DRIVERS OF SUPPLY CHAIN INTEGRATION AND THE ROLE OF ORGANIZATIONAL CULTURE: EMPIRICAL EVIDENCE FROM INDONESIA

by

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The increasing emphasis on integration among members of a supply chain has led to new mechanisms to help firms coordinate the flow of products, services, and information through the supply chain. Many studies support the importance and influence of supply chain integration on firm performance but only a few focus on factors driving the integration practices. Moreover, the role of organizational contextual factors that could influence supply chain integration has been largely overlooked. This research examines firms' internal and external drivers of supply chain integration, as well as evaluates the impact of the integration on firm performance. This study further investigates the moderating role of organizational culture, based on the dimensions of control-flexibility orientation and internal-external focus, in strengthening or weakening the relationships between supply chain integration and its antecedents.

For the purpose of this study, manufacturing firms were identified as the focal firms in supply chains, and thus data was collected through a survey of 223 Indonesian-based manufacturing firms. Two informants from each firm became the respondents. Structural equation modeling was used to analyze the data, and this study confirmed the positive relationships between supply chain integration and firm performance. The results also indicated that internal driver, or specifically firms' customer orientation, triggered the initiation of supply chain integration. Other factors, such as demand uncertainty, supply uncertainty, technology uncertainty, as well as firms' anticipation of benefits, were not significantly related to the degree

of supply chain integration. Furthermore, focal firms with external focus were pursuing a higher degree of supply chain integration than those with internal focus. By investigating the linkages between internal and external drivers, supply chain integration, firm performance, and organizational culture, this study attempts to contribute to the Operations Management discipline, especially to the area of supply chain management. Implications for research and practice are discussed.

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It's the one I dread; facing a blank page (is) not my favorite thing to do. But eventually I have to come home and face that blank page, pray something occur to me… Maybe songs are written somewhere else, in some parallel universe and we just draw them down – Sting (musician, environmentalist).

Facing a blank page, with the hope of making a scientific, yet original, manuscript is indeed dreadful. I could not have finished this dissertation without the love of God, a massive dose of caffeine and music, and the tremendous help of extraordinary people surrounding me. These great people have not merely assisted me in developing a theoretical framework or testing my hypotheses, but also helped me to become a good scholar. My gratitude towards them is everlasting.

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PREFACE

Part of the dissertation was published in the Proceedings of the Production and Operations Management Society (POMS) 21st Annual Conference titled "Organizational Culture Context, Supply Chain Integration and Firm Performance."

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CHAPTER 1
INTRODUCTION

The implementation of supply chain management (SCM) practices has been widely spread among organizations since they realized the benefits of collaboration with supply chain partners. As organizations become more specialized (Lummus and Vokurka, 1999), they seek supply chain partners that can provide quality materials with low cost rather than owning their source of supply. It becomes critical for organizations to manage the entire network of supply to optimize overall performance (Lee, 2000), as well as to synchronize the entire demand channel to ensure effective delivery of their products (Anderson and Narus, 1990). As a consequence, organizations need to closely collaborate with their supply chain partners to secure maximum support for competitiveness in their market. As many scholars have argued, today's business environment is characterized as 'supply chain versus supply chain' competition rather than 'company versus company' competition (Christopher, 1998; Simchi-Levi, Kaminsky, and Simchi-Levi, 2003).

The collaboration among organizations within a supply chain occurs in various degrees and does not necessarily correspond to total ownership of the whole supply chain. Harrigan (1984) argued, "the old concept of vertical integration as being 100 percent owned operations that are physically interconnected to supply 100 percent of a firm's need is outmoded" (p. 640-641). These days, many organizations decide on a lower level of integration, or as referred to by Harrigan (1984) as "tapered integration", as opposed to vertical integration. With this strategy, an organization does not own all of the adjacent business units in the supply chain, but relies on other organizations to provide some portion of its requirements. *Supply chain integration* reflects this tapered integration, where an organization need not own 100 percent of the adjoining

business units in the supply chain but still gains many of the same benefits of integration through collaboration.

Several scholars have attempted to investigate conditions preceding the firms' integration with their supply chain partners. It has been proposed that the integration among supply chain members is driven by increasing global competition (Handfield and Nichols, 1999; Lummus and Vokurka, 1999), continuing unpredictable environment, such as demand changes, supply uncertainties, or technological changes (Afuah, 2001; Chen and Paulraj, 2004; Mentzer, Min, and Zacharia, 2000), and opportunity of new markets (Frohlich and Westbrook, 2002). However, an interview with the Vice President of Supply Chain of a large food manufacturer in Indonesia revealed that the company initiated the supply chain integration mainly because of the benefits it would gain from the practices. The company understood that it would improve its performance beyond what it could achieve from operating as a single entity if it integrates with its key suppliers and customers. In this case, the implementation of supply chain integration practices was driven by internal motivation, rather than external pressures. Yet, to the best of our knowledge, the potential drivers from within the organization have not been widely explored.

This study aims to bridge the gap by examining the impact of firms' external and internal drivers on the degree of their integration with supply chain partners, and further evaluates the impact of integration on their performance. Several empirical studies have confirmed the positive impact of supply chain integration on organization's operational performance (Droge, Jayaram, and Vickery, 2004; Flynn et al., 2010; Gunasekaran, Patel, and McGaughey, 2004). However, despite the abundant literature defining the positive relationship between supply chain integration and firm performance, scholars are still struggling to present consistent empirical evidence (Fabbe-Costes and Jahre, 2008). After studying 36 manuscripts on supply chain

integration that provided mixed results, Fabbe-Costes and Jahre (2008) concluded that a clear definition, valid measures, and other contextual factors are needed in examining the supply chain integration construct.

This conclusion is in fact aligned with the contingency theory suggested by Woodward (1965), which contended that there is no single best approach to manage an organization, but rather, its effectiveness will be contingent upon various internal and external factors. In the Operations Management (OM) field, scholars have been incorporating various contingency factors, such as organizational culture (McDermott and Stock, 1999; Nahm, Vonderembse, and Koufteros, 2004; Naor et al., 2008), organization size and unionization, (Jayaram, Ahire, and Dreyfus, 2010; Shah and Ward, 2003), TQM duration and industry type (Jayaram et al., 2010), national context (Rungtusanatham et al., 2005), and strategic context (Sousa and Voss, 2001).

Among the factors that potentially influence organizational practices, culture is one of the factors that is essential in examining organizational initiatives and effectiveness (Child, 1981). Organizational culture was found to have an impact on organization efficiency (Wilkins and Ouchi, 1983), reliability (Weick, 1987), as well as outcomes (Gregory et al., 2009). However, in the OM literature, studies examining the role of organizational culture were still relatively few (McDermott and Stock, 1999; Metters et al., 2010). Furthermore, with the exception of Liu et al. (2010), the OM field still lacks empirical evidence of the influence of organizational culture on SCM practices. Hence, this study incorporates an examination of organizational culture since different types of culture might either reinforce or hinder the effectiveness of SCM implementation. An examination of these relationships will contribute to the literature.

Thus, this study extends our understanding of supply chain integration by investigating its drivers, both external and internal, and its impact on firm performance. This study further

examines the moderating influence of organizational culture on the relationships between the drivers and supply chain integration. This study also tests the robustness of the relationships with respect to potential influence of firm size and firm age.

Research Objectives

This study examines how supply chain integration potentially contributes to the improvement of firm performance. This study further analyzes the impact of firms' internal and external drivers on the degree of integration with firms' supply chain partners. Moreover, this study also posits that organizational culture, as one of the critical characteristics of an organization, significantly influences the relationship between supply chain integration and its antecedents. Different types of organizational culture might impact the relationship differently, and consequently, certain types of organizational culture could either promote or hinder the integration process. Examining this possibility through an empirical study will enhance our understanding of the nature of integration within a supply chain.

Five research questions guide this study:

(1) To what extent do firms collaborate with their supply chain members?

(2) To what extent does firms' integration with supply chain members improve their performance?

(3) To what extent do firms' external drivers trigger their supply chain integration?

(4) To what extent do firms' internal drivers trigger their supply chain integration?

(5) To what extent does organizational culture influence the relationships between firms' drivers and supply chain integration?

Expected Contributions

This study investigates the impact of supply chain integration on firm performance. There are extensive empirical studies confirming the positive relationship; however, studies evaluating

this particular relationship are still needed to enrich our understanding and explain the mixed results (Fabbe-Costes and Jahre, 2008). As this study provides evidence from Indonesia, it brings a different dimension of supply chain integration, as a developing country might implement different practices as compared to the participating firms in existing studies, which focused on countries with greater economic development.

Existing studies have further provided evidence of the impact of external or environmental factors on the implementation of supply chain integration (Chen and Paulraj, 2004; Mentzer et al., 2000; Paulraj and Chen, 2007). This study extends the examination of the integration antecedents by investigating the potential influence of internal drivers on supply chain integration. In doing so, we get a more comprehensive picture of factors affecting the degree of firms' integration with their supply chain members.

This study also contributes to the OM field by providing a measure of internal drivers, which has not been empirically investigated. The new measure was tested and validated using a rigorous process following Churchill (1979) and Li et al. (2005), and thus could be employed in other studies with different settings.

Finally, this study illustrates the important role of organizational culture in determining the shape of the relationship between firms' drivers and supply chain integration. To date, a study of organizational culture in the OM field is still very limited. The result of this study will enhance our understanding of supply chain integration, especially related to types of organizational culture that could promote, or, in contrast, discourage the integration. Managers equipped with this essential knowledge should be able to transform the values or norms of the organization with ones that are more conducive to the integration process.

An Overview of the Dissertation

This dissertation consists of five chapters. The next chapter, Chapter 2, reviews the literature concerning supply chain integration, firm performance, internal and external drivers, and organizational culture. Based on this review, a research model and hypotheses are developed. Chapter 3 covers the methodology of the study, which is comprised of the sample selection, the instrument development, and the data collection process. The results of the study are then presented in Chapter 4. Finally, the last chapter, Chapter 5, provides discussion of the findings, implications for research and practice, as well as the limitations of the study that suggest avenues for future research.

CHAPTER 2

THEORY DEVELOPMENT

In this chapter we review previous literature related to supply chain integration, firm performance, internal and external drivers, and organizational culture. This review serves as a foundation to build the conceptual framework and develop relevant hypotheses.

Supply Chain Integration (SCI)

A supply chain is a network consisting of suppliers, manufacturers, distributors or intermediaries, and customers. In a study reviewing 588 articles related to supply chain management, Jain et al. (2010) provided a comprehensive definition of supply chain management, as follows,

> [S]upply chain is the stream of processes of moving goods from the customer order through the raw materials stage, supply, production, and distribution of products to the customer. All firms have supply chains of varying degrees, depending upon the size of the organization and the type of product manufactured. These networks obtain supplies and components, change these materials into finished products and then distribute them to the customer. Managing the chain of events in this process is what is known as supply chain management. Effective management must take into account coordinating all the different pieces of this chain as quickly as possible without losing any of the quality or customer satisfaction, while still keeping costs down (Jain et al., 2010).

This definition implies the need to consolidate activities within and between organizations as a part of the supply chain integration process. In the past, firms managed their supply chain by internalizing the supply chain network, either performing backward integration with their upstream partners, forward integration with their downstream partners, or both (Simchi-Levi et al., 2003). In his book describing the birth and the growth of some large firms in the U.S., Chandler (1977) discussed how Ford once owned its primary suppliers, including iron ore producers, to ensure the production of low-cost and reliable cars in 1910. In the early 1980s, however, the maturity stage of the automotive industry, along with the antitrust law, had made vertical integration practices uneconomical, if not infeasible (Harrigan, 1984). Since then, firms

employed a taper-integrated strategy, in which they rely on other firms to provide a portion of their requirements, to gain similar benefits as vertical integration (Harrigan, 1984; Hill, 1994).

Studies have shown that integrating a supply chain would not be effective without a systematic and strategic collaboration, not only across functions within a particular firm (Campbell and Sankaran, 2005; Stock and Lambert, 2001; Zhao et al., 2011), but also across firms (Davis, 1993; Lee, 2000; Mentzer et al., 2000). In the Operations Management (OM) literature, this phenomenon is identified as supply chain integration. It includes activities of sharing and consolidating knowledge and information among supply chain members (Swink, Narasimhan, and Wang, 2007). Rosenzweig (2003) further defined supply chain integration as the linkages among various supply chain elements. Supply chain integration includes "the interrelationship among the departments, functions, or business units within the firm that 'source', 'make', and 'deliver' products and the external relationships with entities outside the enterprise, including the network of direct suppliers and their suppliers and direct customers and their customers" (p. 440).

The nature of supply chain integration indicates that a network of firms should be the appropriate unit of analysis; however, studies still measure this construct using a focal firm's or a dyad's perspective due to the difficulties of measuring an entire network and obtaining relevant sample (Chen and Paulraj, 2004; Frankel et al., 2008). To the best of our knowledge, there are a very limited number of empirical studies addressing supply chain integration practices through the lens of a network of firms. Choi and Hong (2002) provided an exception by investigating supply networks; however, the study was limited to two major companies (that is, Honda and DaimlerChrysler) and emphasized theory building and proposition development. It is widely

accepted in the OM literature to measure *supply chain integration* in terms of the integration practices that a focal firm performs with its supply chain partners (Frankel et al., 2008).

In order to gain a better perspective of supply chain integration, Fawcett and Magnan (2002) identified four types of integration: (1) internal, cross-functional process integration; (2) backward integration with key first-tier suppliers, which naturally would involve second-tier suppliers; (3) forward integration with key first-tier customers, or with the customers' customers; and (4) complete forward and backward integration, or expressed as integration from "suppliers' supplier to the customers' customer". Some scholars further argued that the scope of integration could be collapsed into three elements, which is comprised of internal integration, supplier integration, and customer integration (Campbell and Sankaran, 2005; Flynn et al., 2010; Narasimhan and Kim, 2002; Zhao et al., 2011). As these three elements sufficiently capture the essential dimensions of supply chain integration, this study uses these three dimensions to represent the supply chain integration construct. Specifically, this study measures the degree of integration that a focal firm pursues internally, with its key suppliers, as well as with its key customers.

Several studies have pointed out various levels of supply chain integration in practice (Frohlich and Westbrook, 2001; Rosenzweig, 2003). Most empirical studies have focused on either upstream integration (Petersen, Handfield, and Ragatz, 2005) or downstream integration (Rosenzweig, 2009); however, an empirical study by Frohlich and Westbrook (2001) has shown that companies with the widest degree of integration with both suppliers and customers have the strongest association with performance improvement.

Regardless of the orientations of the integration (that is, internally-oriented, customer-oriented, or supplier-oriented), several key activities characterize the collaboration between a

focal firm and its supply chain members in all levels of integration. Having the knowledge of these activities is pertinent to distinguish supply chain integration from other OM practices. These activities would also serve as a basis for measuring the degree of supply chain integration.

Lee (2000) suggested information sharing, coordination and resource sharing, and organizational relationship linkage as the key activities constituting supply chain integration. Based on Lee's study, Simatupang, Wright, and Sridharan (2002) extended the framework by offering different modes of coordination required to integrate the supply chain processes of different partners. A higher level of collaboration with respect to these four coordination modes indicates a higher degree of supply chain integration. The coordination modes are (1) logistics synchronization, (2) information sharing, (3) incentive alignment, and (4) collective learning. A brief explanation of each coordination mode is described as follows.

Logistics synchronization means jointly coordinating inventory management, facility and transportation with participants of a supply chain (Simatupang et al., 2002). Several strategies of logistics synchronization have been developed based on the principles of logistics management, for instance: collaborative logistics process, which refers to: (1) "joint decision making such as assortment planning, joint forecasting, joint inventory management and replenishment" (Simchi-Levi et al., 2003); or (2) "logistics postponement", which refers to delaying product differentiation to the latest possible time until customer orders are received (Chopra and Meindl, 2009; van Hoek, 2001). Additionally, Simchi-Levi et al. (2003) offered "collaborative transportation" as another way to synchronize the logistics process, which attempts to employ third-party logistics providers to accomplish in-bound and out-bound logistics.

