

**Strategic and IT Integration Decisions: Implications for Interorganizational Cost Management and
Effects on the Perceived Value of Supply Chain Partner**

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July 29, 2006

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We thank Brad Tuttle for his helpful comments and suggestions.

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Abstract

In today's competitive business environment, more companies are adopting the supply chain management approach in order to unify major business processes with their supply chain partners. In doing so, supply chain members are able to gain a competitive advantage by synchronizing the flow of resources and information across companies. However, one major obstacle encountered in supply chain management is information asymmetry. In order to reduce costs associated with information asymmetry, more and more firms engage in interorganizational cost management (IOCM). Successful IOCM requires that firms share information with their suppliers and customers. This paper experimentally investigates two factors that affect the level of information sharing between supply chain members and how they contribute to the overall value as measured by investors' assessed firm value. The two factors examined in this study are (1) information technology integration, and (2) strategic integration. Prior studies focus largely on the effect the announcements on the announcing firm's stock price and ignore their value implications for its supply chain members. This current study provides empirical evidence regarding the effect of one firm's IT investment and strategic partnership announcements on its supply chain partner's firm value. Results show that IT and strategic integration lead to a higher assessed stock price for the supply chain partner. Results also show that strategic integration and IT integration combined leads to the highest perceived firm value for the supply chain partner. These results suggest that IT or strategic integration alone improves valuation of the supply chain partners. However, only when the IT integration is coupled with strategic integration, do supply chain partners maximize IOCM benefits, and thus achieve the greatest increase in firm value.

Key Words: Interorganizational Cost Management, Strategic Integration, Information Technology (IT) integration, Supply Chain, Information Sharing, Information Transfer, Perceived Value

I. Introduction

Today's competitive and global business environment has forced many companies to focus their attention and resources on maintaining and improving their interorganizational collaborations and alliances (KPMG 2005). More and more companies are adopting the supply chain management (SCM) approach that unifies the major business processes of supply chain partners "in order to minimize system-wide costs while satisfying service level requirements" (Simchi-Levi, Kaminsky and Simchi-Levi 2003). In doing so, supply chain members are able to gain a competitive advantage by synchronizing the flow of resources (i.e., material, products and capital) and information across companies (Marquez, Bianchi and Gupta 2004; Simchi-Levi et al. 2003).

One major problem encountered in SCM is information asymmetry (Lee, Padmanabahn and Whang 1997a; Simchi-Levi et al. 2003). For instance, information asymmetry between customers and suppliers will result in a customer requesting function specifications that unnecessarily increase the costs incurred by its supplier (Cooper and Slagmulder 2004). By requiring certain fancy but unneeded function specifications, the customer may force the supplier to develop components using expensive raw materials or production processes. Information asymmetry among supply chain members, therefore, results in inflation of final product costs (Simchi-Levi et al. 2003). In order to reduce costs associated with information asymmetry, more and more firms engage in interorganizational cost management (IOCM). IOCM involves cooperative actions between supply chain members for the purpose of achieving cost reductions and creating value (Coad and Cullen 2006; Cooper and Slagmulder 1998).

Successful IOCM requires that firms share information with their suppliers and customers (Coad and Cullen 2006; Cooper and Slagmulder 2004; Fiala 2005). Information sharing can range from exchanging production schedules to product designs. Sharing more information allows supply chain members to achieve greater benefits (i.e., cost reduction and increased profits) from IOCM practices (Coad and Cullen 2006; Cooper and Slagmulder 2004; Lee, Padmanabhan and Whang 1997b). This paper investigates factors that lead to the information sharing between supply chain firms and thus the overall

value creation. Because interorganizational data is usually proprietary, we cannot directly measure the extent of information sharing and its influence on performance. As such, we use perceived firm value (i.e., stock price) as a proxy for the performance measure of IOCM practices.

Supply chain members can facilitate information sharing by using integrated information technology systems and by developing strategic partnerships (Simchi-Levi et al. 2003; Vickery, Jayaram, Droge and Calantone 2003). Hence, information sharing depends on (1) information technology (IT) integration, and (2) strategic integration among supply chain members. IT integration is defined as the extent to which firms use IT, such as interorganizational systems (IOS), to integrate the interorganizational IT functions.¹ Therefore, IT integration provides supply chain members with an electronic communication platform that facilitates information access and transmission (Vickery et al. 2003). Strategic integration is defined as the extent to which supply chain members coordinate and collaborate to align business functions and processes. Strategic integration establishes partnerships and alliances that allow supply chain members to share proprietary information. Hence, each type of integration (i.e., IT and strategic) alone is expected to increase information sharing, thus contributing to more successful IOCM. However, only when IT and strategic integration are combined will supply chain members expect to benefit the most from IOCM and ultimately to achieve highest firm value.

Coad and Cullen (2006) advocate a need for more IOCM research. As they point out, managerial accounting research in IOCM focuses primarily on either decisions regarding whether to make or buy a product or service, or decisions regarding what relational forms to adopt for cost reduction. However, this stream of research has not examined what factors may affect information sharing which in turn contributes to more successful IOCM and overall supply chain performance. Drawing theoretical support largely from operation management (OM) and information systems (IS) literature, this study extends

¹ IOS is defined as “information and communication technology-based systems that extend beyond an organization’s legal boundaries and link otherwise independent organizations together (Street and Goldsmith 2003). Common types of IOS include electronic data interchange (EDI) and enterprise resource planning (ERP).

IOCM research in managerial accounting by examining the individual and combined effects of IT and strategic integration on supply chain members' firm value.

Prior event studies in IS research and strategic alliance research have examined the effect of events like IT investment or strategic alliance announcements on announcing firms' market value. By announcing firm, in this current study, we refer to the firm that is investing in the new IT system and making the IT and strategy announcements. IS research shows that the market reacts favorably to a firm's IT investment decisions (Chatterjee, Pacini and Sambamurthy 2002; Dehning, Richardson and Zmud 2003; Dos Santos, Peffers and Mauer 1993; Hayes, Hunton and Reck 2001; Im, Dow and Grover 2001). Similarly, supply chain research, a stream of OM research, has generally documented positive stock market returns for firms announcing strategic alliances (Anand and Khanna 2000; Chan, Kensinger, Keown and Martin 1997; Das, Sen and Sengupta 1998; Kale, Dyer and Singh 2002) Taken together, these results suggest that IT investments and strategic partnership announcements are generally perceived as good news by investors of announcing firms.

