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An Agent-System Contingency Theory for Behavioral Research in Supply Chains

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ABSTRACT

In this study, we developed an agent-system contingency theory as a multi-level theoretical lens for behavioral supply chain research. We then proposed the synergistic use of experiment and survey as a methodological framework in investigating multi-level inquiries guided by the agent-system contingency theory, and conducted two experiments for empirical illustrations.

KEYWORDS: Behavioral Supply Chain Management, Behavioral Operations, Supply Chains, Buyer-Supplier Relationships, Decision Making, Vignette-based Experiment

INTRODUCTION

Over the past decades, various industries have gone through vertical disintegration (e.g., Gilson et al., 2009). Thus, managing supply chains has increasingly become a strategic issue of numerous companies (Gunasekaran and Ngai, 2005). Lying at the heart of effective supply chains management (SCM) is the ability to manage various behavioral aspects inherent in the supply chains, such as opportunism, coordination, and responses to various external changes, which can impact the performance of individual partner firms in supply chains.

Rooted in the theory of industrial organization of microeconomics, SCM field has conventionally rested on economic behavioral assumptions such as self-interested and monetary motives, rational decision-making, and optimization (Donohue and Siemsen, 2010). Scholars have recently suggested that the SCM discipline can benefit from a behavioral lens by applying the emerging approach of behavioral operations to the SCM context (e.g., Bendoly et al., 2006; Donohue and Siemsen, 2010). Behavioral operations is “the study of human behavior and cognition and their impacts on operating systems and processes” (Gino and Pisano, 2008), and has motivated us to re-center the SCM theoretical lens on human agents who operate in the supply chains. In addition, recent literature in SCM has been enriched with the use of different empirical methodologies, such as survey (e.g., Rungtusanatham et al., 2003) and vignette-based experiment (e.g., Rungtusanatham et al., 2011). As such, this paper has three objectives. First, we aim to develop an agent-system contingency theory as an alternative theoretical lens for behavioral SCM research. Second, we propose a methodological framework based on the synergistic use of experiment and survey as a methodology to test the proposed multi-level agent-system contingency theory for behavioral SCM research. Finally, we illustrate the use of our proposed theoretical and methodological approaches to behavioral SCM research through two experiment studies in the supply chain decision contexts of (a) opportunism and (b) supply chain vertical integration.

THEORY DEVELOPMENT: AGENT-SYSTEM CONTINGENCY THEORY

We synthesize both macro-level and micro-level theoretical thrusts and propose the agent-system contingency theory as a multi-level theory of behavioral SCM to explain various managerial decisions and actions in supply chains. The central thesis of this theory lies in the contingency logic that system-level properties (i.e., those that are external to human agents in supply chains) interact with agent-level properties (i.e., those inherent in the human agents) in influencing managerial decisions and actions in supply chains.

As an initial step in developing the agent-system contingency theory, we narrow down the scope of agent-level properties to personal characteristics of human agents in supply chains, and focus specifically on individual differences in terms of personality traits. We conceptualize system-level properties as those that are external to human agents and reflect characteristics of firms and/or supply chains, such as relational norms, power-dependence, relationship-specific investments, and contractual arrangements (e.g., Heide and John, 1988; Jap and Anderson, 2003; Noordewier et al., 1990). These macro-level properties form the operating conditions in which human agents with various personality traits operate. As such, the agent-system contingency theory is positioned to address basic research questions, such as “*how do human agents with distinct personality traits shape various managerial decisions and actions in supply chains?*” and “*how do human agents with distinct personality traits behave or take actions under different macro-level operating conditions in influencing various outcomes in supply chains?*”

The agent-system contingency theory postulates two general theoretical propositions: (1) trait

relevance and (2) agent-system property alignment in explaining managerial decisions and actions in supply chains.

First, the *trait relevance* proposition is rooted in the field of person-situation psychology, suggesting that individuals' personal characteristics (e.g., cognition, emotion, motivations, and values) are triggered by specific psychological features of situations and influence the individuals to exhibit certain behaviors (e.g., Mischel and Shoda, 1995). We argue that various decision circumstances in supply chains have inherent psychological features, which are uniquely salient to decision-making agents with certain distinct personality traits. This line of logic suggests a general theoretical proposition as follows.

Proposition 1: Decision-making agents' personality traits relevant to decision contexts influence managerial decisions and actions in supply chains.