Information sharing refers to practices that distribute relevant information among supply chain members to ensure the visibility of demand and inventory (Simatupang et al., 2002).

Despite many problems that firms have to deal with while sharing their information, such as information system investments (Lee and Whang, 1999), trust, and commitment (Spekman, Kamauff, and Myhr, 1998), the literature acknowledges information sharing as a major strategy to counter the so-called "bullwhip effect"–a phenomenon of demand-variability amplification along a supply chain, from retailers, distributors, manufacturers, and suppliers (Lee and Whang, 1999).

Incentive alignment refers to any incentive schemes designed to link to the overall supply chain performance in an attempt to reduce conflict of interest among supply chain members (Simatupang et al., 2002). These could include: (1) relationship pricing, such as volume-based quantity discounts and promotional allowances; (2) a subsidy for products returned or consignment; (3) capacity reservation, such as back-up agreements and quantity flexibility contracts; (4) tying bonuses to desirable performance, such as reduced forecasting errors or improved speed of delivery; and (5) stabilizing the transfer price, such as an every-day-low-price and gain-sharing schemes (Chopra and Meindl, 2009; Simchi-Levi et al., 2003).

Finally, the activities of *collective learning* deal with acquiring knowledge and disseminating it across firms in a supply chain. In a number of industries, it is common to find that partnerships are built to enable a transfer of knowledge and/or technology among the supply chain members (Spekman et al., 1998).

Pursuing a higher degree of supply chain integration requires a focal firm to make significant efforts; yet, scholars argued that the benefits gained could outweigh the efforts. A study by Flynn et al. (2010), which surveyed 617 manufacturing firms in China, provided empirical evidence of the significant relationship between SCM practices and firm performance. This study tested the impact of each dimension of supply chain integration –specifically, internal integration, supplier integration, and customer integration– on operational and business

performance. The study further showed that customer integration significantly influenced operational performance, whereas internal integration significantly influenced operational and business performance. Another study by Zhao et al. (2011) provided further empirical evidence of the positive influence of internal integration on supplier and customer integrations; furthermore, the authors argued that developing internal integration, along with having a relationship commitment to suppliers and customers, would enable a firm to increase the degree of collaborations with their key suppliers and key customers.

As SCM phenomena have been examined extensively in the OM literature for the last six decades (Jain et al., 2010; Singhal and Singhal, 2012a), there is a need to provide unique and novel approaches to the literature. A recent study by Singhal and Singhal (2012a) identified opportunities for OM scholars to contribute to the literature, particularly, by bringing scientific approaches and by using multiple perspectives in examining SCM. Their subsequent study (Singhal and Singhal, 2012b) outlined specific steps to pursue the aforementioned opportunities and suggested that OM scholars build a network of research teams to simultaneously examine SCM phenomena from different populations, as well as to rigorously compare and contrast the findings over a long time period. In doing so, OM scholars would provide unique contributions, not only to the OM field, but also to the field of social science in general.

Supply Chain Integration and Its Impact on Firm Performance

Despite an argument that effective supply chain management would improve the performance of the overall system, in practice, it is difficult to measure the performance of the whole supply chain. In addition, a system perspective would view the increase of supply chain performance as an increased performance of the chain as a whole, and not necessarily an improved performance of each part (or, in this case, of each supply chain member). Therefore, studies have

measured supply chain performance from a focal firm's point of view, and further conceptualized the *improvement of firm performance* as a proxy of effective supply chain management.

In her study related to integration strategies, Harrigan (1984) suggested 'tapered integration' as an appropriate strategy for current business environments, and argued that firms employing this strategy would gain the same benefits as full integration but with less risk. Firms could gain superiority over competitors, gain innovations from external sources while developing internal capabilities, as well as improve bargaining power (Harrigan, 1984). Based on first-hand experience in managing Hewlett-Packard, Davis (1993) offered improved customer satisfaction, reduced costs, and increased profit margin as factual rewards for implementing effective supply chain management. Lee (2000) supported these observations and documented improvements of many large corporations, such as Wal-Mart, Hewlett-Packard, Dell, and Seven-Eleven, after they successfully pursued supply chain integration. A higher degree of collaboration between the companies and supply chain partners has enabled these companies to expand their market share, reduce costs as much as 60 percent, and substantially increase their profits (Lee, 2000).

Based on these phenomena in business, scholars have attempted to provide valid measures of firm performance in the context of supply chain management. Beamon (1999) suggested three interrelated measures, that is, resources, output, and flexibility. 'Resources performance' measures the level of efficiency (such as total costs of resources used and return on investment), 'output performance' measures the level of customer service (such as sales, profit, and customer response time), whereas 'flexibility performance' measures the ability to respond to a changing environment (such as reduced backorders and improved customer satisfaction).

Based on analyzing and synthesizing more than 400 articles, Chen and Paulraj (2004) suggested supplier performance and buyer performance to represent the supply chain

performance construct. *Supplier performance* is measured in terms of quality, cost, flexibility, delivery, and prompt response. *Buyer performance* is measured using indicators of operational performance such as delivery speed reliability/dependability, as well as financial indicators such as return on investment and profit (Chen and Paulraj, 2004).

Fabbe-Costes and Jahre (2008) investigated previous studies examining the impact of supply chain integration on performance, and further classified these studies into four categories based on the performance measures used: (1) studies using *logistics or supply chain performance*, which include cost reduction, lead time reduction, and quality improvement; (2) studies using *mixed performance*, which include productivity and the degree of new product development, aside from logistics/supply chain performance; (3) studies using *financial performance*, which include return on investment and profitability; and finally, (4) studies using *marketing-oriented performance*, which include market share, return on sales, and customer satisfaction (Fabbe-Costes and Jahre, 2008).

The findings in Fabbe-Costes and Jahre's (2008) study revealed that there is still no consensus related to measuring firm performance in the context of supply chain integration. Moreover, most of the previous studies used perceptual measures for different aspects of firm performance, a fact that might contribute to the ambivalent results of the relationship between supply chain integration and firm performance. Mitra and Singhal (2008) opted to use objective data to measure the positive benefit of supply chain integration.

We would argue that as firms integrate with their supply chain partners, they will share more information enabling them to reduce the bullwhip effect, work together with key suppliers and customers to reduce costs or solve inventory problems, and collaborate to improve product design and service levels. Evidence was found on the positive relationship between supply chain

integration and productivity (Frohlich and Westbrook, 2001), brand equity (Kim and Cavusgil, 2009), competitive advantage (Harrison and New, 2002), firm growth (Flynn et al., 2010; Wynarczyk and Watson, 2005), shareholder value (Mitra and Singhal, 2008), as well as financial performance (Droge et al., 2004; Germain, Claycomb, and Droge, 2008; Rosenzweig, 2003; Vickery et al., 2003). Most of the performance measures used by the extant studies could be classified into operational performance (such as productivity) and business performance (such as competitive advantage, firm growth, and financial performance). Moreover, both measures are pertinent in today's business world (Flynn et al., 2010; Rosenzweig, 2009), and therefore, this study uses these two performance measures and hypothesize that,

Hypothesis 1a: Supply chain integration is positively related to firms' operational performance.

Hypothesis 1b: Supply chain integration is positively related to firms' business performance.

Even though objective data would be ideal in serving the purpose of supply chain integration studies, scholars acknowledged the difficulty of obtaining the data due to firms' unwillingness to share such information (Vickery et al., 2003; Ward, Leong, and Boyer, 1994). Narasimhan and Kim (2002) attempted to overcome this issue by combining both subjective and objective data in measuring firm performance. In their study, they employed a 7-point Likert scale comprising profitability, return on investment (ROI), return on assets (ROA), revenue growth, financial liquidity, and net profit, as well as actual data of sales growth and market share growth to supplement the firm performance measures (Narasimhan and Kim, 2002). Another study by Vickery et al. (2003) obtained objective data of pre-tax ROA, ROI, and Return on Sales from one third of the sample and utilized them to validate the perceptual measures.

For the current study, we employed perceptual measures for firm performance. Ketokivi and Schroeder (2004) confirmed that the use of perceptual performance measures is acceptable, provided that several considerations are taken to ensure the reliability and the validity of the measures. Specifically, Ketokivi and Schroeder suggested the use of multiple items to capture different aspects of firm performance, as well as the use of multiple informants to reduce respondent bias. Both suggestions were taken into account in designing the current study.

External Drivers

Aldrich and Pfeffer (1976) argued that organizations are not able to generate all the resources internally, and thereby must enter into transactions and relations with external elements in the environment. The relations between organizations and their environments become critical, as organizations have to make sure that they get the resources they need.

This relationship between organizations and their environments has long attracted the attention of scholars, especially scholars in the field of organizational sociology. The organizational theorists deemed it important to distinguish organizations from their environment, as well as to understand how organizations and their environments interact with one another. Resource dependence theorists (Hickson et al., 1971) argued that organizations are able to adapt when circumstances change. Organizations are capable of managing their environments, which consist of: (1) customers or users; (2) capital sources; (3) raw product suppliers; and (4) technology and science (Tosi and Slocum, 1984). As organizations attempt to adapt with their environments, they learn the characteristics of their environment and make appropriate adjustments on structures and methods (Lawrence and Lorsch, 1967; Thompson, 1967), strategies (Miles and Snow, 1994; Miller, 1987), or organizational boundaries (Balakrishnan and Wernerfelt, 1986; Harrigan, 1985).

In the field of supply chain management, the influence of environment on organizations has been examined extensively (Fine, 2000; González-Benito et al., 2010; Guimaraes et al., 2002; Lee, 2002; Paulraj and Chen, 2007; Wong et al., 2011). Davis (1993) posited that organizations form partnerships with their supply chain members as a response to environmental uncertainties. Studies by Handfield and Nichols (1999), Lummus and Vokurka (1999), and Mentzer et al. (2000) supported this proposition and specifically identified increasing and global competition as dimensions of environmental uncertainties that encourage the implementation of supply chain integration. Demand uncertainty, which is associated with the predictability of the demand for a product (Fisher, 1997), and supply uncertainty, which is related to the continuity of the inbound supply to an organization (Lee, 2000), also trigger the uncertainties faced by firms.

Albeit using different terms, scholars seemed to agree that three elements, that is, supply uncertainty, demand uncertainty, and technology uncertainty, constitute the environmental uncertainties (Chen and Paulraj, 2004; Davis, 1993; Sutcliffe and Zaheer, 1998). Drawing from previous research, Chen and Paulraj (2004) operationalized these three sources of environmental uncertainty and conjectured a positive relationship between environmental uncertainty and buyer-supplier relationships. *Supply uncertainty*, which represents the uncertainties that arise from the upstream part of an organization, is measured by the extent of suppliers' reliability and consistency; *demand uncertainty*, which corresponds to the unpredictability of product demand, is measured by the degree of demand fluctuations and variations; whereas, *technology uncertainty*, which implies the instability of the technology adopted by organizations in an industry, is measured by the level of technology and process obsolescence (Chen and Paulraj, 2004).

Environmental uncertainties would naturally pose various risks on firms (Davis, 1993; Handfield and Nichols, 1999; Lee, So, and Tang, 2000; Simchi-Levi et al., 2003). The

uncertainties could be in terms of late deliveries from suppliers, sudden demand raises, or order cancellations, which encourage firms to stock more products as buffers, but still cause problems such as over stock or stock out, and in turn, loss of sales (Davis, 1993). Along the chain, environmental uncertainties trigger the bullwhip effect (Lee, Padmanabhan, and Whang, 1997a). Lee et al. also suggested better coordination and information sharing with supply chain partners as countermeasures of the bullwhip effect (Lee, Padmanabhan, and Whang, 1997b). Along the way, as firms gain the benefit of better coordination and synchronization, they would intensify the collaboration with their partners. Hence, gradually, firms evolve to a higher degree of supply chain integration.

Several studies attempted to provide empirical evidence of the environmental influence on the formation of inter-firm partnerships. Frohlich and Westbrook (2002) found a positive relationship between external pressures and web-based demand and supply integration. Scholars also found a significant impact of technological uncertainty on the degree of vertical integration (Afuah, 2001; Balakrishnan and Wernerfelt, 1986; Sutcliffe and Zaheer, 1998). A subsequent study by Paulraj and Chen (2007) further confirmed the positive impact of technology uncertainty on long-term supplier partnership. Furthermore, a recent study by Liu et al. (2010) provided evidence of the impact of institutional environment on firms' intentions to implement internet-enabled supply chain management systems. Environmental influence, or specifically environmental uncertainty, is also found to moderately affect the relationship between supply chain integration and firm performance (Fynes, de Burca, and Marshall, 2004; Germain, et al., 2008; Wong et al., 2011).

Based on these arguments, we posit that,

Hypothesis 2a: The extent of supply uncertainty will be positively related to the degree of supply chain integration.

Hypothesis 2b: The extent of demand uncertainty will be positively related to the degree of supply chain integration.

Hypothesis 2c: The extent of technology uncertainty will be positively related to the degree of supply chain integration.

Internal Drivers

Internal drivers refer to those factors within an organization that motivate the organization to collaborate more closely with its key suppliers and/or customers. It is distinguished from organizational culture in the sense that, while internal drivers are associated with factors that trigger or initiate the supply chain integration, organizational culture, in the context of this study, implies norms or values that serve as either boosters or barriers to the implementation of supply chain integration practices.

In a study conceptualizing supply chain management, Lummus and Vokurka (1999) traced the evolution of supply chain management practices and suggested several factors influencing its implementation in business. Aside from environmental pressures, firms could intentionally synchronize their operations with supply chain members in order to improve their performance (Lummus and Vokurka, 1999). In doing so, firms would gain knowledge from their partners and, in turn, all firms within the chain would share the benefits. Firms would also learn from best practices (such as the success stories of Wal-Mart, Hewlett-Packard, or Dell), anticipate the positive impact, and implement supply chain integration in an attempt to gain similar benefits. Frohlich and Westbrook (2002) supported this argument and provided empirical

evidence of the relationship between expected performance and the increased level of web-based demand and supply integration.

In addition to anticipating the benefits, firms could also undertake improvement initiatives via their focus on customers (Chen and Paulraj, 2004; Kaynak and Hartley, 2008; Lockström et al., 2010). In a study extending quality management concepts into supply chains, Kaynak and Hartley (2008) argued that the objective of supply chain management, which is to smooth the flow of materials, finished products, or services within the chain in order to satisfy end customers, is essentially aligned with the purpose of quality management. In their empirical study, Kaynak and Hartley confirmed the positive relationship between customer focus orientation and the quality of data and reports (that firms share with their customers along the supply chain).

A recent study by Lockström et al. (2010) examined supplier integration practices in the automotive industry in China and further suggested six factors that influence the supplier integration. These influencing factors are: (1) *quality mindset/customer orientation*, which refers to firms' focus on continuous improvement to satisfy their customers; (2) *strategic alignment*, which implies the fit between two organizations' business strategies and visions; (3) *top management support*, which refers to support from top management; (4) *trust*, which implies firms' belief in their partners; (5) *long-term orientation*, which is related to firms' commitment to build long-term relationships with their partners; and (6) *willingness to learn/improve,* which refers to firms' eagerness to make efforts to perform better.

The first and the last factors by Lockström et al. (2010), that is, quality mindset/customer orientation and willingness to improve, support Kaynak and Hartley's (2008) conception of customer focus and could potentially trigger close collaborations between firms in a supply chain. Thus, these factors were incorporated in the current study. The next four factors, however,

were not expected to *trigger* the integration processes; rather, they would *enable* firms to integrate with their supply chain members. Specifically, these factors, such as trust or long-term orientation, would serve as catalysts or enablers for the integration, but would not become the cause of the integration itself. Therefore, in this study, these factors, that is, strategic alignment, top management support, trust, and long-term orientation, were not considered to be internal drivers that influence the supply chain integration.