Prior studies focus largely on the effect the announcements on the announcing firm's stock price and ignore their value implications for its supply chain members. This current study provides empirical evidence regarding the effect of one firm's IT investment and strategic partnership decisions on its supply chain partner's firm value. In the current study the IT investment announcement of the announcing firm contains two pieces of information (1) IT integration decision, and (2) strategic integration decision. In so doing, we can gain a holistic perspective regarding the effects of these decisions on overall supply chain value. Furthermore, prior studies have only examined the association between the announcement of each decision (i.e., IT integration or strategic integration) and stock price separately. However, both IT and strategic integration contribute to the overall information sharing along the supply chain, and thus the success of IOCM. Therefore, their effects on firms' value can be interrelated. Our study extends prior literature by examining the combined effect of both decisions made by the announcing firm on supply chain partner's firm value.

Drawing upon information transfer literature, we predict that the IT and strategic integration announcements of the investing firm will affect the firm valuation of its supply chain partner. Prior studies provide evidence that disclosures of one firm are associated with significant stock prices changes of firms in related industries and/or firms in the same supply chain network (Ettredge and Richardson 2003; Foster 1981; Olsen and Dietrich 1985). This phenomenon is referred to as information transfer. Firms in the same supply chain are interdependent and, therefore, one firm's supply chain decision can affect its related (partner) firms (Simchi-Levi et al. 2003). The information contained in supply chain decision announcements by the announcing firm, such as IT and strategic integration, will have value implications for its related supply chain firms.

In this study, an experiment is conducted in which participants derive stock price assessments for one firm's supply chain partner following this firm's IT and strategic integration announcements. The strategic integration announcement is made at the same time as IT integration announcement to allow us test the individual and combined effect of both factors. We choose an experimental approach because experiments provide better control over confounding variables, thus enabling causal inferences to be made (Hunton, McEwen and Wier 2002; Sprinkle 2003). In addition, an archival event study approach is not adopted because firms' supply chain partners' identity is usually not disclosed or even if they are disclosed, the relevant information is not readily available.

As predicted, we find that IT and strategic integration lead to a higher assessed stock price for the supply chain partner. Also consistent with our predictions, we find that strategic integration and IT integration combined results in the highest perceived firm value for the supply chain partner. These results suggest that IT or strategic integration alone improve valuation of the supply chain partners. However, only when the IT integration is coupled with strategic integration do supply chain partners maximize IOCM benefits, and thus achieve the greatest increase in firm value.

II. Theoretical Background and Hypotheses Development

Prior event studies have shown that announcements made by announcing firms are associated with significant stock price changes of “related” non-announcing firms (Bannister 1994; Cavusoglu, Mishra and Raghunathan 2004; Ettredge and Richardson 2003; Foster 1981; Graham Jr and Lefanowicz 1997; Olsen and Dietrich 1985; Pownall and Waymire 1989). This phenomenon is referred to as the information transfer. “Related” firms here refer to those firms that are associated with the announcing firms through either industry or business relationships (e.g., parent-subsidary, partnerships, alliances, and supply-chain members). In this current study, we refer to ‘related’ supply chain firms simply as partners. Announcements examined by prior studies include disclosures of financial information, such as forecasted and actual earnings, and other disclosures, such as security breaches and hacker attacks (Cavusoglu et al. 2004; Ettredge and Richardson 2003; Foster 1981; Olsen and Dietrich 1985).

Our study draws from the information transfer literature to make predictions regarding the effects of IT and strategic integration announcements on the announcing firm’s supply chain partner’s firm value. Specifically with respect to supply chain information transfer effect, Olsen and Dietrich (1985) show that information transfer occurs between retail chain stores and their suppliers. They find that the retailer’s sales announcements are associated with significant stock price changes for its suppliers. If IT and strategic integration decisions of one firm affect its information sharing with its supply chain partners, then these decisions may also affect IOCM and overall supply chain performance. Hence, announcements of these decisions should affect investors’ assessed stock price of the announcing firm’s supply chain partner. This is because IT and strategic integration announcements also convey information to investors about the supply chain partner. We hypothesize in the next section that investors’ assessed stock value of the supply chain partner depends on two factors: (1) IT integration, and (2) strategic integration.

IT Integration

IT integration, often with the implementation of IOS, is one mechanism that can be used to improve information sharing across organizational boundaries. Vickery et al. (2003) point out that

vertically integrated IT systems, such as IOS, facilitates information sharing and execution of transactions among supply chain members by enabling more efficient sharing of production information such as planning/forecasting, tracking, ordering, and shipping information. Prior studies examining the benefits of vertically integrated IT systems, such as IOS, show that the use of these systems leads to increased data accuracy, reduced processing errors, and reduced order-processing time (Anderson and Lanen 2002; Mukhopadhyay, Kekre and Kalathur 1995; Srinivasan and Kekre 1994). Since IT integration facilitates information sharing between supply chain members, highly integrated IT systems can reduce supply chain costs and improve supply chain profits.

If IT integration improves supply chain value, then the market should perceive the IT integration decision as a positive signal for participating firms' value. Indeed, prior event studies in IT integration decisions, such as investment in EDI or ERP, show that IT integration announcements are associated with stock price increases (Chatterjee et al. 2002; Dehning et al. 2003; Dos Santos et al. 1993; Hayes et al. 2001; Im et al. 2001). The increase in stock prices experienced by firms following an IT investment announcement suggests that investors perceive the new IT system to have value-add benefits for announcing firms. The focus of all these studies has been on the investing (i.e., announcing) firms. However, no empirical evidence exists regarding the effect of the investing firm's IT integration decision, such as IOS investment, on the stock price valuations of its supply chain partners. It remains a question whether the benefits from one firm's IT investment will spill over to its partners and therefore be reflected in the partners' stock price.

In addressing the spillover effect of IOS investment on its supply chain partners, IS literature has provided evidence that one firm's IOS investment does benefit its supply chain partners (Barua, Konana, Whinston and Yin 2004; Lee, Clark and Tam 1999; Mahajan and Vakharia 2004; Riggins and Mukhopadhyay 1994; Subramani 2004; Wang and Seidmann 1995). For instance, Wang and Seidmann (1995) show that a supplier's IT investment can create positive externalities for its downstream supply chain partners by reducing transaction costs. In addition, Mahajan and Vakharia (2004) derive models

demonstrating that a firm's IOS investment can serve not only to benefit the investing firm, but also to create positive spillover effects for other supply chain partners. Moreover, Barua et al. (2004) show that a firm's IT capacities positively affect its supply chain partner's IT capabilities, which in turn are positively related to the partner's financial performance. The above evidence suggests that the benefits from one firm's interorganizational IT system implementation can spill over to its supply chain members.

