the capability to generate cross-partner information in the supply chain and further raises the need to collaborate

between partners for performing inter-firm activities smoothly (Rai et al., 2006). The arguments thus lead to the hypothesis.

H10. User satisfaction positively affects collaboration in the supply chain.

2.5 Firm Performance

Financial indicators are important in assessing whether operational changes are improving the financial health of a company, but are insufficient to measure supply chain based firm performance. These measures do not relate to important organizational strategies and non-financial performances, such as customer response and product quality (Beamon, 1999; Kwon and Suh, 2005). In this study, financial and non-financial indicators are defined to measure firm performance.

Collaboration aims at effectively integrating various flow activities between partners for a number of reasons (Kumar and van Dissel, 1996). It thus indicates a potential link with the performance impact of a focal firm. Firms able to collaborate at a higher level of sharing knowledge and with access to common resources are much more likely to improve their performance and gain a source of long-term competitive advantage. Specifically, collaboration between partners affects not only operational outcomes such as cost, quality, and cycle time, but also non-operational outcomes such as customer services, new product development, and reaction to market changes (Zacharia et al., 2009). Accordingly, one hypothesis is thus proposed.

H11. Collaboration positively affects focal firm performance in the supply chain.

3 RESEARCH DESIGN

3.1 Instrument

3.1.1 Basic Information

This part collects basic information on organizational characteristics including industry type, annual revenue, number of employees, and number of suppliers, as well as respondent characteristics, including working experience, education level, gender, and position.

3.1.2 Social Capital Theory

This part measures three social capital constructs. The measuring items for structural capital are

adapted from the instruments developed by Robert et al. (2008), including 3 items. The measuring items for cognitive and relational capital are adapted from the instrument developed by Villena et al. (2011), including 4 items for each.

3.1.3 Justice Theory

This part measures the three justice constructs. The measuring items for distributive and procedural justice are adapted from the instrument developed by Griffith et al. (2006), including 4 and 3 items respectively. The measuring items for interactional justice are adapted from the instrument developed by Luo (2006), including 4 items.

3.1.4 Technology Use

This part measures four technology-based constructs. The measuring items for information, system, and service quality are adapted from the instrument developed by Wang (2008), including 3 items for each. User satisfaction is adapted from the instrument developed by Wang (2008), including 3 items.

3.1.5 Collaboration

This part defines the extent to which focal firms collaborate with their supply chain partners. Collaboration defines all partners in the supply chain actively working together toward common objectives. The measuring items are adapted from the instrument developed by Tan et al. (2002), including 5 items.

3.1.6 Firm Performance

Financial measure is adapted from the instrument developed by Vickery et al. (2003) and Li et al. (2006), including four items, such as return on investment, and cost structure. Non-financial measure comprises are adapted from the instrument defined by Beamon (1999), including five items, such as market change, customer response, and product quality.

3.2 Sample Design

The qualified firms for this study require an emphasis on the investments of supply chain technologies and have considerable experience in SCM practice. It is assumed that larger firms would be more likely to have these experiences. We randomly selected 700 firms to be the study sample

from the population of 1500 firms. Furthermore, the target respondents for the sample firms would be the top managers, including the CEO, vice CEO, or logistics/purchase executives. A total of 212 responses were received. After invalid responses were deleted, this resulted in a sample size of 206 for a response rate of 29.4%.

3.3 Scale Validation

PLS is a structural equation modeling (SEM) technique that employs a nonparametric and component-based approach for estimation purposes. This study uses PLS to analyze the measurement model. PLS is the best analytical tool available to fit the requirement of small sample size.

Reliability is evaluated by Cronbach's α . Convergent validity is assessed by three criteria, factor loading, construct reliability, and average variance extracted (Fornell and Larcker, 1981). Discriminant validity is assessed by the measure that AVE for a construct should be larger than the squared correlation between the construct and other constructs. The testing results indicate that reliability, convergent and discriminant validity are all in a high acceptable level.