Table 1 presents several studies examining the antecedents of supply chain integration. From all of the antecedents influencing the degree of supply chain integration, quality mindset or customer orientation, desire to improve, and anticipation of benefits, are considered to play the role of internal drivers. The desire to improve, as suggested by many studies, is considered as part of the firms' customer orientation.

Contingency Perspective

The contingency theory was developed in the 1950s and early 1960s as a critique to organizational theories that claimed there was "one best way" to manage organizations. Originated by Joan Woodward (1958, 1965), the contingency perspective emerged when Woodward attempted to examine the influence of technology on organizational structures, specifically on span of control, centralization, formalization, and specialization. In her book, "Management and Technology", Woodward (1958) surveyed 203 manufacturing firms in South Essex, U.K. between the period 1953 and 1957, and described how technology adopted by the firms determined their choices of organizational structures, which were classified into "unit production", "mass production", and "process production". Successful firms did not seem to have common organizational structures or to apply similar management styles, but rather, they chose structures that fit with their environment (Woodward, 1958).

Table 1

Antecedents of Supply Chain Integration

SCI Antecedents	Role	Studies
Trust	Enabler	Mentzer et al. (2001), Cai et al. (2010), Lockström et al. (2010)
Commitment	Enabler	Mentzer et al. (2001), Wu et al. (2004), Zhao et al. (2010)
Top management support/Leader	Enabler	Mentzer et al. (2001), Chen & Paulraj (2004), Lockström et al. (2010), Richey et al. (2009)
Environmental pressures	**External Driver**	Frohlich and Westbrook (2002), Chen and Paulraj (2004), Wu et al. (2004), Zhao et al. (2008), Richey et al. (2009)
Quality mindset/Customer orientation, Desire to improve	**Internal Driver**	Chen and Paulraj (2004), Richey et al. (2009), Lockström et al. (2010), Narayanan et al. (2010)
Interfirm compatibility (strategy, vision, goals)	Enabler	Mentzer et al. (2001), Pagell (2004), Jayaram et al. (2010), Lockström et al. (2010), Richey et al. (2009)
Communication, Information Sharing, IT	Enabler	Chen and Paulraj (2004), Pagell (2004), Richey et al. (2009), Narayanan et al. (2010),
Joint key activities	Enabler	Mentzer et al. (2001), Richey et al. (2009), Jayaram et al. (2010)
Anticipation of benefits	**Internal Driver**	Lummus and Vokurka (1999), Frohlich and Westbrook (2002)

In her subsequent study, Woodward, along with other scholars, suggested that organizational effectiveness is attributed to "appropriate organizational structure and management style", which would be different depending on the circumstances (Lawrence and Lorsch, 1967; Thompson, 1967; Woodward, 1965). Fiedler (1966) brought the notion of contingency theory to an individual level in an organization and proposed leadership style as one of the contingent factors affecting group performance. He validated his proposition through field and laboratory studies, and revealed evidence of the interrelationships between situational factors, leadership styles, and group performances (Fiedler, 1966). Several other scholars added a few factors to the contingency theory (e.g., Flynn and Flynn, 2004; Flynn et al., 2010; Jayaram et

al., 2010; Shah and Ward, 2003; Sousa and Voss, 2008; Tenhiälä, 2011; Wong et al., 2011; Zhao, Flynn, and Roth, 2007); however, Child (1981) was among the first scholars to suggest the influence of culture on organizational effectiveness.

Tosi and Slocum (1984) extended the contingency theory and proposed three "contingent factors" that could impact organizational effectiveness: (1) individuals and groups; (2) strategic and design choices; and (3) cultural factors. These factors are interdependent and reinforce one another, with culture being the most pertinent factor as it influences attitudes, cognitive styles, values, and norms in organizations (Tosi and Slocum, 1984). In their study, Tosi and Slocum described how Volvo and General Motors (GM) employed an entirely different management style, even though the automotive technology was the same at that time, and yet gained major success. In this case, the organizational effectiveness was contingent upon the organizational cultures, since both companies developed a set of organizational structures that were aligned with their cultures and, in turn, led them to an improved performance. Given the importance of culture in shaping organizational effectiveness, this study attempted to take this contingency factor into further consideration in developing a research model.

Organizational Culture

Organizational culture has been studied extensively, especially in the social sciences, for over 60 years. Many sociology and anthropology scholars have attempted to define and conceptualize the notion of organizational culture, which resulted in more than 150 definitions of culture provided in the literature (Detert, Schroeder, and Mauriel, 2000). The definition by Barney (1986) is considered as one of the most established and widely accepted. In his study examining firms' sustained competitive advantage, Barney (1986) defined organizational culture as "a complex set of values, beliefs, assumptions, and symbols that define the way in which a

firm conducts its business" (p. 657). He argued that organizational culture has all-encompassing effects on a firm because it defines not only who the firm's relevant employees, customers, suppliers, and competitors are, but also how the firm interacts with its stakeholders. Organizational culture distinguishes a firm from others in the business (Schein, 1985), becomes a source of competitive advantage (Barney, 1986), plays a role in the efficiency and effectiveness of organizational goals (Denison and Mishra, 1995), as well as influences the success of improvement initiatives adopted by a firm (Detert et al., 2000). In the OM field, organizational culture has been empirically investigated, and found to have an impact on the implementation of technology (McDermott and Stock, 1999; Zammuto and O'Connor, 1992), manufacturing practices (Nahm et al., 2004), as well as quality management practices (Naor et al., 2008; Prajogo and McDermott, 2005).

Detert et al. (2000) provided a framework that captures dimensions of organizational culture from the extant literature: (1) the basis of truth and rationality in the organization; (2) the nature of time and time horizon; (3) motivation; (4) stability versus change/innovation/personal growth; (5) orientation to work, task, and coworkers; (6) isolation versus collaboration/ cooperation; (7) control, coordination, and responsibility; and (8) orientation and focus – internal and/or external. Three of the eight dimensions are considered pertinent to the context of supply chain integration, specifically, stability versus change, isolation versus collaboration/ cooperation, and internal versus external focus. These dimensions could define an entity more on the organization level of analysis and address how an organization interacts with its environment, whereas other dimensions define an organization based on the characteristics of its individual employees or personnel. Given the nature of supply chain integration, this study utilized these dimensions, which were suggested by Quinn and Rohrbaugh (1983) and Denison and Spreitzer

(1991), in examining the impact of organizational culture on the relationship between supply chain integration and its drivers.

Quinn and Rohrbaugh (1981, 1983) developed a competing values framework (CVF) to examine organizational effectiveness. This framework consists of three dimensions: (1) external-internal focus; (2) flexibility-control structure; and (3) means-ends emphasis. Quinn and Kimberly (1984) extended the use of this framework to study organizational culture. Drawing from Quinn and Kimberly's study, Denison and Spreitzer (1991) subsequently proposed the competing values framework for examining organizational culture, which focuses on two conflicts within a system: the conflict *between stability and change,* and the conflict *between the internal organization and the external environment*.

After reviewing several organizational culture measures, as presented in Table 2, this study measured organizational culture using the competing values framework. The measurement of organizational culture mostly use individual or group within a firm as a unit of analysis, which is considered not appropriate for the purpose of this study. Out of the three firm-based measures of organizational culture, 'quality improvement implementation survey' originated from the competing values framework and is more specific to measure quality culture, whereas psychometric properties of 'MacKenzie's culture questionnaire' have not been supported by subsequent studies (Scott et al., 2003). Therefore, this study used the competing values framework to measure organizational culture, as this framework has been validated by previous studies (Braunscheidel et al., 2010; Deshpandé et al., 1993; Gregory et al., 2009; McDermott and Stock, 1999; Naor et al., 2008; Zammuto and O'Connor, 1992).

Table 2

Organizational Culture Measures

Organizational Culture Measures	Studies*	Dimensions	Outcome Measures	Unit of Analysis
Competing Values Framework	Cameron and Freeman (1991)	(1) Flexibility-Control orientation, and (2) Internal-External Control orientation	Four types of cultures: Clan, Adhocracy; Hierarchy; and Market	Firm
Quality Improvement Implementation Survey	Shortell et al. (2000)	(1) Organizational characteristics; (2) Managers' style cohesion; (3) Prioritization of goals; and (4) Rewards	Four types of cultures: Group; Developmental; Hierarchy; and Rational	Firm
Organizational Culture Inventory	Cooke and Lafferty (1987)	12 thinking styles	Three types of cultures: People/security culture; Satisfaction culture; and Task/security culture	Individual
Organizational Ideology Questionnaire	Harrison (1975)	(1) Orientation to power; (2) Orientation to roles; and (3) Orientation to tasks and individuals	The extent of each dimension	Individual
Hospital Culture Questionnaire	Sieveking, Bellet, and Marston (1993)	(1) Supervision; (2) Employer attitudes; (3) Role significance; (4) Hospital image; (5) Competitiveness; (6) Staff benefits; (7) Cohesiveness; and (8) Workload	The extent of each dimension	Individual
Unit Cultural Assessment Tool	Coeling and Simms (1993)	Individual and group preferred behavior	The extent of each dimension	Individual and Group
Practice Culture Questionnaire	Stevenson (2000)	(1) Quality improvement; and (2) Resistance to change	The extent of each dimension	Individual
MacKenzie's Culture Questionnaire	MacKenzie (1995)	(1) Commitment; (2) Innovation; (3) Change; (4) Conflict resolution; (5) Management style; (6) Leadership; (7) Trust; (8) Cooperation; (9) Action orientation; (10) HR orientation; (11) Consumer orientation; (12) Organizational direction	The extent of each dimension	Individual and Firm

* Please refer to Scott et al. (2003) for these studies

Figure 1 identifies two dimensions upon which the competing values framework of culture is based. The first dimension is the flexibility-control axis, which reflects the competing demands of change and stability. The second dimension is the internal-external focus axis, which reflects the competing demands of internal and external organization focus. McDermott and Stock (1999) suggested that an assumption underlies this organizational culture framework; since each quadrant as shown in Figure 1 is an ideal type, an organization is likely to have a combination of different cultures, and one type of culture is expected to be more dominant than others. Four types of organizational culture can be further identified from the juxtaposition of these two dimensions, namely, clan, adhocracy, market, and hierarchy. The characteristics of each type are displayed in Figure 1 (adapted from Quinn and Spreitzer, 1991; Cameron and Quinn, 1999).

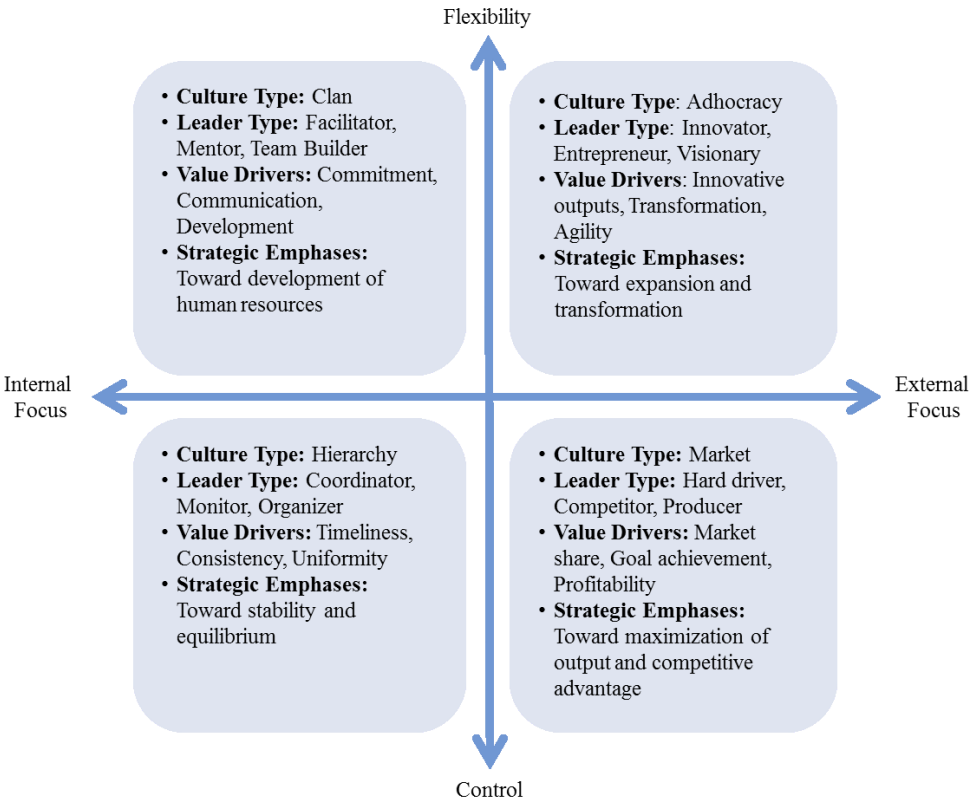

Figure 1. Organizational Culture Framework

As discussed previously, four broad activities reflect the degree of integration among members of a supply chain. These activities, or coordination modes, as termed by Simatupang et al. (2002), are logistics synchronization, information sharing, incentive alignment, and collective learning.

These coordination modes indicate that the focus of an organization is more on outward orientation rather than just inward. The supply chain integration process will require extensive joint activities with suppliers and customers, and even to suppliers' suppliers or customers' customers (Fawcett and Magnan, 2002). Positioning this characteristic on the internal-external focus continuum, supply chain integration leans more towards the external-focus side rather than the internal-focus side. Internal focus means integrating and buffering to sustain the existing organization, while external focus reflects a focus on adaptation and interaction with the environment (Denison and Spreitzer, 1991). Consequently, firms with an external-focus culture will undergo the integration process more smoothly relative to those with an internal-focus culture.

Moreover, the integration of a firm with its supply chain members is also a representation of the firm's dynamic characteristics. A firm should be flexible and adaptable to be able to integrate with its supply chain partners. These characteristics are a reflection of flexibility orientation, which emphasizes growth, resource acquisition, creativity, and adaptation to the external environment (Denison and Spreitzer, 1991). Stability orientation, on the other hand, emphasizes internal efficiency, uniformity, and conservatism (Cameron and Quinn, 1999; Denison and Spreitzer, 1991). Firms with this type of culture might have difficulty in adapting to change. Consequently, firms with a flexibility orientation will perform the integration process more easily and therefore achieve a higher degree of integration than those with a stability orientation.

Thus, based on this discussion, a set of hypotheses, pertinent to the moderating role of organization culture, in terms of control-flexibility orientation, is developed as follows,

Hypothesis 4a: Organizational culture will moderate the positive relationship between *supply uncertainty* and *supply chain integration*, such that, focal firms with higher flexibility orientation will have a higher degree of supply chain integration than those with lower flexibility orientation.

Hypothesis 4b: Organizational culture will moderate the positive relationship between *demand uncertainty* and *supply chain integration*, such that, focal firms with higher flexibility orientation will have a higher degree of supply chain integration than those with lower flexibility orientation.

Hypothesis 4c: Organizational culture will moderate the positive relationship between *technology uncertainty* and *supply chain integration*, such that, focal firms with higher flexibility orientation will have a higher degree of supply chain integration than those with lower flexibility orientation.

Hypothesis 4d: Organizational culture will moderate the positive relationship between *anticipation of benefits* and *supply chain integration*, such that, focal firms with higher flexibility orientation will have a higher degree of supply chain integration than those with lower flexibility orientation.

Hypothesis 4e: Organizational culture will moderate the positive relationship between *customer orientation* and *supply chain integration*, such that, focal firms with higher flexibility orientation will have a higher degree of supply chain integration than those with lower flexibility orientation.

Along the same line, another set of hypotheses, relevant to the moderating role of organization culture, in terms of internal-external focus, is developed as follows,

Hypothesis 5a: Organizational culture will moderate the positive relationship between *supply uncertainty* and *supply chain integration*, such that, focal firms with higher external focus will have a higher degree of supply chain integration than those with lower external focus.