If one firm's IT integration decision can affect its supply chain partners' performance, then the announcement of IT integration should have value implications for supply chain partners following information transfer literature (Bannister 1994; Cavusoglu et al. 2004; Foster 1981; Olsen and Dietrich 1985). Since IT integration has positive spillover effect on supply chain partners' performance, (Lee et al. 1999; Mahajan and Vakharia 2004; Subramani 2004; Wang and Seidmann 1995), investors will adjust upward their stock price valuation for the supply chain partner following the announcement of an IT integration decision. On the other hand, if IT related decisions do not involve integration with other supply chain partners, then these announcements have little or no value implications for the partner. The above arguments lead to the following hypothesis:

H1: Following a firm's IT integration announcement, its supply chain partner's assessed stock price will be higher when IT integration is high than when it is low.

Strategic integration

The objective of IOCM is to find lower-cost solutions than would otherwise be possible if the firm and its supply chain members attempted to reduce costs independently (Cooper and Slagmulder 1998). IOCM requires that supply chain members extend their cost management programs beyond their organizational boundaries (Cooper and Slagmulder 1998). Hence, it necessitates a higher level of coordination and collaboration among supply chain members to achieve greater cost reduction (Cooper and Slagmulder 2004). IOCM, therefore, encourages firms to engage in strategic integration.

As defined above strategic integration refers to the extent to which supply chain members integrate their business functions and processes. Strategic integration is exemplified by strategic alliances,

and close collaborative relationships with business partners; these are typically “goal-oriented, long-term partnerships between two companies in which both risks and rewards are shared” (Simchi-Levi et al. 2003). Dell, for example, forms strategic integrations with its major suppliers; “When we launch a new product, our suppliers’ engineers are right in our plants. If a customer has a problem, we can fix it in real time” (Magretta 1998). On the other end, lack of strategic integration is usually characterized by a short-term, arms-length relationship (i.e., each party is looking out for its own best interest). An example would be a manufacturer who purchases from a supplier standardized commodity-like products that can be purchased easily from other suppliers.

Closer collaboration among strategically integrated supply chain members allows them to exchange proprietary information and align business processes, which in turn leads to greater cost savings and long-term profitability (Cooper and Slagmulder 2004). Kulp (2002) uses a retailer-supplier example to illustrate how sharing proprietary information affects supply chain profits. In her study, manufacturers’ profit differences between vendor managed inventory (VMI) and traditional inventory system increase with the extent that retailer is willing to share managerial accounting information (i.e., inventory supply/demand information).² Similarly, Marquez, Bianchi and Gupta (2004) find that, when supply chain members share demand forecast, inventory, and planning information, the supply chain achieves the greatest operating efficiencies. The close collaboration between Dell and its suppliers, for example, allows both to focus and specialize, benefiting both Dell and its major suppliers (Magretta 1998).

Conversely, when supply chain members lack close collaboration (e.g., arms-length relationships) a significant amount of information asymmetry exists; this often results in major transaction costs (Lee et al. 1997b). It has been noted that ‘lack of partner awareness’, ‘lack of understanding of supply chain’ and ‘myopic strategies’ are major barriers to effective supply chain management (Benton and Maloni 2005). One result of information asymmetry is the bullwhip effect. This effect refers to instances where the

² VMI refers to when the manufacturer (supplier) “manages the inventory of its product at the retailer outlet, and determines for itself how much inventory to keep on hand and how much to ship to the retailer in every period” (Simchi-Levi et al. 2003).

variability in demands increases moving up the supply chain (Simchi-Levi et al. 2003). The bullwhip effect is caused by distorted information that travels from one end of a supply chain to the other (Fiala 2005; Simchi-Levi et al. 2003). It can result in “tremendous inefficiencies, such as excessive inventory investment, poor customer service, lost revenues” (Lee et al. 1997b).

Strategic integration can reduce the costs associated with information asymmetry and improve overall supply chain value (Simchi-Levi et al. 2003; Vickery et al. 2003). Simchi-Levi et al. (2003), for example, suggest that strategic partnerships can mitigate the bullwhip effect and greatly reduce the costs associated with information asymmetry. Moreover, Vickery et al. (2003) show that supply chain integration improves customer service, which in turn leads to better financial performance. Furthermore, event studies that examine the market reaction to the announcements of strategic alliances generally document positive stock market returns (Anand and Khanna 2000; Das et al. 1998; Kale et al. 2002). The positive market reactions to strategic alliance announcements suggest that investors expect the strategic integration will create long-term value for participating firms.

This paper differs in several ways from prior event studies of strategic alliances (Anand and Khanna 2000; Chan et al. 1997; Das et al. 1998; Kale et al. 2002). First of all, our study examines the strategic integration with respect to its effect on (non-announcing) business partner’s stock price. Although prior studies generally report a positive return to either announcing firms or announcing pairs (e.g., supplier and customers), they do not specifically examine the effect of strategic integration announcements on the strategic partner. Thus, it is not clear that benefits from strategic alliances will also accrue to the announcing firm’s strategic partner. Second, our study focuses on how supply chain integration contributes to success of IOCM and thus firm value. In comparison, the strategic alliances examined in afore-mentioned studies have not examined how the market will value the supply chain integration. Despite these differences, prior event studies are, in general, consistent with the view that strategic alliances lead to long-term strategic benefits to participating partners (Simchi-Levi et al. 2003). Following prior research, we hypothesize that the investors will view the event of strategic integration as

good news to the supply chain partners of the announcing firm. The above literature and information transfer literature lead to the following hypothesis:

H2: Following a firm's strategic integration announcement, its supply chain partner's assessed stock price will be higher when strategic integration is high than when it is low.

Combined Effect of IT integration and Strategic Integration

Without strategic integration, cost savings from IT integration can be limited. Although IT integration can facilitate information sharing, it alone does not indicate how much and at what level information will be shared between supply chain members. That is, even when supply chain members have IT integration, they can still choose not to exchange proprietary information that is critical for successful IOCM. For example, if manufacturers do not share accurate demand information with suppliers, suppliers may either produce more or less than the parts actually demanded, and incur overstock or stockout costs (Fisher, Hammond, Obermeyer and Raman 1994; Lee et al. 1997b). These costs will eventually be added to the manufacturer's product cost through either increased costs of outsourced components or delayed production. Prior literature suggests that only through business redesign or reengineering, can IOS's full potential for improving supply chain performance be realized (Clark and Stoddard 1996; Riggins and Mukhopadhyay 1994).

On the other hand, the costs for strategic integration could be staggering without IT integration. Numerous IT value studies have documented that IT integration can significantly reduce order-processing costs, improve cost management, and support just-in-time processes (Anderson and Lanen 2002; Mukhopadhyay and Kekre 2002; Mukhopadhyay et al. 1995; Srinivasan and Kekre 1994). Without support of advanced IT links between supply chain members, strategic integration may not even be feasible. For example, some SCM practices, VMI program or Continuous Replenishment Process, require retailers continuously to transmit inventory data to vendors (Buzzell and Ortmeier 1995; Simchi-Levi et

al. 2003).³ Without IT integration through EDI, ERP or other IOS, supply chain members cannot integrate their business together; or even if they can, the implementation cost will be huge.