Second, the *agent-system property alignment* proposition is built on the theoretical insight garnered from contingency theory (e.g., Lawrence and Lorsch, 1967), which in a general sense suggests that the interaction of internal and external factors tends to determine organizational outcomes. In the context of supply chains, we maintain that the fundamental logic of contingency theory provides a theoretical structure that both macro-level and micro-level conceptual elements of the agent-system contingency theory (i.e., system-level and agent-level properties, respectively) can be harmonized. Specifically, we contend that system-level properties (e.g., relational norms, power-dependence, routines, and policies) in part constitute macro-level operating conditions in which decision-making agents with distinct personality traits function. As such, the agents' decisions and actions are both externally influenced by the macro-level operating conditions and internally influenced by their personality traits relevant to the decision contexts. In addition, the macro-level operating conditions and the personality traits of the agents can be qualitatively dissonant with, neutral to, or consonant with each other, resulting in agent-system property misalignment, agent-system property co-existence without interaction, or agent-system property alignment, respectively. The concepts of agent-system property alignment, co-existence, and misalignment discussed above suggest the following propositions.

Proposition 2.1: The interaction between dissonant/consonant macro-level operating conditions (i.e., inter- and/or intra-firm properties) and decision-making agents' personality traits (i.e., agent-level properties) relevant to decision contexts influences managerial decisions and actions in supply chains.

Proposition 2.2: The interaction between neutral macro-level operating conditions (i.e., inter- and/or intra-firm properties) and decision-making agents' personality traits (i.e., agent-level properties) relevant to decision contexts does not influence managerial decisions and actions in supply chains.

MULTI-LEVEL METHODOLOGICAL FRAMEWORK

Multi-level behavioral SCM inquiries guided by the agent-system contingency theory can be empirically investigated through the synergistic use of experiment and survey research methods. As Babbie (1995) summarized, a common practice in experimental research is that researchers manipulate external stimuli and introduce them to human subjects, and then observe behavioral responses from the subjects; therefore, it is a powerful method in investigating the effects of external factors on human behaviors. The use of survey methods, to complement the experimental approach, enables researchers to measure factors internal to

human agents, such as personalities, attitudes, and beliefs, via questionnaire items (e.g., Flynn et al., 1990). We therefore propose a five-step methodological framework that synergizes the strengths of both experiment and survey methods in addressing a wide range of SCM inquires.

1. Determine the agent- and system-level properties for the analysis
2. Develop experimental vignette and survey measurement items
3. Select subjects for experiment
4. Conduct the experiment and administer the survey measurement items
5. Analyze and interpret result

Experiment 1: Opportunism study

Experiment 1 is a study of opportunism, which is extended from the experimental study by Tangpong, Hung, and Young (2010), focusing on the interaction effect of relational norms and agent cooperativeness on opportunism in buyer-supplier relationships. Opportunism is generally defined as “self-interest seeking with guile” (Williamson, 1985), and occurs in buyer-supplier relationships when one exchange party unilaterally acts for its own gain at the potential expense of the long-term mutual gains of both exchange parties (Brown et al., 2000). We argue that cooperativeness is a key personality trait of the decision-making agent relevant to the decision whether to act opportunistically toward the exchange partner in the buyer-supplier relationship. We elaborate Proposition 1 of the agent-system contingency theory and propose the following hypothesis.

Hypothesis 1: Decision-making agents' cooperativeness is negatively related to opportunism in buyer-supplier relationships.

The literature on buyer-supplier opportunism has also identified two key characteristics of buyer-supplier relationships, namely relational norms and dependence (e.g., Carson et al., 2006; Joshi and Arnold, 1998; Provan and Skinner, 1989), that are associated with opportunism mitigation. Exchange partners in buyer-supplier relationships characterized by high relational norms display a long-term orientation, and strive for mutual interests. Alternatively, opportunism-mitigating mechanisms in buyer-supplier relationships can be based on dependence, which is defined as the degree to which an exchange party needs to maintain the relationship with the other party to obtain necessary resources and to attain its desired goals (Heide and John, 1988). A firm that is highly dependent on its partner in an exchange relationship tends to have a concern about preserving the relationship with its partner. Therefore, its dependence on the exchange partner potentially discourages the firm to act opportunistically towards its partner. In the agent-system contingency framework, both relational norms and dependence are considered important inter-firm properties or macro-level operating conditions in which decision-making agents function. We elaborate Proposition 2.1 of the agent-system contingency theory and propose the following hypothesis.

