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# Profiling Supply Chain Integration: Differences in Practices, Relationships and Performance between Integration Stages

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## ABSTRACT

Integration is recognized as a critical determinant of supply chain performance. In this study, we empirically examine how organizations that are at different stages of integration differ in their practices, relationships and performance. Analyses of data collected from 375 companies indicate that the use of information technologies and process innovations (practices), the presence of positive relationships, and supply chain performance differ by integration stages.

## KEYWORDS

Information technology, process innovation, supply chain relationship, integration, supply chain performance.

## INTRODUCTION

A primary objective of supply chain management (SCM) is the integration of business processes within and outside organizational boundaries. The rationale for integrating business processes can be drawn from multiple disciplines including strategy (e.g., competitive advantage and risk management), logistics (e.g., coordination and efficiency), economics (e.g., diffusion of costs and economies of scale), communication (e.g., information exchange/sharing), and operations and productions (e.g., optimization and cost reduction) (Stonebraker and Liao, 2004).

There is considerable diversity in the conceptualization and operationalization of supply chain integration (Van Der Vaart and Van Donk, 2008). Supply chain integration defined by its scope refers to the extent to which a focal organization has integrated its processes both internally and externally with its trading partners and has, for example, been examined as arcs of integration (Frohlich and Westbrook, 2001), stages of integration (Cooper and Ellram, 1993; Danese, Romano and Vinelli, 2006; Stevens, 1989), phases of integration - development and industrialization (Wagner, 2003), and strategic integration encompassing customer, supplier, product-process and corporate integration (Swink, Narasimhan and Wang, 2007).

While the classification of organizations based on the scope of their integration efforts has theoretical support and intuitive appeal, there are few studies that have empirically examined whether there are significant differences between organizations at different levels or stages of integration. The objective of our study is to address this knowledge gap by comparing the supply chain practices, relationships, and performance of organizations at different stages of integration. We hope that this investigation can provide insights into the specific organizational actions that are necessary for achieving higher levels of integration.

## RESEARCH CONSTRUCTS AND HYPOTHESES

### Supply Chain Practices

SCM encompasses the coordination of a number of business functions including forecasting, production, procurement, logistics, distribution, order processing, marketing, and sales (Mentzer, Dewitt, Keebler, Min, Nix and Zacharia, 2001). The successful coordination of these diverse functions, most of which span organizational boundaries, often requires the use of information and communications technologies and the introduction of new processes and/or the reengineering of existing processes to facilitate the efficient and effective flow of products, services, financial resources, and information among supply chain partners. In recent years, a number of these inter-organizational technologies and process innovations that are either focused on individual facets of the supply chain (e.g., cross docking) or designed to have a broader impact (e.g., collaborative planning, forecasting and replenishment) have been implemented (Apte and Viswanathan, 2002; Zacharia, 2001). In this study, we are interested in the supply chain relationship between a focal organization and its supplier and define supply chain practices *as the extent to which specific technologies and processes (e.g., EDI, RFID, JITM, VMI) that are intended to integrate and enhance exchange processes are used to manage the supply chain between an organization and its supplier.*

## Supply Chain Relationship

The relational view of organizations that emphasizes the quality of the relationship as a key determinant of successful partnerships has empirical support (Gundlach and Achrol, 1995; Zaheer et al., 1998). Partnership quality includes a number of facets including trust, commitment, cooperation and conflict. Morgan and Hunt (1994) suggest that trust and commitment are key foundations of inter-organizational partnerships because they encourage joint actions and investments that strive for long-term mutual gains without fear of opportunistic behavior (Bradach and Eccles, 1989). Cooperation in channels of distribution is attributed to a) realization of mutual goals, b) dealing with environmental turbulence, c) facilitating mutual exchange, d) managing resource dependence, and e) reducing coordination costs. The basic assumption behind cooperative behavior is that organizations perceive that they can achieve their goals through joint actions with other organizations more efficiently and effectively than they would if they pursued them independently. In addition to positive facets (i.e., trust, commitment and cooperation), supply chain relationships can also be characterized by negative aspects such as conflict and disagreements. Conflict can arise in supply chain relationships on account of divergent priorities and interests and manifest itself in overt disagreements and disputes over policies, responsibilities, expectations and actions. Based on the works of Moorman, Zaltman and Deshpande. (1992), Morgan and Hunt (1994), Sibley and Michie (1982) and Gaski (1984), we define supply chain relationship *as the extent to which an organization and one of its suppliers are confident of each other's reliability and integrity, and have the desire and expectation of continuing their valued relationship while engaging in joint actions for mutual benefit without disagreements and disputes.*