From above, IT integration alone will not be effective and strategic integration alone will be either too costly or infeasible. Therefore, only when combined, can IT integration and strategic integration yield the greatest benefit from information sharing between supply chain members, resulting in maximum IOCM benefits. We argue that the benefits of IT integration and strategic integration are greater than the benefits achievable from IT integration alone or strategic integration alone. We also expect that strategic integration coupled with IT integration will have the greatest effect on the supply chain partner's stock price, compared to either IT or strategic integration alone or neither is present.

H3: The supply chain partner's assessed stock price will be highest when both IT integration and strategic integration are high.

III. Method

Design

Our hypotheses are tested using an experiment. The experiment uses a 2x2 between subjects design. The independent variables are IT integration and strategic integration. IT integration is manipulated at two levels: presence or absence of IT integration. In the presence of IT integration, the manufacturer (i.e., customer) indicates in an IT investment announcement that the IT investment will improve the information sharing capabilities between its supplier and itself. The improved IT capabilities can facilitate information sharing at all levels of decision making between the manufacturer and its supplier. In the absence of IT integration, the IT investment will improve the manufacturer's internal information sharing, but does not change the information sharing capabilities between the two supply chain members (See Appendix 1 for the IT integration manipulations).

³ Continuous replenish process refers to that suppliers "receive point of sale (POS) data and use these data to prepare shipments at previously agreed-upon intervals to maintain specific levels of inventory" (Simchi-Levi et al. 2003).

Strategic integration is also manipulated at two levels: presence or absence of strategic partnership. In the presence of strategic integration, the announcement indicates that two supply chain members will form a strategic partnership in order to collaborate at all levels of decision making. In the absence of strategic integration, the announcement indicates that the arm's-length relationship between the two supply chain members will not change from the status prior to the announcement (See Appendix 2 for the strategic integration manipulations).

The dependent variable is investors' equity valuation judgment for the supplier (i.e., non-announcing firm) following the manufacturer's (i.e., announcing firm) announcement. Investors' equity valuation judgments are operationalized by the stock price that is provided by each participant after receiving the announcement. Supplemental analyses follow regarding perceptions of operational, financial, and long-term spillover effects which generally lead to equity valuation; these additional dependent measures are designed to support our valuation (stock price) results.

Participants

Ninety-five MBA students at one state university participated in the experiment. The average years of full-time work experience is 4. (std. deviation = 3.91). The average self-assessed supply chain knowledge is 5.91 (std. deviation = 1.80) on a 1-9 scale with 1 being low supply chain knowledge and 9 being high supply chain knowledge. The average self-assessed IT knowledge is 6.25 (std. deviation = 1.77) on a 1-9 scale with 1 being low IT knowledge and 9 being high IT knowledge. 72.63 percent of the participants have owned stocks, bonds and/or have an IRA and 95.79 percent of the participants plan to invest in stocks and/or bonds in the future.

Participants were randomly assigned to the four treatment conditions. There were no significant differences across treatment conditions in work experience, area of study, frequency of participants who owned stocks, bonds, and/or have an IRA, and frequency of participants who plan to own stock and/or bonds in the future. Although supply chain and IT knowledge are different across treatment conditions,

they are not significant when each variable is included as a covariate in the ANOVA model. Therefore, these variables are not included in our primary analyses.

Task

Participants were first given brief background information regarding two hypothetical publicly-traded companies that are part of the same supply chain. One company is a manufacturer (i.e., downstream firm or customer) and the other company is its major supplier (i.e., upstream firm). In all treatment conditions, the manufacturer is the company making the IT investment and announcement. Specifically, the background information provides participants with details regarding the supply chain relationship. This information includes: (1) percentage of total sales/purchases exchanged between the two companies, (2) status of existing business relationship prior to the announcement (i.e., arm's-length in all experimental conditions), and (3) nature of current information exchange (i.e., the IT systems of the two companies are not linked in all experimental conditions).

Next, participants were provided with the IT investment announcement made by the manufacturer (i.e., customer) which includes the treatment information (i.e., existence or absence of IT and strategic integration). Following the receipt of the above information, participants, as potential investors, answered seven questions regarding the immediate operation effects, three questions regarding the financial performance effects, five questions regarding risk effects, and four questions regarding the long-term performance effects of the announcement on the supplier.⁴ A 1- 9 scale is used with 1 being “strongly disagree” and 9 being “strongly agree” to capture participants’ responses to each question. The questions/statements were worded such that greater agreement with each statement translates to greater perceived performance and they are used in our supplemental analyses. In addition, participants were provided with the stock price of the supplier just prior to the manufacturer’s IT announcement. Participants, as potential investors, were then asked to provide the closing stock price for the day.

⁴ The risk effect questions are intended for further analysis which at this time is not included in the current version of this paper.

Following the equity valuation judgment, participants completed manipulation check questions and a post-experimental questionnaire. The questionnaire includes questions for self-assessments of supply chain and information system knowledge, major area of study, program enrolled, and years of full-time work experience. Furthermore, participants were asked whether they have owned stock, bonds, or have an IRA, and whether they plan to invest in stocks and/or bonds in the future. See one version of our instrument in Appendix 3.

Manipulation checks

The two manipulation check questions correspond to the two treatment variables, IT integration and strategic integration. We asked participants to recall whether the new IT system will change the current information sharing capabilities between the manufacturer and its supplier and whether there will be a change in the current arm's length relationship between two firms. 88.4 percent of the participants correctly answered both manipulation check questions.

We conducted an analysis to test whether our results were sensitive to the exclusion of those participants who have failed at least one of the manipulation check questions. Excluding participants who answered at least one of the manipulation check questions incorrectly did not change any of the conclusions drawn from our results. This suggests that even though some participants failed the manipulation checks (i.e., memory test), they were able to acquire and interpret the IT announcement information in a manner consistent with the participants who passed both manipulation checks. Consequently, all participants are included in our result analyses.

IV. Results

Hypotheses Testing

Table 1, Panel A reports the least-square means by treatment conditions for participants' assessed stock price (PRICE) of the supplier (non-announcing partner firm), following the IT investment announcement of the manufacturer. As predicted, participants' assessed stock price for the supplier

increase from the initial stock price of twenty-nine dollars, which was provided to participants, when either IT integration (IT_INT) or strategic integration (STR_INT) occurs. Also as predicted, the highest assessed stock price is observed in the presence of both IT and strategic integration. The results show that presence of either IT or strategic integration improves the supplier's perceived stock valuation and the combination of both yields the highest. Formal statistical tests of each hypothesis are presented below.