Hypothesis 5b: Organizational culture will moderate the positive relationship between *demand uncertainty* and *supply chain integration*, such that, focal firms with higher external focus will have a higher degree of supply chain integration than those with lower external focus.

Hypothesis 5c: Organizational culture will moderate the positive relationship between *technology uncertainty* and *supply chain integration*, such that, focal firms with higher external focus will have a higher degree of supply chain integration than those with lower external focus.

Hypothesis 5d: Organizational culture will moderate the positive relationship between *anticipation of benefits* and *supply chain integration*, such that, focal firms with higher external orientation will have a higher degree of supply chain integration than those with lower external focus.

Hypothesis 5e: Organizational culture will moderate the positive relationship between *customer orientation* and *supply chain integration*, such that, focal firms with higher external focus will have a higher degree of supply chain integration than those with lower external focus.

Research Model

Based on the theoretical rationale described previously, we developed our research model as shown in Figure 2.

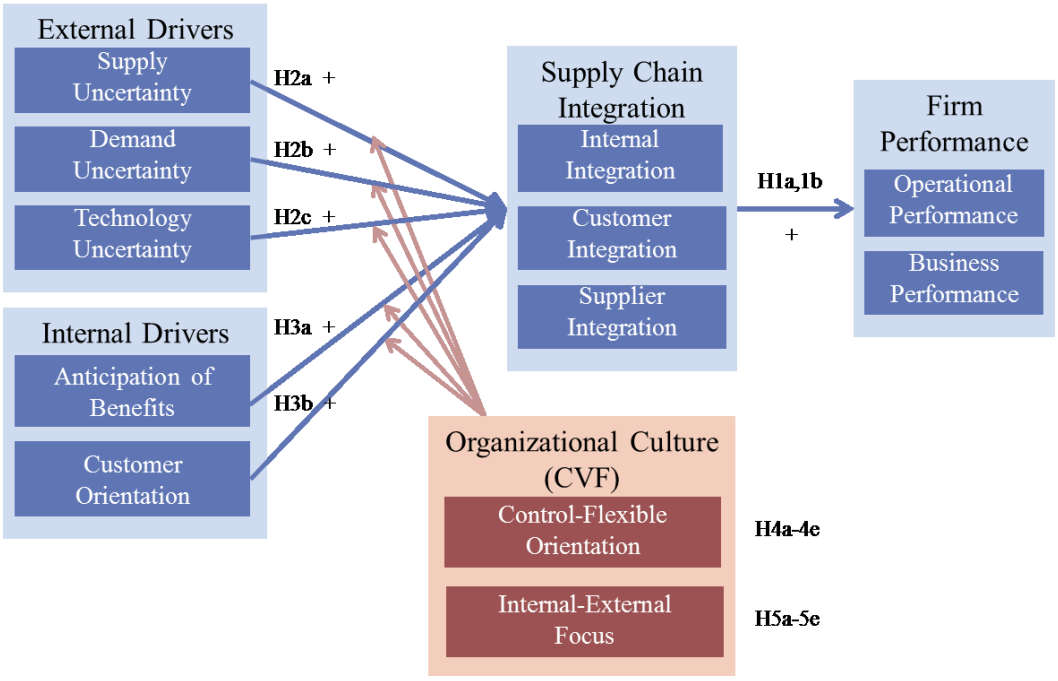

Figure 2. Research Model: Hypothesized Relationships Between Internal and External Drivers, Supply Chain Integration, Firm Performance, and Organizational Culture

CHAPTER 3

METHODOLOGY

This study examined the relationships between *supply chain integration* (in terms of customer integration, supplier integration, and internal integration), *firm performance* (in terms of operational performance and business performance), *external drivers* (in terms of supply uncertainty, demand uncertainty, and technology uncertainty), *internal drivers* (in terms of anticipation of benefits and customer orientation), as well as *organizational culture* (in terms of flexibility-control orientation and internal-external focus). Specifically, this study focused on five research questions: (1) To what extent do firms collaborate with their supply chain members? (2) To what extent does firms' integration with supply chain members improve their performance? (3) To what extent do firms' external drivers trigger their supply chain integration? (4) To what extent do firms' internal drivers trigger their supply chain integration? (5) To what extent does organizational culture influence the relationships between firms' drivers and supply chain integration?

The next section discusses the unit of analysis and the sample of the study. It then details the measurement for each variable. The final section further describes the procedure of data collection, as well as the results of the pilot study.

Sample

In an attempt to address the research hypotheses, a survey of Indonesian-based companies was conducted. As indicated in the previous chapter, the degree of supply chain integration was measured from the focal firm's point of view, and in order to have consistency with respect to the position of the focal firm within its supply chain, manufacturing companies

were selected as the sampling frame. Manufacturing companies were considered as appropriate focal firms because they were positioned relatively in the center of their supply chains, enclosed by tiers of suppliers and tiers of customers.

This study obtained the sample from 2010 Kompas Directory, a published database of companies in Indonesia. It contains a basic profile of firms based in Indonesia, such as type of industry, type of products or services, and contact information. We selected manufacturing companies from this database and contacted each company to ask for their participation. At the design stage of this study, we considered adding another database, the 2010 Indonesian Capital Market Directory (ICMD), which contains 118 public-listed manufacturing firms and also reports firms' financial statements. However, we learned that the financial statements published were slightly outdated (that is, 2007-2009 periods) and thus would not be compatible with the time frame we were using for the large-scale survey (that is, 2008-2010 periods). Therefore, we decided to refer mainly to the 2010 Kompas Directory as the source of our sample.

To evaluate the variables, we designed a survey with two parts, which would be completed by two different employees of each participating firm. Using multiple informants is pertinent to reduce the potential common method bias (Ketokivi and Schroeder, 2004), and furthermore, it would ensure that informants give responses specific to their expertise. The first informant was a senior manager in supply chain/logistics. As this informant was more knowledgeable about collaborations with the firm's supply chain partners, he/she was asked to evaluate the degree of supply chain integration and the internal drivers (please refer to questionnaire A in Appendix A). The second informant was a senior manager in marketing/ finance, as this informant was expected to have a good understanding of firms' environmental pressures and firm performance. He/she was asked to evaluate the extent of environmental

uncertainties (or specifically, the external drivers), assess the organizational culture, and evaluate the performance improvement over the last three years (please refer to questionnaire B in Appendix A). The profile of the respondents/informants and the participating firms are shown in Table 3.

Table 3

Sample Demographics

Informant Characteristics (*N* = 446)	**Frequency**	**%**
Position in the company		
Owner	30	6.7
Top management	62	13.9
Middle management (e.g., manager)	217	48.7
Supervisor/superintendent	112	25.1
Other	7	1.6
N/A	18	4.0
Years in the company		
Less than 1 year	19	4.3
1 to less than 5 years	155	34.8
5 to less than 10 years	117	26.2
10 to less than 15 years	53	11.9
15 years or more	84	18.8
N/A	18	4.0
Years of experience		
Less than 1 year	9	2.0
1 to less than 5 years	72	16.1
5 to less than 10 years	98	22.0
10 to less than 15 years	61	13.7
15 years or more	137	30.7
N/A	69	15.5
Education		
Graduate from high school/equivalent	40	9.0
Graduate from college/equivalent	253	56.7
Some graduate school	111	24.9
Graduate with Masters or PhD	24	5.4
Other	18	4.0

Table 3 (*Contd.)*

Firm Characteristics (*N* = 223)		Frequency	%
Number of employees			
Less than 100 employees		50	22.4
100 to 499 employees		55	24.7
500 employees or more		118	52.9
The company age since establishment			
Less than 3 years		8	3.6
3 to less than 7 years		28	12.6
7 to less than 15 years		41	18.4
15 to less than 30 years		50	22.4
30 years or more		63	28.3
N/A		32	14.3
Industry type			
D15	Food and Kindred products	39	17.5
D16	Tobacco Manufacturing	6	2.7
D17	Textile Mill Products	8	3.6
D18	Apparel and Other Textile Products	10	4.5
D19	Leather and Leather Products	3	1.3
D20	Lumber and Wood Products	4	1.8
D21	Paper and Allied Products	6	2.7
D22	Printing and Publishing	8	3.6
D23	Petroleum and Coal Products	7	3.1
D24	Chemicals and Allied Products	16	7.2
D25	Rubber/Misc. Plastic Products	8	3.6
D26	Stone, Clay, Glass and Concrete Products	1	0.4
D27	Primary Metal Industries	11	4.9
D28	Fabricated Metal Products	9	4.0
D29	Machineries and Related Products	3	1.3
D30	Industrial, Commercial Machinery & Computer Equipment	2	0.9
D31	Electrical Equipment and Components	12	5.4
D32	Radio, Television, and Communication Related Products	6	2.7
D33	Measurement Analyzing, Medical Inst. & Rel. Products	1	0.4
D34	Automotive Industries	20	9.0
D35	Transportation Equipment	3	1.3
D36	Furniture and Fixtures	8	3.6
D37	Recycles	3	1.3
	Others	29	13.0

Instrument Development

All variables were measured using multi-item scales to improve internal consistency (Ketokivi and Schroeder, 2004). The scales to measure each variable, except for internal drivers,

are obtained from existing literature, as their psychometric properties have been validated in previous studies.

To develop the new scale (that is, *internal drivers* measure), we followed a guideline suggested by established studies regarding the development and validation of a new instrument (Churchill, 1979; Malhotra and Grover, 1998; Chen and Paulraj, 2004; Li et al., 2005), as shown in Figure 3.

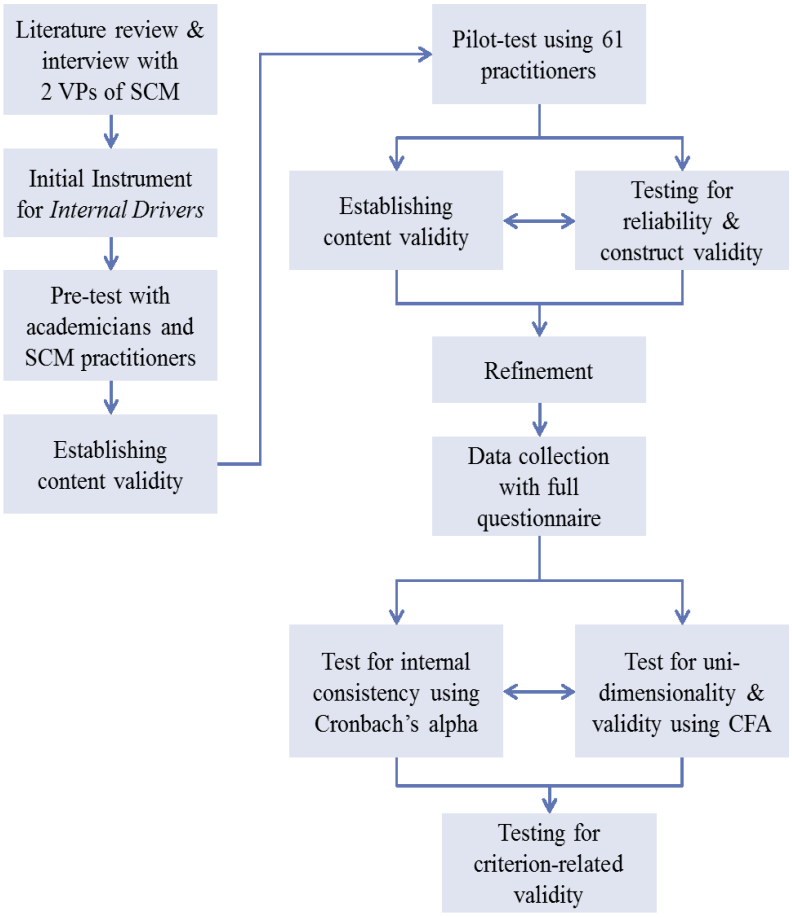

Figure 3. Data Collection and Analysis Procedure

After reviewing existing studies in marketing, strategy, and operations management literatures, two dimensions of internal drivers were identified, that is, anticipation of benefits and

customer orientation (as shown in Table 1). We also conducted an informal interview with two Vice Presidents of SCM from two different manufacturing firms in Indonesia. Ten items that measured internal motivation of a firm in pursuing integration with its supply chain partners were then generated from the literature review and the interview process. We conducted a pre-test and a pilot test for this initial instrument before it was used in the full-scale survey. The processes and results of these tests will be discussed in the next two sections.

For *external drivers* measure, this study adopted the scale developed by Chen and Paulraj (2004), comprising three dimensions: (1) supply uncertainty, which was measured using 4 items, (2) demand uncertainty, which was assessed using 5 items, and (3) technology uncertainty, which was evaluated using 4 items. All items were measured using a 5-point Likert scale, ranging from 1="strongly disagree" to 5="strongly agree".

We adopted a scale by Flynn et al. (2010) to measure *supply chain integration*. The scale was divided into three sections: 6 items to measure customer integration; 6 items to measure supplier integration; and 8 items to measure internal integration. Respondents were asked to evaluate the extent of integration with a 5-point Likert-type scale (1="not at all" and 5="extensive").

Flynn et al. (2010) also provided a perceptual measure for *firm performance*, which captured two aspects: (1) operational performance (6 items) and (2) business performance (4 items). This study used this perceptual measure as it has been validated and it contained sound psychometric properties and has been validated.

The scale for *organizational culture* was adapted from the study of Cameron and Quinn (1999), Naor et al. (2008), and Liu et al. (2010), which measured 'control-flexibility orientation' with 5 items, and 'internal-external focus' with 5 items. The respondents were asked to indicate

the side of the continuum their company tends to be along a 7-point scale (please refer to Appendix A for details).

Furthermore, two control variables were incorporated in this study: (1) firm age, and (2) firm size. Firm age was measured by the number of years it operated since it was founded. Firm size was measured by total number of employees.

The survey items were originally in English, so the items were translated into Bahasa Indonesia by an Indonesian doctoral student to make sure that respondents would understand the items. A senior faculty member of an Indonesian university back translated the questionnaire to assure the accuracy of the translation.

Data Collection

Before launching the questionnaire to a full-scale survey, a pre-test and a pilot study were conducted to refine the initial instrument. The pre-test was conducted in July 2011, involving three Indonesian doctoral students, two Indonesian faculty members, and two Indonesian practitioners to review all of the items. All parties gave constructive feedback related to the wording and the format of the questionnaire (such as fonts or margins), as well as provided suggestions related to the data collection process. After two iterations of refinements, the first part of the instrument (that is, questionnaire A) was then tested in the pilot study.

The pilot study was conducted in August 2011 and early September 2011. We did not use all items of this study for the pilot test because of three reasons: (1) all measures were obtained from established studies and had sound psychometric properties, except for the *internal drivers* construct; (2) the purpose of the pilot study was to test the reliability and validity of the new scale/instrument, as suggested by Flynn et al. (1990) and Malhotra and Grover (1998); and (3) using all items would require each respondent to respond to 83 items, including demographic

questions. In order to make the survey-completion process less tedious, and to increase the response rate (Dillman, 1991), we decided to use questionnaire A (containing items measuring internal drivers, supply chain integration, and demographics) for the pilot study.

We used convenience sampling using 61 Indonesian practitioners who were either taking an MBA Executive program or attending management-related training in a private institute of management in Jakarta, Indonesia. Even though the institution is based in Jakarta, which is the capital city of Indonesia, its MBA/training participants usually come from different regions of Indonesia; therefore, to some extent, the results can be considered to represent responses from practitioners from all over the country. Additionally, using convenience sampling is acceptable for pilot testing (Flynn et al., 1990; Noar, 2003). The results of the pilot study will be detailed in the next section.

After the pilot study, we refined the instrument and launched the final instrument to a full-scale survey. The data collection began in mid-October 2011 and ended in February 2012. Several steps were performed to collect data for this study. First, each firm was contacted by phone or email to ensure their participation, as well as to get the specific informants. Second, a questionnaire, which constituted survey and company profile questions, was then e-mailed as an attachment to the informants of the participating companies. A cover letter defining the study's objectives and offering a copy of the results was also attached to the questionnaire package. The respondents returned their completed questionnaire to the researcher by e-mail.