Hypothesis 2: The interaction between agent cooperativeness and relational norms is negatively related to opportunism in buyer-supplier relationships.

On the other hand, dependence-based mechanisms to mitigate opportunism in a buyer-supplier relationship are characterized by the replaceability of partners (Heide and John, 1988); therefore, it is independent from the internal predisposition of cooperative agents to act in fair and supportive manners. We thus elaborate Propositions 2.2 of the agent-system contingency theory and propose the following hypothesis.

Hypothesis 3: The interaction between agent cooperativeness and dependence is not related to opportunism in buyer-supplier relationships.

To test the hypotheses, we designed a vignette-based experiment (e.g., Rungtusanatham et al., 2011). Participants in the study were 172 MBA students in two U.S. universities. The experiment was a two-by-two (i.e., high/low relational norms and high/low dependence) between-subject design. We randomly assigned participants into four groups, and each of the participants read a short business vignette adopted from Joshi and Arnold's (1998) buyer-supplier relationship study. The results of the multiple regression analyses yielded support for all three hypotheses. Therefore, the results of Experiment 1 are largely consistent with the central thesis of the agent-system contingency theory.

Experiment 2: Supply chain vertical integration study

Vertical integration decisions influence the boundary of the firm as the firm's managers decide which tasks or activities are to be performed within the firm's boundary and which ones outside the boundary (Pisano, 1990). Typically, vertical integration attempts reflect the firm's major commitment and investment, thus exposing the firm to greater financial risks. We argue that risk propensity is a key personality trait of the decision-making agent relevant to the supply chain vertical integration decision, given the uncertain and risky nature of the decision. Risk propensity (i.e., individual predisposition toward taking risks; the reverse of risk aversion) is a key personal characteristic that has found to influence various managerial decisions, the outcomes of which are uncertain (Kull, Oke, & Dooley, 2014; Martinez and Artz, 2006). We thus elaborate Proposition 1 of the agent-system contingency theory into Hypothesis 4 as follows.

Hypothesis 4: Decision-making agents' risk propensity is positively related to the supply chain vertical integration decision.

The macro-level operating condition that we use to examine the supply chain vertical integration decision is relational norms. Research on relational governance has suggested that relational norms are a predominant form of relational governance in mitigating opportunism and increasing customer's satisfaction in exchange relationships (Lai, Li, & Lai, 2013), and that relational norms can mitigate the opportunism risk when the transactions are characterized as high asset specificity and high uncertainty (e.g., Crosno and Dahlstrom, 2008). Relational governance seems to be a preferred governance mode to hierarchy or vertical integration, which potentially incurs high entry cost, increases hierarchy cost and management complexity, and results in integration problems if it is implemented through acquisition. Thus, from the agent-system contingency framework, relational norms in exchange relationships are considered a macro-level operating condition that can influence the supply chain vertical integration decision. This line of reasoning is consistent with Proposition 2.1 of the agent-system contingency theory and suggests Hypothesis 5 as follows.

Hypothesis 5: The interaction of agent risk propensity and relational norms in exchange relationships is negatively related to the supply chain vertical integration decision.

To test Hypotheses 4-5, we also used the vignette-based experimental method as in Experiment

1. Participants in the study were 98 business executives in the U.S. Participants were randomly assigned into two groups. The participants in one group read a short business vignette regarding supply chain vertical integration decision in the context of high relational norms while those in the other group read the same vertical integration vignette but in the context of low relational norms. The agent risk propensity was measured with an existing five-item instrument with a 1-7 rating system (Hung et al., 2012). The results of the multiple regression analyses yielded support for both Hypotheses 4 and 5. Therefore, the results of Experiment 2 are consistent with the central thesis of the agent-system contingency theory.

Discussion and conclusion

This study contributes to the literature in four meaningful ways. First, it provides a multi-level theory for behavioral research in SCM as the agent-system contingency theory unifies decision-influencing forces internal to decision-making agents and those external to the agents in explaining managerial decisions and actions in supply chains. Second, this study also contributes to the advancement of behavioral operations in general since the use of personality trait as a focal construct in this study can simplify the theoretical development in behavioral studies of operations, given that personality traits encapsulate individuals' behavioral attributes such as cognitions, emotions, and motivations. Third, the agent-system contingency theory is developed as a general theoretical lens for behavioral research in SCM, and its central propositions can be applied to various supply chain decision contexts. Finally, the generic methodological framework proposed in this study is intended for various multi-level SCM inquiries guided by the agent-system contingency theory.

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