[INSERT TABLE 1 ABOUT HERE]

H1 predicts that PRICE will be higher in the presence of IT_INT than in the absence of IT_INT. H2 predicts that PRICE will be higher in the presence of STR_INT than in the absence of STR_INT. An ANOVA model with IT_INT and STR_INT as the independent variables and PRICE as the dependent variable is used to test H1 and H2.

Table 2, Panel A presents the ANOVA results. Results presented in Table 2 show a significant main effect of IT_INT on PRICE ($F = 5.29$; $p < 0.01$, one-tailed), thus supporting H1. This result along with the results in Table 1 show that the assessed PRICE will be higher when the manufacturer's IT investment improves information sharing capabilities between manufacturer and its supplier than when the investment only upgrades the manufacturer's own system. Results presented in Table 2, Panel A also show a significant main effect of STR_INT on PRICE ($F = 10.83$; $p < 0.01$, one-tailed), thus, supporting H2. This result, along with the results in Table 1, shows that the positive spillover effect is greater when the announcing firm collaborates with its supplier than when it does not.

[INSERT TABLE 2 ABOUT HERE]

H3 predicts that PRICE will be highest when IT integration is coupled with strategic integration. In order to test H3, a comparison is made between the condition with both IT and strategic integration and the other three conditions averaged. This contrast, presented in Table 2, Panel B, is significant ($F = 10.31$; $p < 0.001$, one-tailed), thus supporting H3. In order to determine whether having both IT and strategic integration yields significantly higher PRICE than IT or strategic integration alone, a comparison is made

between the condition with both IT and strategic integration and the two conditions when either IT or strategic integration are present but not both. This contrast, of the average of the two conditions of IT and Strategic integration alone, is also significant ($F = 5.07$; $p = 0.01$, one-tailed)⁵. This result also supports H3. Table 2, Panel B presents the comparison results for H3.

Supplemental Analyses

The above results suggest that non-announcing firms' price improves when the announcing firms decide to engage in either IT integration or strategic integration. However, the greatest stock price improvement occurs only when both IT and strategic integration are present. In order to further examine investors' perceptions of the spillover effects from the announcing firm's decision to its supply chain partner, additional firm performance measures, such as perceived immediate operational effects, financial performance effects, and long-term performance effects, were included in the task. These additional measurements of investors' perceived spillover effects provide a robustness check of the current study's primary results, for these generally lead to greater valuation, expressed here by the stock price.

Multiple questions are used to measure each of the other dependent variables. First seven questions are posed to form an index (i.e., score) for investors' perceived immediate operational effects following the manufacturer's IT investment and strategic collaboration announcements. Immediate operational effects include changes to inventory turnover, order lead time, unit product costs, product design, market changes, and forecast product demands. Second three questions are posed to form an index for investors' perceived financial performance effects following the manufacturer's announcement. Financial performance effects include changes to revenue, costs, and profitability. Finally, four questions are posed to form an index for investors' perceived long-term performance effects following the manufacturer's announcement. Long-term performance effects include changes to market share of the

⁵ It is also the case using contrasts that both IT integration and Strategic integration are significantly ($p < 0.05$) better than IT integration alone and both IT integration and Strategic integration are significantly ($p < 0.05$) better than Strategic integration alone in terms of valuation.

suppliers' products, competitive advantage, stock price, and intrinsic value (See Appendix 3 for questions).⁶

Principal component analysis was used for each set of questions to extract the components that explain the maximum amount of variance. First with respect to immediate operational effects, only one component has an eigenvalue greater than one, and thus it is retained to provide an index for operating effect. This component accounts for 70.37 percent of the total variance. Using the commonly used loading cutoff of 0.5, all seven questions posed for immediate operational effects loaded on this component (Sharma 1996). Second with respect to financial effects, only one component has an eigenvalue greater than one. This component accounts for 75.57 percent of the total variance. Again, using the 0.5 cutoff, all three questions posed for financial effects loaded on this component. Finally with respect to the long-term effects, only one component has an eigenvalue great than one. This component accounts for 66.16% of the total variance. Using the 0.5 cutoff, all four questions posed for long-term effects load on this component.⁷

Each of the above perceived performance measures are treated as dependent variables for the supplemental analyses. Table 3 reports the least-square mean ratings by treatment condition for each of the three performance measures. The spillover effects captured by each dependent variable across treatment conditions are consistent with each other and with PRICE. The greatest positive effect appears in the presence of both IT and strategic integration. This is followed by absence of IT integration but presence of strategic integration or by the presence of IT integration but absence of strategic integration. Finally the absence of IT and strategic integration yields the lowest level of performance for each of the

⁶ The stock price in this set of questions is aimed at capturing investors' perceptions regarding the whether in the long run the suppliers' stock price will increase following the IT investment announcement made by one of its major customers (i.e., manufacturer) but does not measure investors' equity valuation judgment.

⁷ The goal of principal component analysis (PCA) is not to develop items/indicators in order to reflect the presence of an unobservable construct such as with factor analysis. Instead, the goal of PCA is to reduce the number of items/variables such that each component retained forms a new variable and explains the maximum amount of variance. PCA techniques focus on explaining variance in the data and not the correlation among indicators as with factor analysis. With PCA, the indicators are formative and are not meant to be reflective (i.e., indicators reflect the presence of a latent construct) as in factor analysis (Sharma 1996). As such, construct reliability and validity tests are not necessary with PCA.

performance measures. These results parallel the stock price results and support the findings regarding firm value.

[INSERT TABLE 3 ABOUT HERE]

Table 4, Panels A, B, and C present the ANOVA results using perceived spillover effect with respect to the immediate operational performance (OPERATIONAL), financial performance (FINANCIAL), and long-term performance (LTP) as the dependent variables, respectively. Each of the dependent variables is tested in separate ANOVA models.⁸ The results in Table 4, Panel A, B, and C along with those in Table 3 show significant main effects, in the direction similar to that of the stock price, of IT_INT on STR_INT on OPERATIONAL, FINANCIAL, and LTP, respectively. Similarly, results show significant main effects on STR_INT on OPERATIONAL, FINANCIAL, and LTP. These results are consistent with PRICE as the dependent variable and lend support to our hypotheses since they are generally leading indicators of security prices.

[INSERT TABLE 4 ABOUT HERE]

The primary results show that the greatest price increase for the non-investing (partner) firm occurs when both IT integration and strategic integration are present. Contrast results, presented in Table 4, Panels D, E, and F, are consistent and significant ($p < 0.05$, one-tailed) when using OPERATIONAL, FINANCIAL, and LTP as the dependent variables as compared to those using PRICE as the dependent variables. Therefore, the supplemental analyses show that investors' assessed stock price following the announcing firm's announcement is consistent with their perceptions of the above performance measures.