We followed the guidelines of "Total Design Survey Method" as suggested by Dillman (1991) to improve the response rate. After sending the initial questionnaire package, we contacted each informant to make sure that the questionnaire was received. We employed 2-3 follow-ups by calling the non-respondents to remind them to complete the survey.

From 813 firms contacted, 160 firms were removed from the list because of invalid contact data. After four months of data collection, 446 usable questionnaires were received from 223 firms, yielding a 34.15% response rate.

Results of the Pilot Study

The initial instrument to be pilot tested, as mentioned earlier, comprised items measuring internal drivers and supply chain integration (which were assessed using a 5-point Likert-type scale), as well as demographic questions. Regarding the sample size, Hair et al. (2006) suggested a minimum of five observations for each variable being measured, and thus the sixty-one samples were considered sufficient for testing the new scale, which consisted of ten items.

Exploratory factor analysis (EFA) was performed to test if the internal drivers construct was composed of two dimensions or factors, that is, anticipation of benefits and customer orientation. Several tests were conducted before determining the applicability of EFA to this data. First, we looked at the correlation matrix of these 10 items. More than 20% of the correlations were significant (i.e., 22 of the 45 correlations, or 46.67%, were significant at .05 alpha level), which provided an adequate basis for proceeding to an empirical examination of EFA (Hair et al., 2006). Second, we checked assumptions of factor analysis using Bartlett's test of sphericity and measure of sampling adequacy (MSA). Bartlett's test for the initial EFA was significant at $p<.01$ and Kaiser-Meyer-Olkin (KMO) MSA was .682. The significant Bartlett's test and the value of KMO (that is, above .50) indicated that the data did not produce an identity matrix and was thus acceptable for factor analysis.

EFA was first run using Oblique rotation method to allow correlated factors. EFA produced two factors with eigenvalue greater than 1.0. The amount of variance accounted for by these two factors was 53.94%. The scree-plot test also suggested two factors to be extracted, since two

factors appeared before the steep slope of the curve began to straighten out. We examined factor loadings and communality of each item to determine if an item significantly loaded to a factor and thus should be retained, or else it should be removed from the scale. Factor loading above .40 and communality greater than .50 became the threshold for statistical significance, as suggested by Hair et al. (2006). Based on these cut-off values, item CO3 (communality = .078) and CO1 (communality = .065) were deleted one by one, and then EFA was rerun after each deletion. We also decided to select the orthogonal matrix (VARIMAX) to run EFA because the off-diagonal correlations in the Component Correlation Matrix from Oblique rotation were less than .30, indicating very low correlation between factors (Hair et al., 2006).

KMO of the final iteration was .763 and Bartlett's test was significant at $p<.01$. The two factors with eigenvalue above 1.0 explained 66.38% of the variance in the data. We decided to retain item AB4 (that is, "we anticipate cost reduction"), even though its communality was .414 or less than .50, because of two reasons: (1) its factor loading was relatively high (.578); and (2) we deemed that this item represented an important aspect of pursuing integration among supply chain partners, or, in other words, provided an important theoretical justification for inclusion.

We also assessed the reliability of the construct using Cronbach's alpha. The alpha value for the first dimension of internal driver construct (that is, anticipation of benefits) was .714, whereas the second dimension (that is, customer orientation) was .751. Both values exceeded the required threshold of .60 for a new scale, as suggested by Nunnally (1978). SPSS output recommended deleting item AB4 to improve alpha value of the scale from .714 to .740, however, as argued previously, we kept the item and decided to test its contribution to the construct using confirmatory factor analysis (CFA) with full-scale data. Factor loadings for each item, along with the reliability for each factor or dimension, are presented in Table 4.

Table 4

Factor Loadings (Exploratory Factor Analysis) for Internal Drivers Scale

	Component	
	1	**2**
AB1 - We expect to improve speed of response.		0.819
AB2 - We seek to improve our service/support.		0.827
AB3 - We seek to improve reliability and delivery.		0.816
AB4 - We anticipate cost reduction.		0.578
AB5 - We expect to maximize our performance		0.845
CO1 - We have routine or regular measures of customer service.	*deleted*	
CO2 - Our organization actively seeks ways to improve the primary product/service in order to achieve greater satisfaction.	0.716	
CO3 - We are more customer-focused than our competitors.	*deleted*	
CO4 - I believe this business exists primarily to serve customers.	0.825	
CO5 - We follow up with customers for quality/service feedback.	0.848	
Cronbach's alpha	0.751	0.714

CHAPTER 4

RESULTS

A two-step testing (Anderson and Gerbing, 1988) was employed for the full-scale survey data by assessing the instrument and evaluating the theoretical model. The descriptions and the results of each step are detailed below.

Assessment of the Measurement

After data was collected, the data was used to test for the reliability and the validity of the instruments. Before evaluating the measurement, we examined the data for normality and multicollinearity issues. A check of normality using skewness and kurtosis statistics revealed that all variables (or items) had values of skewness and kurtosis that were close to zero (Keppel and Wickens, 2004) or at least within ±1 (Noar, 2003), except for AB1-AB5. However, their skewness and kurtosis statistics were still within -1.5 to +1.5; moreover, following a suggestion by Keppel and Wickens (2004) and Hair et al. (2006), a close examination of the Histogram for each item showed that the data approximately followed a normal distribution. Therefore, based on these observations, we concluded that the data did not violate the normality assumption.

We performed a test of multicollinearity by identifying two collinearity statistics: Tolerance and VIF (Variance-Inflation Factor) that assessed multicollinearity among the independent variables. Tolerance values below .20 and VIF values above 4.0 indicate a multicollinearity problem (Hair et al., 2006), while other scholars suggested 10.0 as the maximum cutoff value for VIF (Neter et al., 1996). The results of the current test showed that all Tolerance values were above .20 (ranged from .211 to .750) and all VIF values were below 4.0 (ranged from 1.173 to 3.911), with the exception of two items: SCI14 and SCI15, which showed a slightly higher VIF statistic (5.196 and 4.735, respectively). We resolved this multicollinearity

issue by correlating the measurement errors of the two items when we performed confirmatory factor analysis and structural equation modeling (Byrne, 1998; Schumacker and Lomax, 2010).

Non-Response Bias and Common Method Bias Analyses

As mentioned previously, the response rate was 34.15%, and even though this percentage represented a good response rate in the OM literature (Malhotra and Grover, 1998), there was a larger portion of the population that did not respond. Therefore, the sample data was tested for non-response bias by comparing the responses of early and late waves (Armstrong and Overton, 1977).

The data was split into two groups based on the time we received the completed survey, specifically, whether it was received during 2011 (that is, mid-October – end of December, n_1 = 89) or during 2012 (that is, beginning of January – end of February, n_2 = 134). The results of independent *t*-test, as presented in Table 5, showed that the early and late responses were not significantly different for all constructs, as well as for two demographic characteristics, except for Technology Uncertainty (TU) and Firm Age. A closer examination of the raw data revealed two issues that might explain the significant difference of Firm Age: (1) the early responses were skewed negatively towards older firms (specifically, 80% of the total participating firms have been established for 15 years or more), whereas, the late responses relatively followed a normal distribution, and (2) the item to measure Firm Age was added late, after 32 early responses, causing 32 missing Firm-Age data points for the early wave. After we realized that the item had not been included, we revised the questionnaire and collected data using the revised version. We still kept these 32 early responses and included them in the subsequent analyses because the rest of the survey questions were completed properly.

Nevertheless, from the available data, it seemed that the early responses, which were older firms in majority (mean = 4.16 out of 5) viewed that the level of technology obsolescence (TU) adopted by firms was relatively small (mean = 2.78 on a 5-point Likert scale).

Table 5

Non-Response Bias Analysis

Variable	Mean		Std. Dev.		Std. Error		*p*
	n_1	n_2	n_1	n_2	n_1	n_2	
SU	2.4078	2.4981	0.84	1.01	0.09	0.09	0.4916
DU	2.9157	2.8960	0.80	0.95	0.08	0.09	0.8729
TU	2.7781	3.0243	0.82	0.91	0.09	0.08	0.0408*
AB	4.4767	4.3644	0.53	0.72	0.06	0.06	0.2175
CO	4.2671	4.2902	0.55	0.73	0.06	0.07	0.8032
SCI1	3.7070	3.7919	0.73	0.77	0.08	0.07	0.4229
SCI2	3.5884	3.6952	0.66	0.76	0.07	0.07	0.2905
SCI3	3.5997	3.6816	0.82	0.81	0.09	0.07	0.4721
OP	4.0751	4.1019	0.66	0.65	0.07	0.06	0.7691
BP	3.7640	3.8992	0.69	0.78	0.07	0.07	0.1946
Firm Size	3.2584	3.0800	1.59	1.66	0.12	0.11	0.2660
Firm Age[a]	4.1615	3.4480	0.97	1.23	0.09	0.08	0.000**

Note: n_1 (early wave) = 89, n_2 (late wave) = 134

[a] n_1 = 57, n_2 = 134

* Significant at $p<.05$; ** Significant at $p<.01$

Legend:
SU = Supply uncertainty; DU = Demand uncertainty, TU = Technology uncertainty;
AB = Anticipation of benefits; CO = Customer orientation; OP = Operational performance;
BP = Business performance; CI = Customer integration; SI = Supplier integration;
II = Internal integration.

Furthermore, in an attempt to reduce common method bias, we designed the study so that separate informants would evaluate different constructs. Nevertheless, we performed Harman's single factor test (Podsakoff et al., 2003) to validate the aforementioned argument. We conducted exploratory factor analysis (EFA) for all items and the results revealed 11 underlying factors with eigenvalue greater than 1.0. These factors explained 70.85% of the variance in the data. The

first factor accounted for 23.89%, which was not a major factor explaining the variance (Podsakoff et al., 2003). We also checked the possibility of common method bias using confirmatory factor analysis (CFA) with one factor for all items (Byrne, 1998; Hu and Bentler, 1999). The goodness-of-fit indices were as follows: chi-square or $\chi^2_{(1034)} = 5102.15$, comparative fit index or CFI = .77, goodness of fit index or GFI = .43, normed fit index or NFI = .73, non-normed fit index or NNFI = .76, and root mean square error of approximation or RMSEA = .160. As the EFA results did not produce one factor, while the CFA results showed a poor fit, we assumed that common method variance was not a problem in this study.

Content Validity

C*ontent validity* refers to the degree to which a scale logically appears to measure the intended construct. It is a qualitative process, which involves judgment (Chen and Paulraj, 2004). High content validity usually is achieved if the scale is developed using rich literature review, as well as using expert opinion. To develop the new scale for this study, we examined operations management, marketing, and strategy literatures to ensure the inclusion of all-encompassing indicators measuring firms' motivation to pursue supply chain integration. A number of academic scholars and practitioners participated in generating these indicators, as well as in judging these indicators' relative importance as firms' internal drivers. For the scales that were adopted from the literature and had been widely used, the content validity of those scales was assumed to be satisfied. Finally, this study also reassessed each item of the scales to ensure that there was no tautology among the items.

Unidimensionality

Unidimensionality refers to the degree to which the items within a scale measure a single construct. This study employed confirmatory factor analysis (CFA) using LISREL 8.52

(Jöreskog and Sörbom, 1993) to assess the unidimensionality of each scale. Several goodness-of-fit indices were used as parameters, as suggested by scholars in the field of structural equation modeling (e.g., Gerbing and Anderson, 1988; Byrne, 1998, Hu and Bentler, 1999) and as commonly appeared in OM literature (Shah and Goldstein, 2006). Specifically, we used chi-square statistic, normed fit index (NFI), non-normed fit index (NNFI), comparative fit index (CFI), goodness-of-fit index (GFI), and root mean square error of approximation (RMSEA). For a model to show a good fit, it was expected to have a ratio of chi-square to degree of freedom less than 3.0 (Noar, 2003), fit indices above the .90 thresholds, and error measurement (such as, RMSEA) less than .08 (Byrne, 1998; Hu and Bentler, 1999; Hair et al., 2006).

We first performed CFA for all scales, which include 10 constructs (that is, supply uncertainty [SU], demand uncertainty [DU], technology uncertainty [TU], anticipation of benefits [AB], customer orientation [CO], customer integration [CI], supplier integration [SI], internal integration [II], operational performance [OP], and business performance [BP]). The goodness-of-fit indices are presented in Table 6. The statistics indicated that all scales were unidimensional, as the goodness-of-fit indices were above .90 and RMSEA was less than .08 (Gerbing and Anderson, 1988). In the case of supply chain integration (SCI) scale, the GFI statistic was .868 (slightly below the cutoff value); however, we considered that this scale still showed a good fit for two reasons: (1) other statistics, including χ^2/df ratio, CFI, NFI, NNFI, and RMSEA, indicated a good fit; and (2) GFI measurement was influenced by sample size (Hu and Bentler, 1999), and thus for a relatively small sample size (that is, sample size ≤ 250), its computed statistic could underestimate the true value (Bollen, 1990). Bollen advised computing adjusted GFI to overcome this underestimation issue. Based on Bollen (1990), we computed the adjusted GFI, which resulted in a value of .9606.

Table 6

Measurement Test: Goodness-of-Fit Indices for All Constructs

Construct	χ^2	df	χ^2/df	CFI	GFI	NFI	NNFI	RMSEA
External Drivers								
Supply uncertainty (SU)	74.74	40	1.87	0.975	0.942	0.947	0.965	0.063
Demand uncertainty (DU)								
Technology uncertainty (TU)								
Internal Drivers								
Anticipation of benefits (AB)	37.75	17	2.22	0.985	0.959	0.975	0.976	0.074
Customer orientation (CO)								
Supply Chain Integration								
Customer integration (CI)	305.15	127	2.40	0.978	0.868	0.964	0.973	0.079
Supplier integration (SI)								
Internal integration (II)								
Performance								
Operational performance (OP)	67.53	30	2.25	0.981	0.943	0.963	0.971	0.075
Business performance (BP)								

Reliability and Validity

Reliability refers to the degree to which a scale is free from error, and thus yields consistent results. We used Cronbach's alpha for examining the reliability of the scales in the pilot study, with a cutoff value of 0.6 for the new measure and a value of 0.7 for a measure that has been previously tested (Nunnally, 1978). For the full-scale survey data, we used two measures of reliability, as suggested by Bagozzi and Yi (1988), that is, Cronbach's alpha and composite reliability. The composite reliability was assessed, in conjunction with Cronbach's alpha, to address several issues: (1) Cronbach's alpha does not accurately predict the reliability of multidimensional measure, unless the measure is unidimensional (Raykov, 1998); and (2) Cronbach's alpha does not allow measurement errors to be correlated (Bollen, 1989). Nevertheless, we still provided Cronbach's alpha as this statistic is more commonly used in the literature. Cronbach's alpha and composite reliability for all constructs are presented in Table 7

and Table 8. All of the values exceeded the threshold of .70, indicating good reliability. We presented customer integration, supplier integration, and internal integration constructs in a separate table as these three constructs were conceptualized as underlying dimensions of another latent variable, namely, supply chain integration. A test of second-order construct was performed and the results of this test are discussed in the next section.

Convergent validity refers to the correlation between different items measuring the same construct. All indicators or items representing one construct were deemed to be convergent if the *t*-value was greater than 1.69 ($p<.05$), while the loading of each indicator was greater than .50 (Anderson and Gerbing, 1988). Two items were deleted one by one during CFA (specifically, SU3 and DU1), due to poor loading (that is, .27 and .30, respectively). After each deletion, CFA was rerun with the remaining items. From Table 7 and Table 8, we can also see that all *t*-values were greater than the thresholds. Some of the factor loadings, however, were slightly below .50 cutoff value, specifically, DU4 (loading = .49), TU2 (loading = .47), OP1 (loading = .46), and OP2 (loading = .49). However, we still kept these items because they were considered important to measure the respective construct (Chen and Paulraj, 2004; Flynn et al., 2010). Additionally, other statistics, such as goodness of fit indices, Cronbach's alpha, composite reliability, and *t*-value, were all satisfactory, and thus we concluded that all scales had good convergent validity.