## Supply Chain Performance

Organizations in a supply chain can achieve operational efficiency and effectiveness by lowering costs, reducing inventory, promoting flexibility, ensuring on-time deliveries, and minimizing stock-outs. These objectives relate to both parties in a buyer-supplier dyad, and therefore, could be indicative of the performance of the overall supply chain, rather than that of a single organization. We define supply chain performance *as an organization's achievement of efficiency and effectiveness (e.g., reduced operational costs, improved delivery performance) in its supply chain operations with a supplier.*

## Integration

Integration is defined as the merging of parts into a whole, and supply chain integration, at its normative ideal, refers to the adoption and use of collaborative and coordinating structures, processes, technologies and practices among supply chain partners for building and maintaining a seamless conduit for the precise and timely flow of information, materials and finished goods. Researchers have conceptualized supply chain integration in terms of its scope, supported function, management direction, and means used to accomplish it. In this study, we focus on integration in terms of its scope, and define it *as the extent to which supply chain functions/operations of a focal firm and its supplier are inter-connected within and across organizational boundaries.*

## Hypotheses

Information technologies and innovations such as EDI, RFID, JITM, and VMI are intended to re-engineer or radically alter key processes within a supply chain to improve information and resource flows (Apte and Viswanathan, 2002, Zacharia, 2001). Normative and empirical literature suggest that these supply chain practices are critical for achieving higher levels of integration.

*H1: Supply chain practices in the use of information technologies and process innovations differ by integration stages.*

In a supply chain, the development of trust and commitment between trading partners is an affirmation of their confidence in each other's reliability and their desire to forge and sustain a long term relationship. Similarly the presence of collaborative actions with no or minimal occurrences of conflict is an indication of a thriving partnership. Organizations that participate in such relationships can be expected to achieve greater levels of integration, as both parties have common incentives to invest in relationship-specific technologies, redesign exchange processes, and engage in cooperative actions that synchronize their operations (Mentzer, Min and Zacharia, 2000; Seggie, Kim and Cavusgil, 2006).

*H2: Supply chain relationship gauged on trust, commitment, cooperation and conflict differs by integration stages.*

The timely and accurate flow of data about demand, orders, production and delivery schedules, inventory, payments, and returns is a vital necessity for successful supply chain operations. Organizations that have higher levels of integration can facilitate and enhance information exchange and achieve greater operational efficiencies.

*H3: Supply chain performance differs by integration stages.*

## METHOD

### Data collection Procedures

Data for this study were collected through an anonymous online survey of supply chain executives and managers. Contact information for the target respondents of the study was obtained from the membership list of an international organization of supply chain professionals. The organization, which was willing to share its membership list for academic research but wished to remain anonymous, provided the names, addresses, and e-mail addresses of 5,000 randomly chosen members from the following industry sectors: manufacturing (4,463), wholesale/retail (437), and construction (100).