⁸ Because all the dependent variables are measures of firm performance, correlations among the dependent variables are expected. The correlations among the dependent variables ranged from 0.31 to 0.86. MANOVA was used with OPERATIONAL, FINANCIAL, LTP and PRICE as the dependent variables and IT and STRATIGIC as the independent variables. The results from the MANOVA model are quantitatively and qualitatively similar to the ANOVA results presented in the primary analyses. Furthermore, the conclusions drawn from the MANOVA results are consistent with those from the ANOVA results. Therefore, only ANOVA results are presented in the paper.

V. Discussion and Conclusion

In this study we use an experiment to investigate two key factors that affect IOCM. Previous studies find that successful IOCM requires that firms share information with their suppliers and customers (Coad and Cullen 2006; Cooper and Slagmulder 2004). Supply chain members can facilitate information sharing by using vertically integrated information technology systems (e.g., IOS) and by developing strategic partnerships (Simchi-Levi et al. 2003). We consider the effect an announcement of changes in these factors on the supply chain partner's firm value (i.e., stock price), which we use as a proxy for investors' perceived long-term benefits of information sharing. Extant literature suggests that IT announcements and strategic integration announcements are generally perceived as positive news by investors for announcing firms. Drawing upon information transfer literature and the related interdependent nature of supply chains, we predict that the IT and strategic integration announcements of the investing firm will have a spillover effect on the firm valuation of its supply chain partner. Thus, we differ from previous IOCM studies by examining the effect of both factors on partners of the announcing firms' value. Also, different than the majority of studies, we consider the combined effect of these two factors. We expect and find that IT and strategic integration combined maximizes the benefit of information sharing, and therefore contributes to the success of IOCM, and ultimately maximizes the supply chain partner's firm value.

Specifically we find that the partner's stock price will be significantly higher when the announcing firm's IT investment improves information sharing capabilities between them than when it is merely an upgrade to the announcing firm's own internal system. We also find the partner's stock price will be significantly higher when the announcing firm also announces plans for a strategic integration with supply chain partners than when it does not. These results indicate the importance of both IT and strategic integration to IOCM and in turn to the overall supply chain value.

Moreover, we found through a series of contrast tests that the combination of an integrated IT and strategic integration will result in valuation of the partner to be significantly higher than either IT

integration or strategic integration alone. This means that, while IT integration is valuable, it alone can only do so much like promote cost savings through more efficient transaction processing. IT integration however, can be an important enabler for strategic integration. Likewise, while strategic integration is valuable, it also alone may be handicapped without IT integration. In other words both together add the most value to all the partners in the value chain and not just to the announcing firm. We also found significant support for our hypotheses when we considered immediate operational performance, financial performance, and long-term performance measures. Each of these are leading indicators of firm valuation (i.e., stock price) and we find that their results parallel those of investors assessed stock price, in that the main effects of IT integration strategic integration are significant. Furthermore, as with the stock price, participants rated the combined performance significantly higher than IT integration or strategic integration separately.

In summary, as we hypothesized we find that IT integration between the investing firm and its supply chain partner significantly and positively affects the stock valuation of the supply chain partner. In addition, we find that strategic integration significantly and positively affects the firm valuation of the supply chain partner. When combined, IT and strategic integration have greatest effect on partner's value. Our theoretical results contribute to the IOCM literature in finding the importance of the combined strategic integration and IT integration in maximizing the benefits from IOCM benefit as they relate to the partner's firm value. We extend IOS research by showing that IOS investment affects supply chain member's performance as reflected in its perceived stock price. We also add to the supply chain literature by showing that strategic alliance announcements have value implications for the strategic partners.

There are also several practical implications. In order to maximize the benefit of information sharing for IOCM, supply chain firms not only need have IT integration providing communication platform, but also need build trust and create integrated business function and processes. There are also disclosure implications publicly-traded firms. Given the significant increase in individual investors brought on by the Internet and the greater dissemination of information (i.e., firm IT investment decisions,

strategic alliances, etc.) brought about by the adoption of Regulation Fair Disclosure, it is of relevance to management to understand how IT and strategic announcement information affects individual investors' equity valuation judgments (SEC 2000a; SEC 2000b).

This current study is subject to several limitations. First, we rely on MBA students to proxy as investors. To the degree that participants are not representative of investors, relations between IT and strategic integration announcements and stock price may differ from those that would exist in the stock market. Results from one recent study suggest that the use of MBA as a proxy for non-professional investors is valid so long as researchers carefully align the experimental task with the appropriate level of MBA students (Elliott, Hodge, Kennedy and Pronk 2004). Second, benefits (e.g., increase in firm value) of IT and strategic integration are measured using participants' perceptions and not actual investment decisions. Therefore, it is possible that actual investment decision may differ from perceived assessed stock prices. If so, the increase in perceived firm value may differ from market behaviors. Third, the information provided to participants is limited to the IT investment announcement which includes both information about IT and strategic integration. Additional financial statement information provided to participants may have influenced their assessed firm valuation. Given that the revised stock price is used in our analysis, actual assessed stock price is not necessary when drawing conclusions from our results.

Appendix 1: IT Integration Treatments

Treatment: Absence of IT Integration

Karts Company (Customer) announced today an investment in a new information technology (IT) system to replace its old system. The new IT investment will significantly improve internal information sharing within Karts Company. **The new IT system will NOT, however, change the information sharing capabilities between Motors Corporation and Karts Company.**

Treatment: Presence of IT Integration

Karts Company announced today an investment in a new information technology (IT) system to replace its old system. The new IT investment will significantly improve internal information sharing within Karts Company. **The new IT system will also change the information sharing capabilities between Motors Corporation and Karts Company.** Once the IT system is in place, it will **facilitate the sharing of information** between the two companies at all levels of decision making including operational, management control, and strategic decisions.

Appendix 2: Strategic Integration Treatments

Treatment: Absence of Strategic Integration

Karts Company also indicated **NO change** in its current arm's-length relationship with Motors Corporation.

Treatment: Presence of Strategic Integration

Karts Company also indicated that they **will change** their current arm's-length relationship with Motors Corporation. Karts Company will **form a strategic partnership** with Motors Corporation in order to **collaborate** at all levels of decision making including operational, management control, and strategic decisions.

Appendix 3: Instrument

Instructions

Please carefully read the following information and complete all of the questions on the pages that follow. Please complete this case independently of other students. This case will take approximately 17 minutes. Thank you for your participation!

Carefully read the following company background information for **Motors Corporation** and **Karts Company**. You will then be asked to read a news announcement made by **Karts Company**, and to respond to several questions regarding your perceptions of the announcement as it relates to **Motors Corporation**. We are interested in your judgments.