Table 7

Item Loading, t-value, and Construct Reliability (N=223)

Construct	Items	Loading	t-value	Composite reliability	Cronbach's alpha
Supply uncertainty (SU)	SU1	0.86	15.12	0.87	0.86
	SU2	0.92	16.55		
	SU3	-- *deleted* --			
	SU4	0.69	11.36		
Demand uncertainty (DU)	DU1	-- *deleted* --		0.77	0.76
	DU2	0.73	11.37		
	DU3	0.84	13.44		
	DU4	0.49	7.05		
	DU5	0.63	9.53		
Technology uncertainty (TU)	TU1	0.69	10.43	0.78	0.81
	TU2	0.47	6.61		
	TU3	0.75	11.52		
	TU4	0.82	12.74		
Anticipation of benefits (AB)	AB1	0.81	12.97	0.88	0.89
	AB2	0.91	15.89		
	AB3	0.73	12.20		
	AB4	0.68	11.07		
	AB5	0.74	12.36		
Customer orientation (CO)	CO2	0.81	13.52	0.84	0.84
	CO4	0.89	15.32		
	CO5	0.70	11.34		
Operational performance (OP)	OP1	0.46	6.24	0.83	0.85
	OP2	0.49	6.61		
	OP3	0.61	8.70		
	OP4	0.74	11.00		
	OP5	0.85	13.47		
	OP6	0.79	12.14		
Business performance (BP)	BP1	0.84	13.32	0.89	0.90
	BP2	0.85	13.56		
	BP3	0.81	12.55		
	BP4	0.75	11.36		

Table 8

Item Loading, t-value, and Construct Reliability for Supply Chain Integration (Second-Order Construct) (N=223)

1st-order construct	Items	Loading	t-value	Composite reliability	Cronbach's alpha
Customer Integration (CI)	SCI1	0.70	11.38	0.88	0.88
	SCI2	0.74	12.36		
	SCI3	0.85	15.11		
	SCI4	0.81	14.01		
	SCI5	0.76	12.73		
Supplier Integration (SI)	SCI6	0.78	13.30	0.88	0.88
	SCI7	0.75	12.69		
	SCI8	0.79	13.75		
	SCI9	0.81	14.22		
	SCI10	0.75	12.61		
Internal Integration (II)	SCI11	0.88	16.35	0.93	0.93
	SCI12	0.86	15.74		
	SCI13	0.86	15.89		
	SCI14	0.82	14.59		
	SCI15	0.78	13.52		
	SCI16	0.73	12.23		
	SCI17	0.65	10.82		
	SCI18	0.66	10.84		
2nd-order construct	**Items**	**Loading**	**t-value**	**Composite reliability**	**Cronbach's alpha**
Supply Chain Integration (SCI)	CI	0.83	9.54	0.88	0.84
	SI	0.91	11.42		
	II	0.79	11.35		

The final purpose of conducting CFA was to assess *discriminant validity*, which refers to the uniqueness of the construct, or to what extent items of a construct measure the intended construct and not other constructs. We assessed discriminant validity using chi-squared difference tests (Bagozzi et al., 1991; Raykov and Marcoulides, 2000). Specifically, we compared the χ^2 of a constrained model, which fixed the correlation between two constructs to 1.0, and the χ^2 of an unconstrained model, which allowed the correlation between two constructs to be freely estimated. The χ^2 difference was then compared against a critical value (that is,

$\chi^2_{(1)} = 6.64$ at $p<.01$). All χ^2 differences were significant, as shown in Table 9, indicating good discriminant validity of the scales.

Table 9

Discriminant Validity Analysis

Variable	SU	DU	TU	AB	CO	CI	SI	II	OP
SU									
DU	34.60**								
TU	39.14**	43.10**							
AB	70.43**	73.10**	63.87**						
CO	62.25**	60.35**	56.68**	43.45**					
CI	69.00**	74.72**	59.03**	44.51**	30.90**				
SI	64.16**	63.28**	50.65**	36.87**	20.49**	26.29**			
II	57.28**	69.67**	45.10**	31.25**	17.74**	21.46**	18.02**		
OP	299.51**	112.10**	82.78**	62.08**	62.90**	57.87**	60.46**	48.22**	
BP	56.54**	71.80**	44.97**	46.99**	62.13**	50.80**	50.28**	42.33**	48.05**

Note: Chi-square difference is reported ($N = 223$)
Legend:
SU = Supply uncertainty; DU = Demand uncertainty, TU = Technology uncertainty; AB = Anticipation of benefits; CO = Customer orientation; OP = Operational performance; BP = Business performance; CI = Customer integration; SI = Supplier integration; II = Internal integration.
** significant at $p< 0.01$

Second-Order Construct Analysis for SCI

As discussed previously in the literature review, SCM scholars had argued that supply chain integration (SCI) has three underlying dimensions: customer integration, supplier integration, and internal integration (Campbell and Sankaran, 2005; Flynn et al., 2010; Narasimhan and Kim, 2002; Zhao et al., 2011). However, there was still no consensus on how to operationalize this construct. Rosenzweig (2003) and Vickery et al. (2003) assumed SCI as unidimensional and used a few indicators (specifically, 4 and 3 items, respectively) to measure SCI. A good number of studies recognized the aforementioned SCI dimensions as separate constructs, and further used each dimension to directly predict a dependent variable (such as, firm performance) (Campbell and Sankaran, 2005; Flynn et al., 2010; Narasimhan and Kim, 2002). We argued that, as the SCI

construct had been acknowledged to consist of three dimensions, we should take into account the likelihood that the three dimensions were related to one another and altogether they represented a higher order factor. In this case, the three dimensions (that is, customer integration, supplier integration, and internal integration) were conceptualized as first-order factors explained by another latent variable, which was the SCI construct.

In the current study, we performed a test comparing different SCI models to select the best model representing the supply chain integration construct. Following a procedure by Noar (2003) and Chen et al. (2005), we conducted CFA using LISREL 8.52 (Jöreskog and Sörbom, 1993) to check on four models and compared their goodness-of-fit indices. Each model is briefly described below. We also included a *null model*, or independence model, which served as a baseline for comparisons (Noar, 2003).

The first model (Model 1) was a *one-factor* model, which considered all indicators as measuring one overall factor, as opposed to three factors. According to Noar (2003), support for this model would indicate that there was no differentiation between the three factors and that SCI was a unidimensional construct.

The second model (Model 2) was an *uncorrelated factors* model, in which all indicators were linked to their respective factors, while correlations among the three factors were set to zero. If this model were supported, it would mean that SCI was a multidimensional construct that comprised of three orthogonal dimensions.

The third model (Model 3) was a *correlated factors* model, which was similar to Model 2, except that we allowed the correlations among factors to be freely estimated. If this model were supported, similar to Model 2, it would suggest that SCI was a multidimensional construct; however, the three dimensions were expected to be interrelated with one another.

The final model (Model 4) was a *hierarchical* model, or a *second-order factor* model. We assumed that the three factors were correlated and they also represented a higher-order latent variable. Support for this model would indicate that SCI was a second-order construct encompassing three different, yet correlated, dimensions.

The CFA results for all models are presented in Table 10. Model 1 and Model 2 showed a poor fit (that is, ratio of χ^2/df was greater than 3.0; goodness-of-fit indices were less than .90; while RMSEA was greater than .08). Model 3 and Model 4 fit the data well, or better than the other models (χ^2/df = 2.4; CFI = .978; GFI = .868; NFI = .964; NNFI = .973; and RMSEA = .079). Even though all statistics for Model 3 were identical with those for Model 4 (due to having an equal number of estimated parameters), based on "the principle of parsimony" (Noar, 2003; p. 634), we decided to use Model 4 or the hierarchical model to represent the SCI construct. The final model is depicted in Figure 4.

Table 10

Confirmatory Factor Analysis for Supply Chain Integration Scale

Models	χ^2	**df**	**Fit indices**				
			χ^2**/df Ratio**	**CFI**	**GFI**	**NFI**	**RMSEA**
Null	8623.29	153	56.36	-	-	-	-
1 - One factor	1355.45	135	10.04	0.893	0.596	0.879	0.202
2 - Uncorrelated factors	970.28	130	7.46	0.930	0.670	0.920	0.171
3 - Correlated factors	305.15	127	2.40	0.978	0.868	0.964	0.079
4 - Hierarchical	305.15	127	2.40	0.978	0.868	0.964	0.079

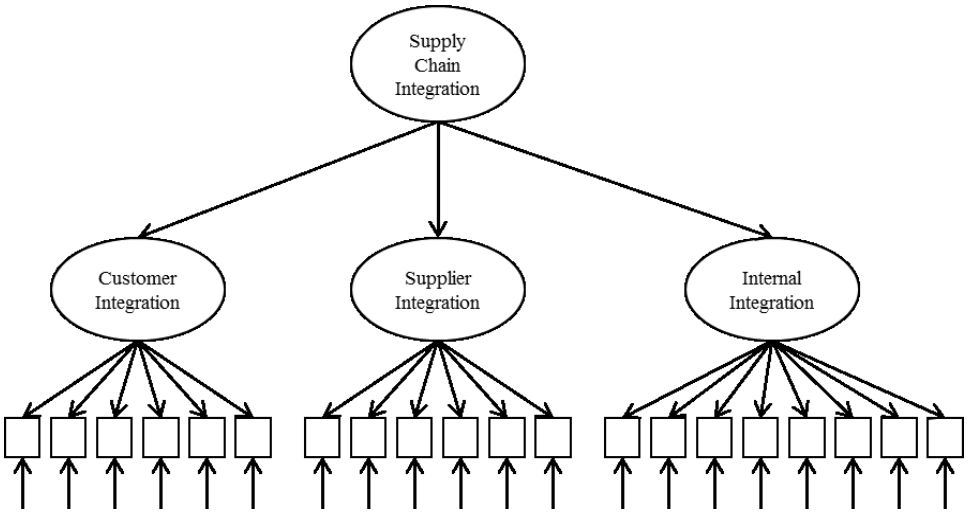

Figure 4. Supply Chain Integration as a Second-Oder Construct

Hypotheses Testing

For the hypotheses testing, this study used structural equation modeling (SEM) as opposed to other techniques, such as multiple regression analysis. SEM is an appropriate statistical analysis to test complex relationships between multiple independent and dependent variables, whereas multiple regression would be appropriate to test the relationships between multiple independent variables and one dependent variable (Hair et al., 2006). SEM could be used to test a measurement model with latent and observed variables, as well as analyze a structural model while accounting for measurement error (Byrne, 1998; Schumacker and Lomax, 2010). In the OM literature, the use of SEM has been growing extensively as more scholars consider SEM as an appropriate tool in examining and testing the relationships among OM-related constructs (Shah and Goldstein, 2006).

The Extent of Supply Chain Integration (SCI)

The descriptive statistics and correlations among constructs are presented in Table 11. In order to address the first research question, which asked the extent of supply chain integration

within the context of this study, we plotted the mean of each SCI dimension, that is, customer integration, supplier integration, and internal integration. As depicted in Figure 5, the degree of customer integration was relatively higher than the degree of supplier integration and internal integration. This result indicated that Indonesian manufacturing firms, as represented by firms that participated in this study, collaborate more closely with their key customers than with their key suppliers.

Table 11

Descriptive Statistics and Correlation Matrix

Var.	SIZE	AGE	SU	DU	TU	AB	CO	CI	SI	II	OP	BP
AGE	.348**											
SU	-.186**	-.158*										
DU	-.137*	-0.102	.392**									
TU	0.063	-0.035	.241**	.309**								
AB	-0.03	.158*	-0.112	-0.105	-0.061							
CO	-0.026	.136*	-0.02	-0.006	0.017	.484**						
CI	0.056	.162*	-0.074	-0.077	0.029	.354**	.536**					
SI	0.089	0.114	-0.048	-0.012	0.040	.442**	.597**	.665**				
II	.206**	.248**	-0.055	-0.114	0.000	.396**	.564**	.607**	.653**			
OP	.159*	.263**	-.238**	-0.076	0.013	.178**	0.049	.204**	.133*	.170*		
BP	0.081	.147*	-0.004	-.150*	0.039	.229**	0.053	.240**	.173*	.167*	.482**	
Mean	2.305	3.749	2.404	2.892	2.926	4.403	4.274	3.720	3.627	3.584	3.963	3.820
Dev.	0.814	1.193	0.931	0.878	0.881	0.595	0.664	0.762	0.718	0.840	0.601	0.714

Note: $N = 223$
** significant at $p < 0.01$ * significant at $p < 0.05$
Legend:
SIZE = Firm size; AGE = Firm age; SU = Supply uncertainty; DU = Demand uncertainty, TU = Technology uncertainty; AB = Anticipation of benefits; CO = Customer orientation; CI = Customer integration; SI = Supplier integration; II = Internal integration; OP = Operational performance; BP = Business performance

We compared our results in relation to the extent of SCI with Wong et al. (2010)'s study, which examined 151 manufacturing firms in Thailand. Figure 5 displays the extent of customer integration, supplier integration, and internal integration from Wong et al.'s study, which showed that, overall, the degree of SCI practiced in Thailand was slightly higher than that in Indonesia.

The next graph, Figure 6, compares the extent of supply chain integration from several studies, including the current study and Wong et al.'s (2010) study, on a 7-point axis.