4 STATISTICAL ANALYSIS

PLS was used to examine the structural model. There are two steps in evaluating the structural model. First, we needed to estimate standardized path coefficients and their statistical significance for testing the hypotheses. PLS does not provide a significance test or confidence interval estimation. We re-sampled 1000 times with Bootstrapping analysis to obtain a stable result for these analyses. Second, the coefficient of determination (R^2) for endogenous variables was calculated to assess the predictive power of this model. Figure 2 shows the testing results of the structural model.

In the SCT, we found that structure capital is reported as an important predictor of collaboration ($p < 0.05$, $\beta = 0.18$). Hypothesis 1 is thus supported. However, cognitive and relational capital are not ($\beta = 0.08$ and 0.05). Hypothesis 2 and 3 are thus not supported. In the justice theory, distributive and procedural justice are two notable precursors of collaboration ($p < 0.05$, $\beta = 0.21$ and 0.19) while interactional justice is not. Hypothesis 4 and 5 are thus supported. In contrast, Hypothesis 6 is thus not supported. In the technology use, we found that information quality, system quality and service

quality are all reported as important predictors of user satisfaction ($p < 0.01$, $\beta = 0.27$, 0.32 , and 0.45). Hypothesis 7, 8, and 9 are thus supported. They jointly explain 63% of the variance in user satisfaction ($R^2 = 0.63$). Subsequently, user satisfaction plays a critical role in explaining collaboration ($p < 0.01$, $\beta = 0.42$). Hypothesis 10 is thus supported.

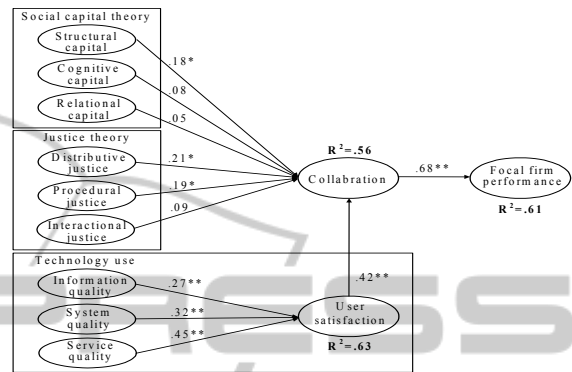


Figure 2: Result of the structure model Value on path: Standardized coefficients (β), R^2 : Coefficient of determination, *: $p < 0.05$, **: $p < 0.01$.

The three sets of variables, SCT, justice theory, and technology use, jointly explain 56% of the variance in collaboration ($R^2 = 0.56$). In turn, collaboration, as an important supply chain mechanism, exercises its significant influence on focal firm performance ($p < 0.01$, $\beta = 0.68$). Hypothesis 11 is thus supported. It explains 61% of the variance in focal firm performance ($R^2 = 0.61$).

5 FINDINGS AND DISCUSSIONS

Considered wholly for the three major issues, social capital, justice, and technology use, they report differentiated effects on collaborative behaviors. In particular, the technology use with the three components, information, system, and service quality, is the most important precursor in determining collaboration behaviors. That is, the three components are all critical in influencing collaboration. In contrast, both of the social exchange issues, social capital and justice, with their comprising elements, do not show as strong effects as technology use. The former comprises structural, cognitive, and relational capital and the latter are distributive, procedural, and interactional justice. Their elements are partially, not all, found in an effect of significance. This is an interesting finding

for this study.

Social capital, a pre-expectation belief of the members in terms of the common goals, values, and mutual trust in the supply chain before the decision to participate in collaborative behaviors, may at times be recognized with negative effect and possibly produce social liability, although most previous studies have thoroughly discussed its positive impact on focal firm performance (Villena et al. 2011).

Perceived justice, a post-expectation belief of the members in terms of fair outcomes, policies, and interpersonal relations in the supply chain for the decision to join collaborative behaviors, may often be sensed to have imbalanced relations because there is a powerful partner to control the decisions in the relationships (Griffith et al., 2006). In fact, justice between supply chain members may have been well realized in most cases.