Company Background

Motors Corporation (Supplier) is a nine-year old, medium-sized U.S. based company. Motors Corporation's stock is publicly traded on the NASDAQ. Motors Corporation operates in a relatively uncertain industry where gross market demand usually fluctuates from year to year. Approximately 60% of Motors Corporation's total sales (in dollars) are to Karts Company. Karts Company is one of the few customers that purchase from Motors Corporation. Currently, Motors Corporation sells all its products through arm's-length transactions (i.e., each party is looking out for its own best interest), even to its major customer, Karts Company.

Karts Company (Customer) is a twenty-year old, medium-sized U.S. based company. Karts Company's stock is publicly traded on the New York Stock Exchange. Karts Company manufactures golf carts and markets them through independent distributors. Approximately 60% of Karts' total purchases of materials (in dollars) are from Motors Corporation. Motors Corporation is one of the few suppliers that manufacture motors that can be used in manufacturing golf carts. Currently, Karts Company purchases all its materials/products through arm's-length transactions from all its suppliers, including Motors Corporation.

IT and Business Relationship

Currently, the information technology (IT) systems of Motors Corporation and Karts Company are **NOT** linked with each other. The information exchange (e.g., order and shipping information) between the two companies has been conducted mainly through phone and fax. Presently, Motors Corporation and Karts Company are **NOT** collaborating on any product designs; and they are **NOT** sharing proprietary information, such as market demand or product costs. The existing **IT system** of Karts Company does **NOT** allow information sharing with Motors Corporation, which affects collaboration between the two companies.

Instructions: Before trading begins today, the following announcement about Motors Corporation's major customer, Karts Company, is issued. Please read the following announcement carefully as you will be asked to answer questions regarding your beliefs about how Karts Company's announcement will affect Motors Corporation.

Karts Company Announces a New IT Investment

IT INVESTMENT

Karts Company announced today an investment in a new information technology (IT) system to replace its old system. The new IT investment will significantly improve internal information sharing within Karts Company. **The new IT system will also change the information sharing capabilities between Motors Corporation and Karts Company.** Once the IT system is in place, it will **facilitate the sharing of information** between the two companies at all levels of decision making including operational, management control, and strategic decisions.

BUSINESS RELATIONSHIP

Karts Company also indicated that they **will change** their current arm's-length relationship with Motors Corporation. Karts Company will **form a strategic partnership** with Motors Corporation in order to **collaborate** at all levels of decision making including operational, management control, and strategic decisions.

Instructions: For the following questions, please indicate your belief about how Karts Company's (customer) announcement today will affect **Motors Corporation (supplier)**. Please circle **one number** on the scale for each question below.

Immediate Operational Effects

1. Motors Corporation's **inventory turnover** will *significantly improve*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree					Strongly Agree					

2. Motors Corporation's **order lead time** (i.e., time it takes to produce and ship products) will *significantly decrease*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree					Strongly Agree					

3. Motors Corporation's **unit product costs** will *substantially decrease*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree					Strongly Agree					

4. Motors Corporation's **product design** will *noticeably improve*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree					Strongly Agree					

5. Motors Corporation's **product quality** will *significantly improve*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree					Strongly Agree					

6. Motors Corporation will be *significantly more responsive* to **market changes**.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree					Strongly Agree					

7. Motors Corporation's will *more accurately forecast* **product demands**.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree					Strongly Agree					



PLEASE CONTINUE TO THE NEXT PAGE.

Instructions: For the following questions, please indicate your belief about how Karts Company's (customer) announcement today will affect **Motors Corporation (supplier)**. Please circle **one number** on the scale for each question below.

Financial Performance Effects

1. Motors Corporation's **revenue** will *significantly increase*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

2. Motors Corporation's **overall production costs** will *substantially decrease*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

3. Motors Corporation's **profitability** will *considerably improve*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

Risks Effects

1. Motors Corporation will face *significantly greater variability in sales revenue*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

2. Motors Corporation's **inventory risk** (e.g., lost sales due to inventory shortages and large inventory holding costs due to inventory overstock) will *noticeably decrease*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

3. Motors Corporation's risk of losing Karts Company as a customer will *significantly decrease*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

4. Motors Corporation's is *more likely* to be taken advantage of by Karts Company.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

5. Motors Corporation's **business risk** (i.e., internal and external threats to company's ability to continue operating at the current level) will *significantly decrease*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

Instructions: For the following questions, please indicate your belief about how Karts Company's (customer) announcement today will affect **Motors Corporation (supplier)**. Please circle **one number** on the scale for each question below.

Long-Term Performance Effects

1. Motors Corporation's **market share of its products** will *significantly increase*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

2. Motors Corporation's **competitive advantage** will *noticeably improve*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

3. Motors Corporation's **stock price** will *significantly increase*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

4. Motors Corporation's **intrinsic value** will *significantly increase*.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

5. Prior to Karts news announcement, Motors Corporation's stock closed yesterday at \$ **29.25**. Assuming no other information is disclosed since the news announcement made by Karts Company (customer), what do you think the stock price of Motors Corporation (supplier) will be at the close of the market today?

STOCK PRICE (in Dollars) \$ _____

Close of Market Today



6. In your judgment, how would you rate the effect of Kart Company's announcement on the **attractiveness** of Motors Corporation's stock?

	1	2	3	4	5	6	7	8	9	
Makes LESS attractive										Makes MORE attractive

7. Following Karts Company's announcement I would *highly* recommend Motors Corporation's stock to my friends.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree



PLEASE CONTINUE TO THE NEXT PAGE.

**PLEASE COMPLETE ALL THE QUESTIONS ON
THE PREVIOUS PAGES BEFORE TURNING THIS
PAGE.**

**ONCE YOU TURN THIS PAGE, YOU SHOULD
NOT LOOK BACK!**

Instructions: From your memory and **without looking back** at the previous pages, please respond to questions 1 and 2.

1. Which of the following statements characterizes the **IT investment** of Karts Company?
 - a. The new IT system will **NOT** change the information sharing capabilities between Motors Corporation and Karts Company.
 - b. The new IT system will **change** the information sharing capabilities between Motors Corporation and Karts Company. Once the IT system is in place, it will facilitate the sharing of information between the two companies at all levels of decision making including operational, management control, and strategic decisions.
2. Which of the following statements characterizes the future **business relationship** between Motors Corporation and Karts Company?
 - a. Karts Company will make **NO change** in their current arm’s-length relationship with Motors Corporation.
 - b. Karts Company will **change** their current arm’s-length relationship with Motors Corporation. Karts Company will form a strategic partnership with Motors Corporation in order to collaborate at all levels of decision making including operational, management control, and strategic decisions.

Instructions: To help us understand your responses, we need to understand your background. Please answer the following questions.