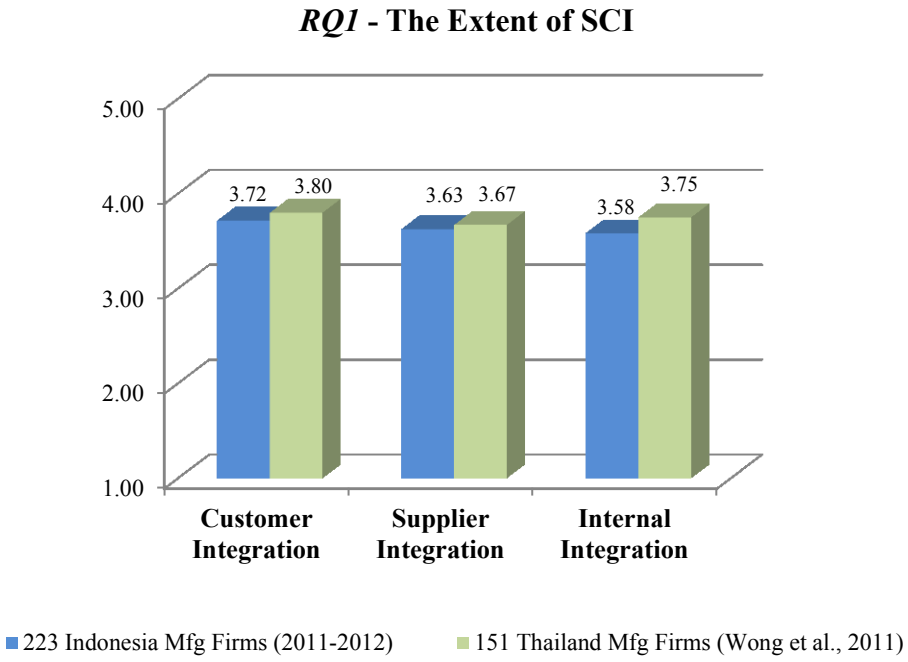

Figure 5. The Extent of Supply Chain Integration

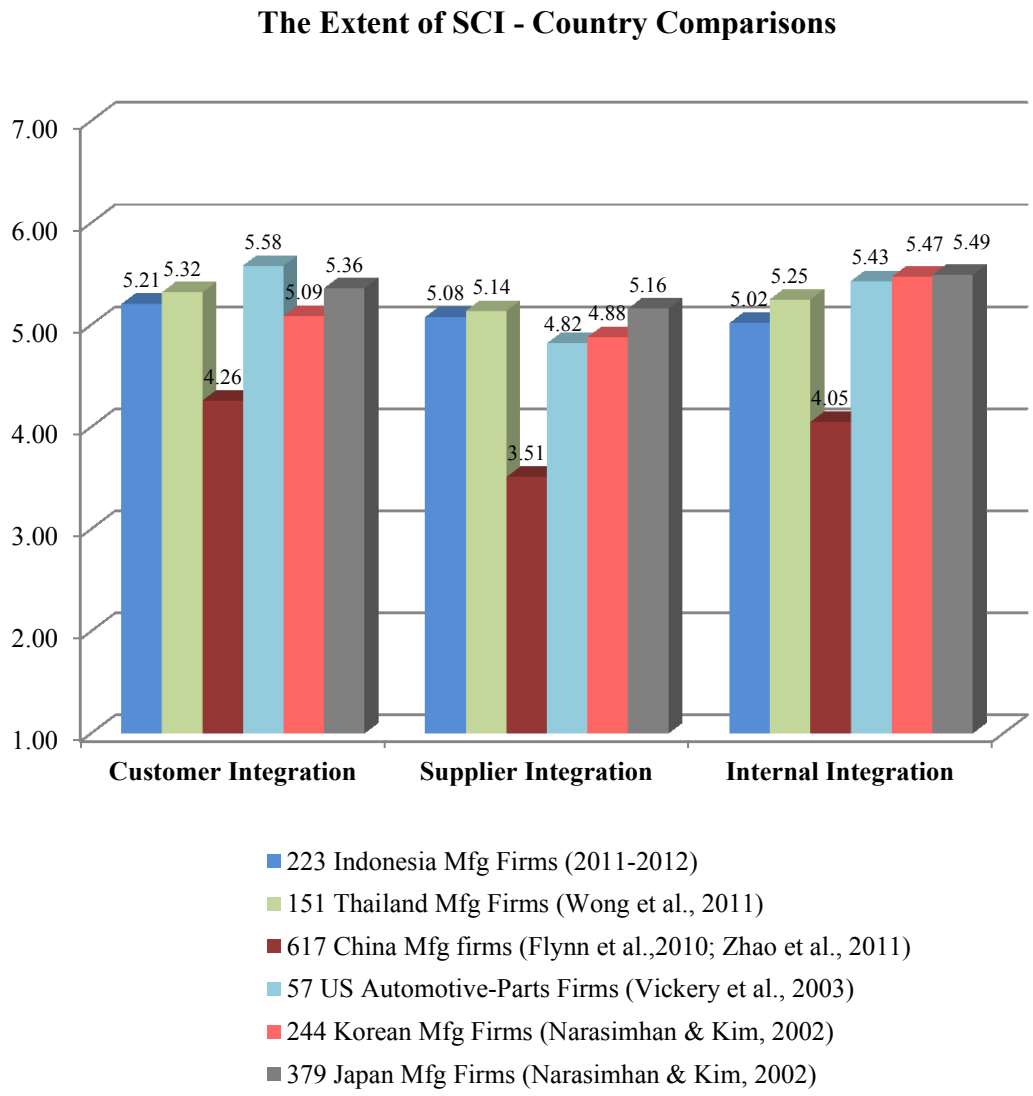

Figure 6. The Extent of Supply Chain Integration Across Countries

Hypotheses Testing Related to SCI, Firm Performance, and Firms' Drivers

The hypothesized research model was pictured in Figure 2 in Chapter 2. A higher degree of supply chain integration was hypothesized to improve firms' operational and business performances. Five drivers (that is, supply uncertainty, demand uncertainty, technology uncertainty, anticipation of benefits, and customer orientation) were conjectured to trigger firms' integration with their supply chain partners. We performed hypotheses testing using LISREL

8.52 (Jöreskog and Sörbom, 1993). The full model showed a good fit ($\chi^2_{(487)} = 678.49$; $\chi^2/df = 1.39$; CFI = .97; NFI = .90; GFI = .85; NNFI = .96; RMSEA = .042). Two control variables were added to the full model, namely, firm size and firm age, as they were measured using a continuous scale. We did not assess the effect of industry type at this point because the final data was gathered from 24 different manufacturing-related industries. Several industries were only represented by 1-3 firms, and hence could distort the industry-effect analysis.

The results showed that firm size was significantly related to supply chain integration at $p<.05$ (t-value = 2.14), whereas firm age was not. This significant and positive relationship between firm size and supply chain integration suggested that the larger the firm size, the higher the degree of integration a focal firm pursues with their supply chain partners.

The first set of main hypotheses proposed that the degree of supply chain integration (SCI) would have a positive influence on firm performances, specifically, operational performance and business performance. The results showed that SCI was positively and significantly related to operational performance (t-values = 2.24, $p<.05$) and to business performance (t-values = 2.83, $p<.01$), providing support for H1a and H1b. However, SCI only explained 3.4% of the variability of operational performance and explained 3.8% of the variability of business performance. The major proportion of the variations in firm performance is due to other factors beyond the scope of this study.

The second set of main hypotheses argued that external drivers would be positively related to the degree of SCI. The results, however, showed that there was not enough evidence for the significant relationships between the three dimensions of external drivers and supply chain integration. Specifically, supply uncertainty (SU), demand uncertainty (DU), and technology uncertainty (TU) did not significantly influence firms' initiatives to pursue

integration with their supply chain members (*t*-values = -1.56, -0.87 and 1.16, respectively). These results indicated a lack of support for H2a – H2c.

Table 12

Results of the Hypotheses Testing

Path (From-To)	**Standardized parameter estimates (*t*-value)**	**Conclusion**
Supply chain integration -- operational performance	0.18 (2.24)*	H1a supported
Supply chain integration -- business performance	0.19 (2.83)**	H1b supported
Supply uncertainty -- supply chain integration	-0.12 (-1.56)	H2a not supported
Demand uncertainty -- supply chain integration	-0.08 (-0.87)	H2b not supported
Technology uncertainty -- supply chain integration	0.09 (1.16)	H2c not supported
Anticipation of benefits -- supply chain integration	0.05 (0.57)	H3a not supported
Customer orientation -- supply chain integration	0.67 (6.69)**	H3b supported

Note: $N = 223$
Fit indices: $\chi^2_{(487)} = 678.49$, $\chi^2/df = 1.39$, CFI = .97, NFI = .90, GFI = .85, NNFI = .96, RMSEA = .042
* significant at $p<.05$ ** significant at $p<.01$

The final set of main hypotheses that was related to antecedents of SCI was anticipation of benefits (AB) and customer orientation (CO). These two drivers were proposed to positively influence the degree of SCI. The analysis revealed that, out of the two dimensions of internal drivers, only CO was significantly related to supply chain integration at $p<.01$ (*t*-value = 6.69), supporting H3b, whereas AB was not significantly related to SCI at $p<.05$ (*t*-value = 0.57), not supporting H3a. In total, all antecedents in combination were able to explain 59.0% of the variance in SCI. These results are shown in Table 12 and depicted in Figure 7.

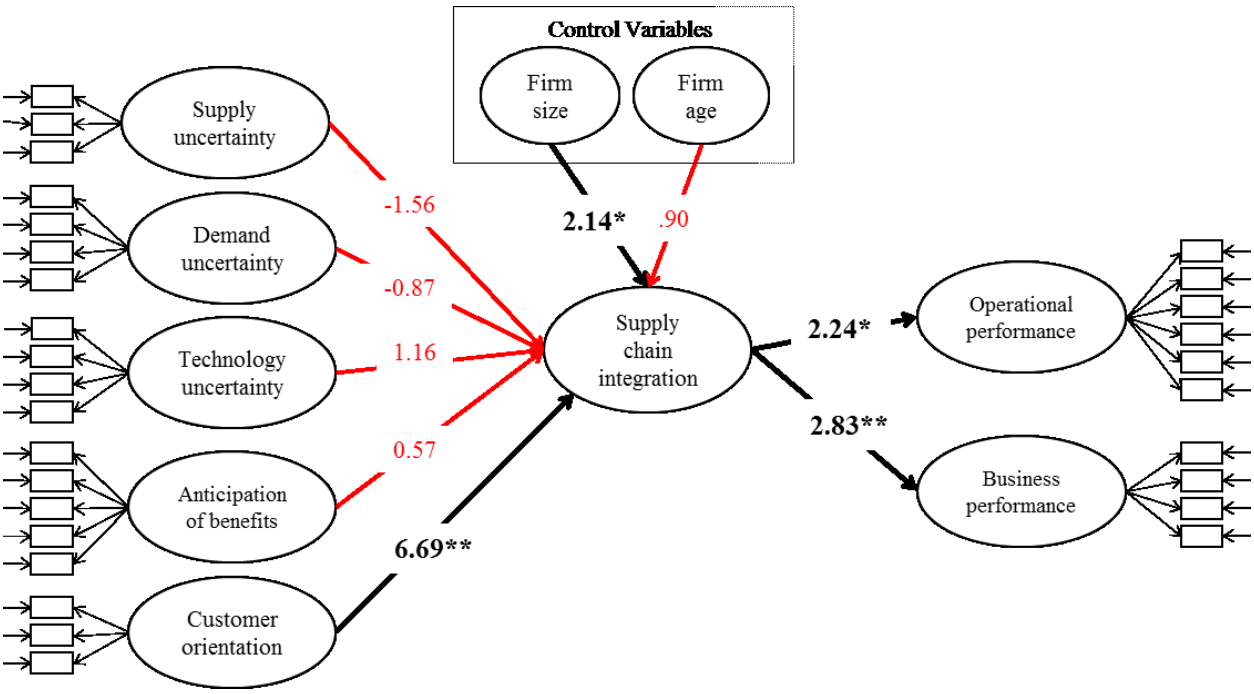

Figure 7. Results of the Hypotheses Testing (*t*-values are reported)

Hypotheses Testing Related to Moderating Variables

This study further investigated whether the same theoretical relationships would still apply in different firms' internal environments. Specifically, we tested whether all drivers of SCI would be significantly pertinent to firms with different levels of flexibility orientation, as well as to firms with different levels of external focus. We performed model-invariance test (Byrne, 1998; Schumacker and Lomax, 2010) using LISREL 8.52 to test the moderating relationships.

We split the data into two groups at a time, that is, firms with low flexibility orientation and firms with high flexibility orientation, based on the median of the data (Byrne, 1998; Schumacker and Lomax, 2010). Based on these criteria, those firms that scored less than 4 out of 7 points on the control-flexibility scale became the low flexibility group (n_1 = 115), while those firms that scored 4 or more became the high flexibility group (n_2 = 108). To test the hypotheses related to the moderating influence of organizational culture, we compared the chi-square

statistic of a constrained model (in which all estimated parameters of the two groups were fixed to be equal) with an unconstrained model or baseline model (in which all parameters of the two groups were allowed to be freely estimated). The results showed that the chi-square difference of the two models was not significant at $p<.05$ critical value ($\Delta\chi^2 = 16.06$, df = 21), suggesting that the low-group data and the high-group data separately fit the path model (please refer to Table 13). In order to provide evidence for the moderating hypotheses, we further tested each path that was conjectured to be significantly different between the two groups.

The first set of moderating hypotheses proposed that the positive relationships between external drivers and SCI should be moderated by the firms' flexibility orientation. The chi-square difference of the path between supply uncertainty (SU) and SCI was not significant ($\chi^2_{(1)} = .02$), $p<.05$) suggesting that the level of flexibility orientation did not moderate the relationship between SU and SCI. In other words, there was not enough evidence that firms with higher level of flexibility orientation pursue a higher degree of supply chain integration than those with a lower degree of flexibility orientation. This result did not provide support for H4a.

Hypothesis H4b suggested that firms' flexibility orientation should moderate the positive relationship between demand uncertainty (DU) and SCI. However, the chi-square difference showed an insignificant result ($\chi^2_{(1)} = 0.02$, $p<.05$), and thus did not provide support for H4b.

We performed the same test for the remaining paths between SCI and its antecedents, specifically, technology uncertainty (TU), anticipation of benefits (AB), and customer orientation (CO). The chi-square difference for each path was not significant at $p<.05$ ($\chi^2_{(1)} = 0.81$, 0.04, and 0.19, respectively), lending no support for H4c, H4d, and H4e. These results are detailed in Table 13.

Table 13

Multigroup Test for Low- and High-Flexibility Firms

	χ^2	df	χ^2/df	CFI	RMSEA	$\Delta\chi^2$	Δdf	$\Delta\chi^2$ test
1. Baseline	551.23	420	1.31	0.96	0.053			
2. Constrained	567.29	441	1.29	0.96	0.051	16.06	21	Not significant
3. Paths								
3a. SU - SCI (H4a)	551.25	421	1.31	0.96	0.053	0.02	1	Not significant
3b. DU - SCI (H4b)	551.25	421	1.31	0.96	0.053	0.02	1	Not significant
3c. TU - SCI (H4c)	552.04	421	1.31	0.96	0.053	0.81	1	Not significant
3d. AB - SCI (H4d)	551.27	421	1.31	0.96	0.053	0.04	1	Not significant
3e. CO - SCI (H4e)	551.42	421	1.31	0.96	0.053	0.19	1	Not significant

Note: Critical $\chi^2 = 3.84$ (df = 1) at $p<.05$

n_1 (low-flexibility group) = 115 n_2 (high-flexibility group) = 108

Legend: SU = Supply uncertainty; SCI = Supply chain integration; DU = Demand uncertainty; TU = Technology uncertainty; AB = Anticipation of benefits; CO = Customer orientation

The last set of moderating hypotheses was associated with firms' external focus. It was proposed that firms with a higher external focus would have a higher degree of supply chain integration than their counterparts with a lower external focus. The integration could be triggered by supply uncertainty, demand uncertainty, technology uncertainty, anticipations of benefits, or customer orientation. We performed the same procedure of multi-group analysis for firms with low external focus and high external focus.

The data was split into two groups based on the median of the data (Byrne, 1998; Schumacker and Lomax, 2010). Firms that scored less than 4 out of 7 points on the internal-external focus scale were grouped as low external focus ($n_1 = 105$), whereas the remaining firms (scored 4 or more on the internal-external focus scale) were grouped as high external focus ($n_2 = 118$). We compared the baseline model (or the unconstrained model) with the constrained model for the two groups. The result was not significant at $p<.05$, indicating that there was no difference between the two groups. However, to provide evidence specific for each hypothesis,

we tested each path that linked firms' drivers with SCI by comparing the baseline model and the model in which each tested path was fixed to be equal across groups.

Hypothesis 5a proposed that firms' external focus should moderate the positive relationship between supply uncertainty and SCI. The result showed that the chi-square difference for the path SU – SCI was significant ($\chi^2_{(1)} = 3.98$, $p<.05$), indicating that there was a difference between the two groups; however, the SU – SCI path turned out to be insignificant for both groups, lending no support for H5a.

The next hypothesis, H5b, suggested that firms' external focus should also moderate the positive relationship between demand uncertainty and SCI. However, contrary to what we proposed, the chi-square difference for the DU – SCI path was not significant ($\chi^2_{(1)} = -1.08$, $p<.05$). This evidence provided no support for H5b. A similar conclusion was made for H5c, which proposed that firms with a higher external focus should have a higher degree of SCI, as triggered by technology uncertainty, than those with a lower external focus. The chi-square difference was also not significant ($\chi^2_{(1)} = -0.15$, $p<.05$), which indicated a lack of support for H5c.

The last two moderating hypotheses were related to the paths linking internal drivers and SCI. We argued that firms with a higher external focus should have a higher degree of SCI, as triggered by anticipation of benefits (H5d) and customer orientation (H5e), than their counterparts with a lower external focus. The chi-square difference statistics revealed significant results at $p<.05$ for both paths ($\chi^2_{(1)} = 5.44$ for AB – SCI, and $\chi^2_{(1)} = 3.89$ for CO – SCI), suggesting that there was a difference between the two groups. However, AB was not significantly related to SCI in both groups, which failed to support H5d. On the other hand, CO was significantly related to SCI at $p<.01$ (t-value = 3.73 for the low external group; and t-value = 5.46 for the high external group). Examining this result closely, we could see that the parameter

coefficient for the high external group was greater than that for the low external group (parameter estimates = .82 and .49, respectively), suggesting that high external firms pursued a higher degree of integration than low external firms. This result provided support for H5e. These results are detailed in Table 14. The graphs for low- and high flexibility groups, as well as for low- and high-external focus groups, are depicted below.