Further, technology use is identified as a physical behavior of the members in the supply chain for the decision to participate in collaborative behaviors. The reasons for its importance may be twofold. Advances in ICT have made integrating information flows in the supply chain feasible, positioning ICT as a key driver of collaborative effort. In fact, the extent to which modern supply chains rely on ICT has led to the argument that it is impossible to achieve an effective collaboration without ICT (Sanders and Premus, 2005; Smith et al., 2007). Next, technology use is a system-operational behavior rather than a cognitive behavior, such as social capital and perceived justice. That is, supply chain members can be certainly to physically perceive IT capability for its suitability. In the final goal of firm performance, collaboration is the central principle in creating flexible supply chains for the target.

In this study, we have found that collaboration is an important mediator in achieving final firm performance from a combination of different sets of drivers. As partners in the supply chain tend to be more satisfied with their collaborative behaviors, they will effectively eliminate waste (time and material), both internally and externally, and can particularly focus on their core competencies.

6 CONCLUSIONS AND SUGGESTIONS

The findings have important implications for both practitioners and researchers. For the practitioners,

the managers should recognize the value to assure the goals for the developed collaborative effort that are understood by all members. Many firms have engaged in collaborative effort for their supply chain members, yet not all collaborative efforts are successful. Collaborative effort between members may require significant investment in various intangible and tangible resources. A better understanding of the three important issues proposed in this study can help managers improve the possibility of success in collaborative effort. When an investment occurs under the consideration of specific social resources, it is important to identify the psychological states or beliefs of partners in an initial manner so they voluntarily initiate formal social bonding. Therefore, managers need to fully prepare for a cordial atmosphere among partners in terms of their concerns about communication channels, relational stability, mutual rewards, and fair policies. Collaborative relationships are well founded on the responses from the positive beliefs and behaviors of these issues. Advances in ICT are a further investment to make specific social resources feasible in implementing collaborative behaviors. Managers should be first in the preparation to reach consensus on these social resources and further nurture IT capabilities in an interorganizational boundary.

For the researchers, we approach supply chain collaboration from an understanding of both the pre-expectation and post-expectation beliefs as a confirmation of willingness to participate in collaborative effort and of the important enabling role of supply chain technologies in the effort. Few studies have proposed a similar structure in examining collaborative effort. This approach is both comprehensive and unique in understanding the effect of collaboration on firm performance. In particular, considering the D&M model for technology use, it tries to pinpoint the importance of one of the IT features, service quality. This is because the IT-enabled supply chain is extremely complex, involving numerous organizations and users from different industries and hence, an assurance of prompt and uninterrupted system services is imperative.

Subsequent research could be based on this foundation. First, this study is based on a survey method and future research could conduct a case study longitudinally to deeply understand the physical collaboration between the focal firm and its supply chain partners. Second, since the study sample was selected from a combination of various industries, the conclusions are more general and

comprehensive. Future research could be targeted toward particular industries, for instance, the high-tech electronics industry, to understand their differences and similarities. This would provide more insight into supply chain collaboration in the particular industry. Besides, the role of cloud computing in collaborative effort is an important issue of technology use in the future.

Although this research has produced some useful results, a number of limitations may be inherent in it. First, the response rate was lower than desirable, despite the various efforts to improve it. This may be due to a lack of rich experience of most companies on supply chain collaboration. However, the response sample indicated no systematic non-response bias and was well representative of the study sample. Next, the respondents were originally targeted to CEOs, Vice CEOs, and logistics/purchasing executives. However, approximately 26.3% of the respondents are senior staff members. Since senior managers in the larger firms are always busy, some questionnaires may be completed by their subordinates. In fact, staff members are those people who are physically responsible for the daily work. However, additional benefit would be gained from creating a diversity of data sources with multiple informants and therefore, an increase in the variance of the variables of interest.

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