1. To what extent do you agree with the following statement: “I have adequate supply chain knowledge to understand this case”? Please circle a number on the following scale.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

2. To what extent do you agree with the following statement: “I have adequate information system knowledge to understand this case”? Please circle a number on the following scale.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

3. Motors Corporation and Karts Company are mutually dependent on each other.

	1	2	3	4	5	6	7	8	9	
Strongly Disagree										Strongly Agree

4. Have you ever owned stocks, bonds and/or an IRA? Yes No
5. Do you plan to invest in stocks and/or bonds in future? Yes No
6. Which of the following programs are you currently enrolled in? Please circle one.
 MBA (specify program) _____ MAcc Other (specify): _____
7. Please specify your major area of study _____
8. Years of full-time work experience: _____

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TABLE 1: Least-Square Means by Treatment Conditions

Dependent variable: PRICE

	<u>STR_INT</u>		
<u>IT_INT</u>	Absence	Presence	IT Factor Means
Absence	28.89	30.43	29.66
Presence	29.98	31.48	30.73
STR_INT Factor Means	29.44	30.96	

IT_INT = Degree of IT integration
STR_INT = Degree of strategic integration
PRICE = Assessed stock price provided by participants following the IT
IT and strategic integration announcement

TABLE 2: Hypotheses Test Results with PRICE as the dependent variable

Panel A: ANOVA Results for H1 and H2

Source	SS	df	MS	F-Statistic	p-value ^a
<i>IT_INT</i>	25.80	1	25.80	5.29	0.0238
<i>STR_INT</i>	52.78	1	52.78	10.83	0.0014
<i>IT_INT*STR_INT</i>	0.01	1	0.01	0.00	0.9580
<i>Residual</i>	502.01	87	4.88		

Panel B: Contrast Results for H3

Treatment Conditions (IT_INT, STR_INT)	Weights	Weights	Weights
0,0^b	-0.33	0	0
1,0	-0.33	-0.5	0
0,1	-0.33	0	-0.5
1,1	1	0.5	0.5
F-Statistic (p-value)	10.31 (0.02)	2.61 (0.01)	5.19 (0.02)

^aTwo-tailed *p*-values.

IT_INT = Degree of IT integration
 STR_INT = Degree of strategic integration
 PRICE = Assessed stock price provided by participants following the IT
 IT and strategic integration announcement

^b 0 = absence of integration (IT_INT or STR_INT)
 1 = presence of integration (IT_INT or STR_INT)

Table 3: Least-Square Means by Treatment Conditions for Supplemental Analyses

PANEL A:

Dependent variable: OPERATIONAL*

	<u>STR_INT</u>		
<u>IT_INT</u>	Absence	Presence	IT_INT Factor Means
Absence	2.69	4.99	3.84
Presence	4.89	6.14	5.52
STR_INT Factor Means	3.79	5.57	

PANEL B:

Dependent variable: FINANCIAL*

	<u>STR_INT</u>		
<u>IT_INT</u>	Absence	Presence	IT_INT Factor Means
Absence	3.04	4.67	3.86
Presence	4.41	5.55	4.98
STR_INT Factor Means	3.73	5.11	

PANEL C:

Dependent variable: LTP*

	<u>STR_INT</u>		
<u>IT_INT</u>	Absence	Presence	IT_INT Factor Means
Absence	3.38	4.80	4.09
Presence	4.53	5.61	5.07
STR_INT Factor Means	3.96	5.21	

* The least square means presented in this table represent the mean score based on the participants' responses using a 1 to 9 scale with 1 being "strongly disagree" and 9 being "strongly agree." The questions/statements were worded such that greater agreement with each statement translates to more positive perceived spillover effects. The mean factor scores are used for the supplemental analyses; however, for interpretation purposes the mean rating scores are presented in this table.

- IT_INT = Degree of IT integration
- STR_INT = Degree of strategic integration
- OPERATIONAL = Investors' perceived immediate operational spillover effects
- FINANCIAL = Investors' perceived financial spillover effects
- LTP = Investors' perceived long -term spillover effects

Table 4: Result for Supplemental Analyses

PANEL A: ANOVA Results
Dependent variable: OPERATIONAL

Source	SS	df	MS	F-Statistic	p-value^a
<i>IT_INT</i>	16.61	1	16.61	27.69	<0.0001
<i>STR_INT</i>	19.32	1	19.32	32.21	<0.0001
<i>IT_INT*STR_INT</i>	1.75	1	1.75	2.92	0.0909
<i>Residual</i>	54.00	90	0.60		

PANEL B: ANOVA Results
Dependent variable: FINANCIAL

Source	SS	df	MS	F-Statistic	p-value^a
<i>IT_INT</i>	9.21	1	9.21	11.97	0.0008
<i>STR_INT</i>	13.92	1	13.92	18.09	<0.0001
<i>IT_INT*STR_INT</i>	0.43	1	0.43	0.52	0.4711
<i>Residual</i>	70.02	94	0.77		

PANEL C: ANOVA Results
Dependent variable: LTP

Source	SS	df	MS	F-Statistic	p-value^a
<i>IT_INT</i>	9.06	1	9.06	11.50	0.0010
<i>STR_INT</i>	12.39	1	12.39	15.73	0.0001
<i>IT_INT*STR_INT</i>	0.45	1	0.45	0.57	0.4514
<i>Residual</i>	94.00	94	0.79		

Table 4: Result for Supplemental Analyses (Continue)

Panel D: Contrast Results

Dependent variable: OPERATIONAL

Treatment Conditions (IT_INT, STR_INT)	Weights	Weights	Weights
0,0^b	-0.33	0	0
1, 0	-0.33	-0.5	0
0, 1	-0.33	0	-0.5
1,1	1	0.5	0.5
F-Statistic (p-value)^a	23.03 (<0.001)	6.32 (0.01)	7.54 (0.007)

Panel E: Contrast Results

Dependent variable: FINANCIAL

Treatment Conditions (IT_INT, STR_INT)	Weights	Weights	Weights
0,0^b	-0.33	0	0
1, 0	-0.33	-0.5	0
0, 1	-0.33	0	-0.5
1,1	1	0.5	0.5
F-Statistic (p-value)	15.95 (<0.001)	3.71 (0.06)	6.04 (0.02)

Panel E: Contrast Results

Dependent variable: LTP

Treatment Conditions (IT_INT, STR_INT)	Weights	Weights	Weights
0,0^b	-0.33	0	0
1, 0	-0.33	-0.5	0
0, 1	-0.33	0	-0.5
1,1	1	0.5	0.5
F-Statistic, p-value	14.23 (<0.001)	3.44 (0.07)	4.99 (0.03)

^aTwo-tailed *p*-values.

^b0 = absence of integration (IT_INT or STR_INT)