This study examines relationship of the strategic alignment of Electronic Commerce Use (ECU) and Supply Chain Integration (SCI), and the impact of this alignment on Organizational Benefits (OBE). Using a covariation model approach, the authors empirically test a covariate model versus a direct effects model. Overall, the results suggest a significant and positive relationship between the strategic fit of SCI and ECU and its impact on OBE.

KEYWORDS: Empirical research, Supply chain Integration, Electronic commerce use, Strategic alignment, Fit, Organizational benefits, Structural equation modeling

INTRODUCTION

In the global competitive arena, firms are no longer able to outperform competitors by relying on their own resources. Supply chain integration (SCI), or the consolidation of processes of the members of the supply chain (Dong, Xu et al. 2009), has emerged as a widely accepted performance enhancing practice among firms (Saeed, Malhotra et al. 2011). In integrated supply chains, participants align their processes and share relevant up-to-date information with the objective to increase performance (Villena, Gomez-Mejia et al. 2009). In many ways, the interlinkages between supply chain partners is feasible because of advances information
technology (IT), where electronic commerce use (ECU) has become an important driver of performance in the supply chain (Dong, Xu et al. 2009). As individual resources (Barney 1991, Barney 2001), both SCI and ECU allow firms to experience performance gains. Despite the importance of SCI and ECU in practice (Dong, Xu et al. 2009, Saeed, Malhotra et al. 2011), there is a need to explore the interlinkages of these constructs and their relationship with performance outcomes (Scannell, Vickery et al. 2000, Zhu 2002, Rosenzweig, Roth et al. 2003, Droge, Jayaram et al. 2004, Devaraj, Krajewski et al. 2007, Downing 2010); and in particular their strategic alignment. Since, the best of our knowledge, the strategic alignment between SCI and ECU has not received adequate coverage previous literature, it is our intent to study this linkage and its impact on the firm’s Organizational Benefits (OBE).

THEORETICAL BACKGROUND

Supply Chain Integration (SCI)

SCI has become an increasingly important practice in supply chain management (SCM) in recent years (Saeed, Malhotra et al. 2011, Wong, Boon-itt et al. 2011). The growing body of literature in SCI stresses its impact on performance at the operating and strategic levels (e.g., Frohlich and Westbrook 2001, Narasimhan and Das 2001, Narasimhan and Soo Wook 2002, Devaraj, Krajewski et al. 2007, Patel, Azadegan et al. 2013). There is little doubt that focusing in SCI is becoming a pre-requisite for success for supply chain partners. For instance, integration with members of the supply chain translates into reduction of waste and elimination of redundant processes (Swink, Narasimhan et al. 2007), through the development of routines, and cooperation among the members (Flynn and Flynn 1999). The literature in operations management provides evidence of positive relationships between SCI and diverse operational performance outcomes, such as: Cost reduction (Scannell, Vickery et al. 2000, Devaraj, Krajewski et al. 2007), improved product quality (Rosenzweig, Roth et al. 2003), increased customer satisfaction (Downing 2010), enhanced time-based performance (Droge, Jayaram et al. 2004), and improved general performance (Downing 2010). Consistent with previous literature, SCI is viewed as the extent of integration of the internal and external processes of a firm and its partners in the supply chain (Narasimhan and Soo Wook 2002, Mora-Monge, Azadegan et al. 2010).

Electronic Commerce Use (ECU)

IT practices such as Electronic Commerce Use (ECU) have been linked to increased performance outcomes (Downing 2010). Information systems (IS) research at the firm level has focused on traditional IT practices, such as electronic data interchange (EDI). Since EDI is limited to pre-determined firm transactions and ECU involves a larger set of possible activities (Mora-Monge, Azadegan et al. 2010), researchers have proposed the use of internet-based activities (Auger, BarNir et al. 2003), such as market research and logistics, to capture ECU (e.g., Jones, Wilikens et al. 2000, Khazanchi and Sutton 2001, Teo and Ranganathan 2004, Mora-Monge, Azadegan et al. 2010).

Based on the resource-based view of the firm (Barney 1991, Barney 2001), ECU becomes an inimitable resource that produces dynamic capabilities to the firm (Zhu 2002), and thus, it is considered a source of competitiveness in the supply chain (Dong, Xu et al. 2009). ECU is then viewed as the extent in which electronic means are utilized in firm processes among organizations (Mora-Monge, Azadegan et al. 2010).
Organizational Benefits (OBE)

While the role of IT in organizational performance is still debated in the literature (Brynjolfsson 1993, Ross 2002, Mora-Monge, Azadegan et al. 2010, Chen, Wang et al. 2014), multiple studies have found evidence of the IT’s impact on performance. For instance, Madapusi et al. (2012) found a positive relationship of between enterprise resource planning (ERP) implementation and operational performance; whereas Ranganathan, et al. (2011) found that the extent of web-enabled SCM is positively related to performance. In the ECU context, there is evidence of its relationship to OBE (e.g., Zhuang and Lederer 2003, Riggins and Mitra 2007, Mora-Monge, Azadegan et al. 2010). For instance, Mora-Monge et al. (2010) found empirical support of the positive impact of ECU on OBE. Similarly, Devaraj et al. (2007) found a positive impact of electronic business (eBusiness) technologies, through an integrated supply chain, with operational performance.