An online questionnaire was used as the research instrument. A total of 396 responses were recorded in the database used in the data collection process. However, 21 of them were removed from further analyses because they had missing data for more than 30% of the questions in the survey (Hair et al., 1998). After removing these 21 responses, the overall response rate was 7.5%. Of the 5,000 original e-mails, 860 were returned without reaching the intended recipients, and 152 target respondents replied to the solicitation e-mail stating that they will not participate in the study. The most common causes for the returned e-mails were i) not having permission to send to the recipient (e.g., rejected by spam blockers), and ii) invalid e-mail addresses (e.g., recipient name was not recognized or email account did not exist at the organization). Typical reasons for non-participation included time constraints, personal and company policy against survey participation, and job changes. If the returned emails are removed from the original sample, the effective response rate is 9.1%, which is typical for electronic surveys. For example, Kim, Cavusgil and Calantone (2005) conducted a survey among a sample of members of the Council of Logistics Managers using an online survey combined with e-mail solicitation. If only the usable responses are taken into account, their response rate of 10.67% is comparable to ours.

### Measures

Each of the dependent variables in the study was measured with multiple-item scales. Supply chain practices were measured by asking respondents to indicate the extent to which their organization used information technologies and process innovations to support SCM with their selected suppliers (Supplier Y). The 11 items for this scale were identified from relevant readings from both trade publications (e.g., CIO, Computerworld) and the academic press (e.g., Zacharia, 2001; Apte and Viswanathan, 2002). Supply chain relationship between the respondent organization and Supplier Y was assessed with items primarily derived from Doney and Cannon (1997) and Wilson and Vlosky (1998). Supply chain performance was appraised by asking respondents to rate the performance of the supply chain between their organization and Supplier Y relative to that of their top competitors. The seven items used for this measure were obtained from the Supply Chain Council's ([www.supply-chain.org](http://www.supply-chain.org)) Supply-Chain Operations Reference (SCOR) model (Schultz, 2003). Supply chain integration was captured by asking the respondents to choose one of four stages that best characterized their level of integration (Stevens, 1989).

## FINDINGS

Our data analysis shows that the extent of IT and process innovation use, positive supply chain relationship, and performance are significantly different by integration stage; but the level of negative supply chain relationship is not. Further, the post-hoc pair-wise comparisons between each of the stages reveal that external or full integration is significantly different from the other three stages on IT and process innovation use, and the independent and functional stages on positive supply chain relationship. Our results offer evidence for the assertion that supply chain practices, positive supply chain relationship and performance are differentiated by integration stages. Organizations that are in the most advanced stage of integration are the most prolific users of IT and process innovations, boast the most positive relationship with their supply chain partners and enjoy the highest supply chain performance.

## LIMITATIONS AND CONCLUSION

Our research is an empirical field study that cannot be as rigorously controlled as a laboratory experiment and has some shortcomings. First, the data for the study was collected from a single respondent from each organization. However, based on the respondents' titles and their years of experience, it appears that they are well qualified to answer the survey. Second, data was gathered from only one half of a buyer-supplier dyad. If data had been collected from corresponding supplier organizations, the analyses could have been extended and the results corroborated. On the other hand, Reve and Stern (1986) have shown that dyad participants may have widely different perceptions, which limits the potential for meaningful data aggregation. Moreover, collecting matched responses from a buyer-seller dyad poses a number of logistical problems that could adversely affect sample size.

Third, while a response rate of 9% may be the norm for online surveys, it is still low in comparison to rates for traditional mail surveys, which typically range from 15% to 25%. The non-response bias analysis appears to indicate that the sample

may consist of a slightly higher proportion of smaller companies (in terms of annual revenue). Finally, as a cross-sectional field survey, the study does not capture the dynamics of time and sequence in the formation of supply integration. This limitation can only be addressed through longitudinal studies that collect and analyze data over a period of time.

Achieving integration is recognized as a key objective of supply chain management. However, the profile of organizations at different stages of integration has been sparsely examined. Our study uses a fairly large sample to investigate the relationship between integration and relevant supply chain practices, relationships and performance. The results indicate that IT and process innovation use, relationship quality and performance differ by integration stages.

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