Drawing from IS and SCM literature, we conceptualize OBE as increased competitiveness that can be directly or indirectly created in the firm, by the use of specific recourses and capabilities (Subramani 2004). Benefits could be direct, (i.e. first order) or indirect (i.e. second order) (Bakos and Brynjolfsson 1993, Mukhopadhyay and Kekre 2002). Direct benefits arise when the firm utilizes its resources and capabilities, which translate into operational and strategic performance (Mukhopadhyay and Kekre 2002). Indirect benefits produce increased competitiveness based on direct benefits and external factors outside the control of the firm (Subramani 2004).

Strategic Alignment

It has long been contended that alignment of business resources and capabilities (e.g. strategies, business practices, etc.) leads to sustained gains in performance and ultimately to achieving a competitive advantage (Venkatraman and Camillus 1984, Venkatraman 1989, Venkatraman 1990, Xu, Cuvusgil et al. 2006, Mora-Monge, Rao et al. 2007). Alignment is usually defined as the theoretical fit or match between two related variables, more specifically as fit between a firms’ strategy and its context (Venkatraman and Prescott 1990). This concept has also been coined as coalignment (Miller 1981, Venkatraman 1989, Venkatraman and Prescott 1990, Mora-Monge, Rao et al. 2007), consistency (Venkatraman and Prescott 1990), contingency (Venkatraman and Prescott 1990), strategic consensus (McDermott and Boyer 1999), strategic focus (Van Dierdonck and Miller 1980, Davidow and Uttal 1989) and strategic alignment (Papke-Shields and Malhotra 2001), depending on the discipline studying the construct. Although it seems conceptually clear and appealing, its measurement has been long debated (John, Steven et al. 2011). In fact, its operationalization, has been impacted by the discipline investigating the construct (Venkatraman 1989). Numerous guidelines has been proposed for the measurement of alignment, but in general, Venkatraman’s seminal work (Venkatraman 1989) offers one of the most comprehensive guides for measurement. He offers six perspectives for measurement: mediation, moderation, covariation, profile deviation, gestalts and matching. Even though every perspective has its advantages and disadvantages, covariation in general has emerged as a commonly used approach for fit measurement. According to this perspective, fit is a pattern of internal consistency among a set of underlying related variables. (Venkatraman 1989).
There is a plethora of research demonstrating the relevance of alignment and its direct effect on business performance metrics (Tallon 2011). Previous research has found positive links between strategy, contextual characteristics (e.g. external environment), and organizational performance (Miles and Snow 1978, Venkatraman and Camillus 1984, Van de Ven and Drazin 1985, Fry and Smith 1987). For example, Zatzick et al. (2012) found that the strategic orientation of a firm after the implementation of a total quality management (TQM) program in a company led to performance gains; whereas McLaren et al. (2011) studied the importance of the alignment between IS capabilities and competitive strategies. Recently, Tallon (2011) found that the alignment of information technology (IT) and business strategy not only is critical for companies, but also has a spillover effect over different business processes in an organization. Although the evidence suggest that more emphasis should be given to the study of fit between resources and strategy in a given process (Tallon 2011), the alignment between resources, for example between SCI and ECU, has not been received adequate attention from the literature, and given its importance from both theoretical and practical perspectives, it is our intend to close this gap in the literature by exploring this relationship and the impact of this alignment on OBE.

The above theoretical arguments suggest that the alignment between SCI and ECU should lead to improvements in the overall performance of the firm, including efficiency gains, as well as in competitive advantage gains. Thus, the alignment of SCI and ECU should have a positive association with the firm’s organizational benefits. This relationship leads to the following proposition:

**Research proposition: The strategic alignment between SCI and ECU is positively and significantly related to OBE.**

**RESEARCH METHODOLOGY**

**Research context and sample**

A survey method was used to obtain the data for our empirical test, where the unit of analysis is the company. Key informants targeted for this study were senior and middle managers in the IS/SCM fields operating in the USA. Company contact information was obtained from multiple sources, including the Institute of Supply Management (ISM) and a third party marketing company that collects and distributes executive contact information. In total 180 usable responses were obtained, for a response rate of 5.3%.

**Measures**

Because of the nature of the constructs is multidimensional, they were measured using multiple 7 point Likert-style questions validated in prior empirical research studies. Items for the SCI construct were based on studies on the effects of the construct as a moderator of performance (Narasimhan and Soo Wook 2002). The items for ECU were based on the electronic markets theory (Malone, Yates et al. 1987), the technology acceptance model (Davis 1989, Davis, Bagozzi et al. 1989), and the diffusion of technology theory (Rogers 1983) and adopted from Mora-Monge et al. (2010). Finally, scales for Organizational Benefits were derived from a blend of measures from the SCM (Li, Rao et al. 2005, Li, Ragu-Nathan et al. 2006) and IS Success
After purifying the items, the examination of factor structure was done through a confirmatory factor analysis (CFA) to assess convergent validity at the dimension level and discriminant validity at the construct level. The remaining items were combined into their respective dimension and analyzed using the principle component analysis method and VARIMAX rotation extraction method. A factor loading of 0.5 or higher was considered as the cutoff score (Hair, Black et al. 2010). The results, presented in Table 1, indicate the adequacy of the measures used in the study.

<table>
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<tr>
<th>Construct</th>
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<td>Dimension</td>
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<td>Supply Chain Integration (SCI)</td>
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<td>Customer Integration (SCI_CUS)</td>
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<td>Internal Integration (SCI_INT)</td>
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<td>Electronic Commerce Use (ECU)</td>
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<td>Competitive Advantage (OBE_COA)</td>
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Table 1. CFA Results

Data Analysis

To answer the research proposition stated previously, we examined the relationship between ECU and SCI, and their impact on OBE using the covariation technique suggested by Venkatraman (1984, 1989, 1990) that involves the following steps: 1) Specification of a direct effects model, 2) specification of a coalignement model, and 3) selection of the best model that explains OBE.

The direct effects model theorizes ECU and SCI as predictors of OBE. The coalignement model is specified as a second-order factor, where the first-order factors (ECU and SCI) are coaligned. The reasoning behind this approach is that the pattern of covariations among the two constructs can be captured as a separate unobservable dimension that has no directly observable indicators (Venkatraman 1990). This can be translated into structural equation models that provide estimates of the strength of all hypothesized relationships between variables in a theoretical model and provides information about direct and indirect impacts on variables (Maruyama 1998). Both models were tested using AMOS for Windows 22.0.

The direct effects model (see Figure 1) was found to fit well with the empirical covariances from the data ($\chi^2 = 38.26$, df = 17, RMSEA = 0.08, CFI = 0.98, GFI = 0.95, NFI = 0.96). Based on the good fit of the structural model, the standardized coefficients are then analyzed to assess significance. Overall, all of the coefficients are statistically significant at the 0.01 level, with the exception of the path coefficient between SCI and OBE, which seems counterintuitive since previous research has found a positive relationship between SCI and OBE.
The results of the coalignment model (see Figure 2) also show an adequate fit with the empirical covariances from the data ($\chi^2 = 38.26$, df = 17, RMSEA = 0.08, CFI = 0.98, GFI = 0.95, NFI = 0.96). Based on the good fit of the structural model, the standardized coefficients are then analyzed to assess significance. In this model, all of the coefficients are statistically significant at the 0.01 level.

Selection of the best model that explain performance

Venkatraman (1990) argues that if the statistics of the coalignment model are not different from the direct effects model, it is preferred because this model has a more parsimonious representation. Furthermore if the second-order factor loadings prove to be significant, additional support is given to the existence of a second-order of coalignment between ECU and SCI. In the case of the present study, measures of the covariation model were better to those of the main effects model; in fact, whereas the direct effects model did not find a significant relationship of SCI to OBE, the coalignment model did. Also, the model clearly demonstrates the effect of fit on OBE by the magnitude and significance of the coefficient between the coalignment and OBE constructs (0.88; p<0.01).

Figure 1. Model Estimation Results (Direct Effects Model)
IT practices such as ECU have been linked to increased performance outcomes (Downing 2010). IS research at the firm level has focused on traditional IT practices, such as electronic data interchange (EDI). Since EDI is limited to pre-determined firm transactions and ECU involves a larger set of possible activities (Mora-Monge, Azadegan et al. 2010), researchers have proposed the use of internet-based activities (Auger, BarNir et al. 2003), such as market research and logistics, to capture ECU (e.g., Jones, Wilikens et al. 2000, Khazanchi and Sutton 2001, Teo and Ranganathan 2004, Mora-Monge, Azadegan et al. 2010).

CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH

This study examined the relationship of the strategic alignment of ECU and SCI, and its impact on OBE. Our results provide empirical evidence of the importance of the strategic fit between SCI and ECU. Results of the empirical study confirmed the existence of an strategic alignment between ECU and SCI, which provides support to the premise that an alignment between SCI and ECU must be in place in order to attain sustained benefits at the organizational level. Although previous research has highlighted the importance of both SCI and ECU, this study contributes to the literature by demonstrating that even though these factors do in fact impact the OBE of a firm, the alignment of these resources is critical as well.

The findings of the study provides insights to practitioners on how supply chain members could be able to achieve superior performance, by carefully finding a strategic match between their electronic commerce practices and upstream and downstream integration of processes. In particular, firms need to have a clear understanding of the potential benefits that the alignment between SCI and ECU could provide them. From a theoretical perspective, this study, to the best of our knowledge, is one of the first attempts to empirically explore the strategic alignment between SCI and ECU.

There are also some limitations associated with this research. First, the data collected in this study was acquired from single respondents at each firm, which might create measurement bias. Second, responses are based on subjective perceptions, and thus, generalization of results should be done carefully. Hence, our findings should be interpreted within these limitations.
REFERENCES