Table 14

Multigroup Test for Low- and High-External Focus Firms

	χ2/df	CFI	RMSEA	Δχ2	Δdf	Δχ2 test	Low external focus	High external focus	Hypotheses
1. Baseline	1.25	0.97	0.047						
2. Constrained	1.22	0.97	0.044	13.36	21	Not significant			
3. Paths									
3a. SU - SCI	1.25	0.97	0.048	3.98	1	Significant	.07[a] (.70)[n.s.]	.12 (1.18)[n.s.]	H5a not supported
3b. DU - SCI	1.24	0.97	0.047	1.08	1	Not significant			H5b not supported
3c. TU - SCI	1.24	0.97	0.047	0.15	1	Not significant			H5c not supported
3d. AB - SCI	1.26	0.96	0.048	5.44	1	Significant	.23 (1.90)[n.s.]	.12 (.93)[n.s.]	H5d not supported
3e. CO - SCI	1.25	0.97	0.048	3.89	1	Significant	.49 (3.73)[**]	.82 (5.46)[**]	H5e supported

Note: Critical $\chi^2 = 3.84$ (df = 1) at $p<.05$

n_1 (low-external group) = 105 n_2 (high-external group) = 118

[a] parameter estimate coefficient (*t*-value is in brackets)

[n.s.] not significant; [**] significant at $p<.01$

Legend: SU = Supply uncertainty; SCI = Supply chain integration; DU = Demand uncertainty; TU = Technology uncertainty; AB = Anticipation of benefits; CO = Customer orientation

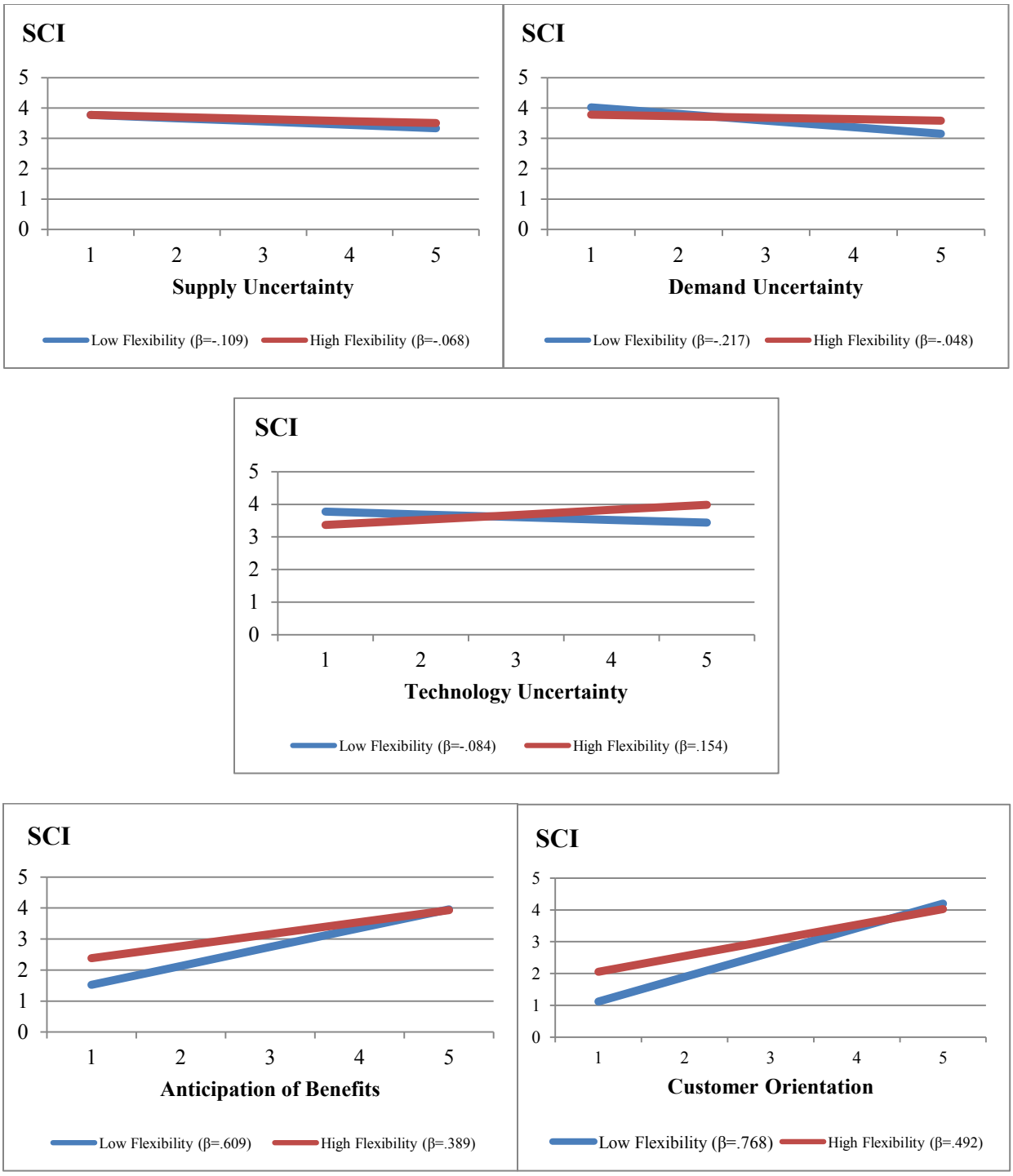

Figure 8. Graphs for Low- and High-Flexibility Groups

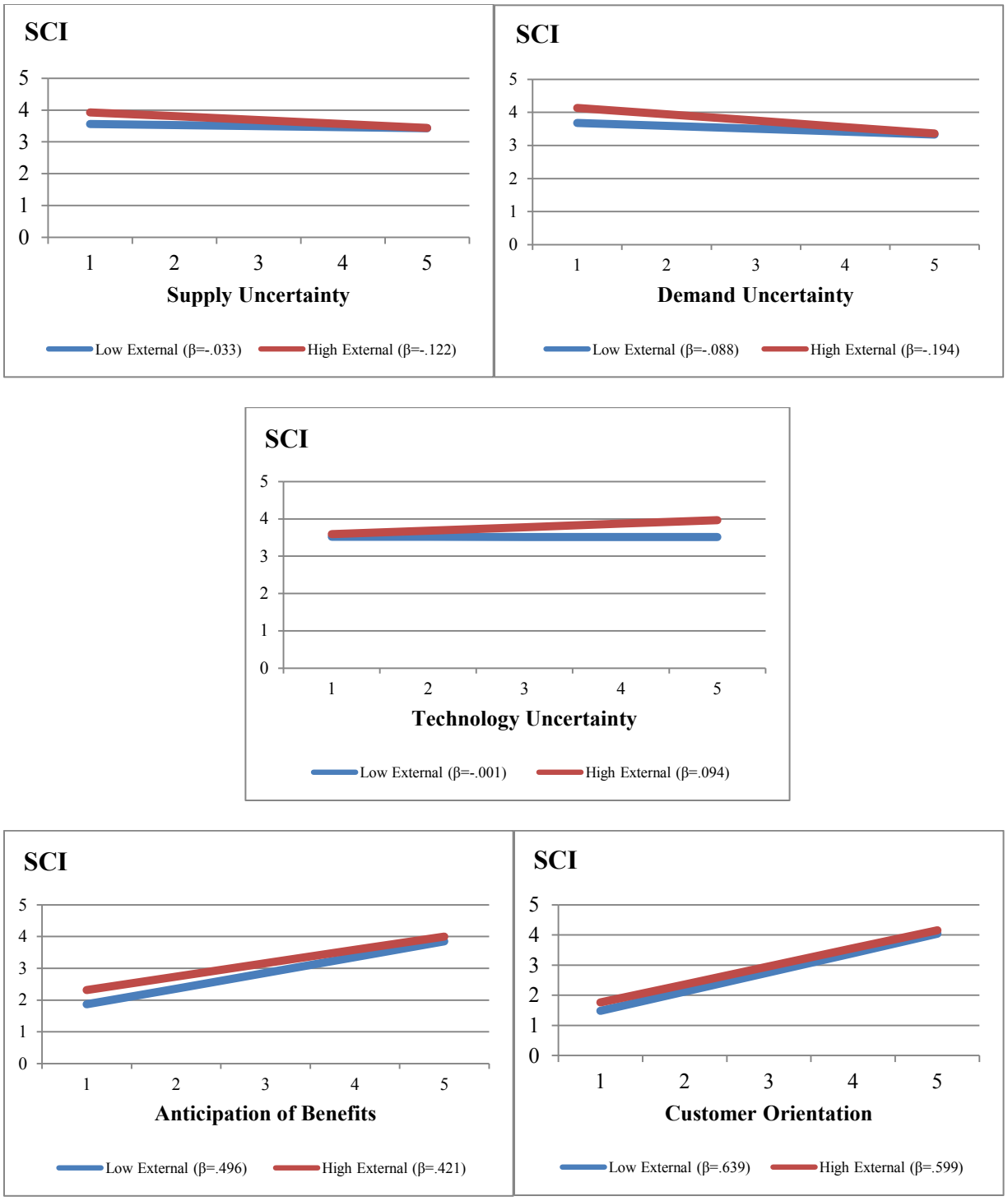

Figure 9. Graphs for Low- and High-External Focus Groups

To gain a better understanding of the results and their implications, we conducted separate analyses to test the influence of each driver on each dimension of supply chain integration. The results will be discussed and presented in the next section.

Follow-Up Analyses

The Impact of External and Internal Drivers on Dimensions of SCI

In order to obtain more insight from these findings, we decided to perform additional analyses to examine the direct influence of external and internal drivers on each dimension of supply chain integration. We employed a separate multiple regression analysis for each dimension of SCI, namely, customer integration, supplier integration, and internal integration. A hierarchical multiple regression with two models was used for this purpose; the first model was to regress the external drivers (SU, DU, and TU) to each dimension, and the second model was to check the direct effect of internal drivers (AB and CO), as well as to check the contribution of adding these latter drivers, on each SCI dimension. Similar to the analyses in the full model, two control variables were included in the first model, namely, firm size and firm age.

The results of the hierarchical regression are shown in Table 15. For customer integration (CI) as the dependent variable, Model 1 is not significant ($F_{(5,216)} = 1.637$, $p<.05$) and there was no predictor (that is, either SU, DU, or TU) that was significantly related to CI. When internal drivers were added, however, the model became significant ($F_{(7,214)} = 10.980$, $p<.01$) and explained an additional 22.8% of the variability of CI. The results showed that customer orientation (CO) significantly predicted CI ($\beta = .446$, $p<.01$), while anticipation of benefits (AB) did not ($\beta = .077$, $p<.05$). These results were consistent with our previous analyses using SCI as the dependent variable.

The second dimension of SCI showed slightly different results. Model 1 of supplier integration (SI) was still insignificant ($F_{(5,216)} = 1.872$, $p<.05$); however, Model 2 was significant ($F_{(7,214)} = 19.192$, $p<.01$) and provided an additional 34.4% in explaining the variability of SI. Both internal drivers (that is, AB and CO) were significant predictors of SI ($\beta = .20$ and $\beta = .476$, respectively, at $p<.01$), suggesting their significant impact on supplier integration.

Table 15

Hierarchical Regression Results for Dimensions of Supply Chain Integration

	Supply Chain Integration Dimensions					
	DV = CI		**DV = SI**		**DV = II**	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
External Drivers						
SU	-0.057	-0.045	-0.021	-0.002	-0.040	-0.026
DU	-0.097	-0.019	0.160*	0.056	0.220**	0.134*
TU	0.045	-0.005	0.108	0.049	0.180**	0.127*
Internal Drivers						
AB		0.077		0.200**		0.122f
CO		0.446**		0.476**		0.453**
Model R^2	0.037	0.264	0.042	0.386	0.135	0.397
Change in R^3		0.228**		0.344**		0.262**
Model F	1.637	10.980**	1.872	19.192**	6.740**	20.130**

Note: N=223 (standardized parameter coefficient is reported)
f significant at $p<.10$ * significant at $p<.05$ ** significant at $p<.01$
Legend: CI = Customer integration; SI = Supplier integration; II = Internal integration; SU = Supply uncertainty; DU = Demand uncertainty; TU = Technology uncertainty; AB = Anticipation of benefits; CO = Customer orientation

Finally, the hierarchical regression analysis was performed for the last dimension, that is, internal integration (II). The results showed that environmental uncertainties, in the form of demand uncertainty and technology uncertainty, significantly influenced II ($\beta = .220$ and $\beta = .180$, respectively, at $p<.01$) and the model was significant ($F_{(5,216)} = 6.740$, $p<.01$). When the two internal drivers were added to the second model, the model provided an additional 26.2% contribution in explaining the variance ($R^2 = .397$, $F_{(7,214)} = 20.130$, $p<.01$). DU and TU still

significantly predicted II (β = .134 and β = .127, respectively, at p<.05), and additionally, AB and CO also significantly influenced II, albeit at different thresholds (β = .122 at p<.10 for AB, and β = .453 at p<.01 for CO). All results are presented in Table 15.

The Effects of Industry Type

We did not include industry type as one of the control variables in previous analyses due to the small number of firms representing each of the 24 different industries; however, we acknowledged that industry type could be a significant contingency factor (Jayaram et al., 2010; Shah and Ward, 2003) and thus could potentially influence the relationships between firms drivers and the degree of SCI. In order to evaluate the effect of industry type, as well as to gain a better understanding of the findings of this study, we performed a separate hierarchical regression analysis for the top three industries with a sizable number of participating firms, that is, food, automotive, and chemical industries (the number of firms were 39, 20, and 16, respectively). The results are presented in Table 16.

For the food and chemical industries, the results were consistent with those of the full model. Specifically, out of the five firm's drivers, only customer orientation was significantly related to the degree of SCI (β = .624 at p<.01 for food industry, and β = .983 at p<.01 for chemical industry). The automotive industry, however, showed slightly different results. Aside from customer orientation, which was also significant (β = .637 at p<.05), supply uncertainty and demand uncertainty also positively influenced the degree of SCI (β = .482 at p<.05 for SU and β = .489 at p<.05 for DU). These results indicated that the automotive industry was more susceptible to environmental uncertainties than food and chemical industries; however, as the sample size was small, these findings should be interpreted cautiously.

Figure 8 further compares the extent of SCI –as represented by each SCI dimension– implemented by food, automotive, and chemical industries. The implication of the overall findings will be discussed in the next chapter.

Table 16

Hierarchical Regression Results for Food, Automotive, and Chemical Industries

DV = SCI	**Food** (*n*=39)		**Automotive** (*n*=20)		**Chemicals** (*n*=16)	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
External drivers						
SU	0.104	0.017	-0.332	0.482*	-0.286	0.062
DU	-0.038	-0.047	0.479*	0.489*	-0.031	-0.426
TU	0.090	0.021	0.134	0.289	-0.486	-0.157
Internal drivers						
AB		0.164		-0.315		-0.432
CO		0.624**		0.637*		0.983**
Model R^2	0.025	0.554	0.301	0.562	0.279	0.775
Change in R^2		0.529**		0.261*		0.496**
Model *F*	0.288	7.956**	2.297	3.590*	1.548	6.892**

Standardized parameter coefficient is reported.
* significant at $p<.05$ ** significant at $p<.01$
Legend: SU = Supply uncertainty; DU = Demand uncertainty, TU = Technology uncertainty; AB = Anticipation of benefits; CO = Customer orientation

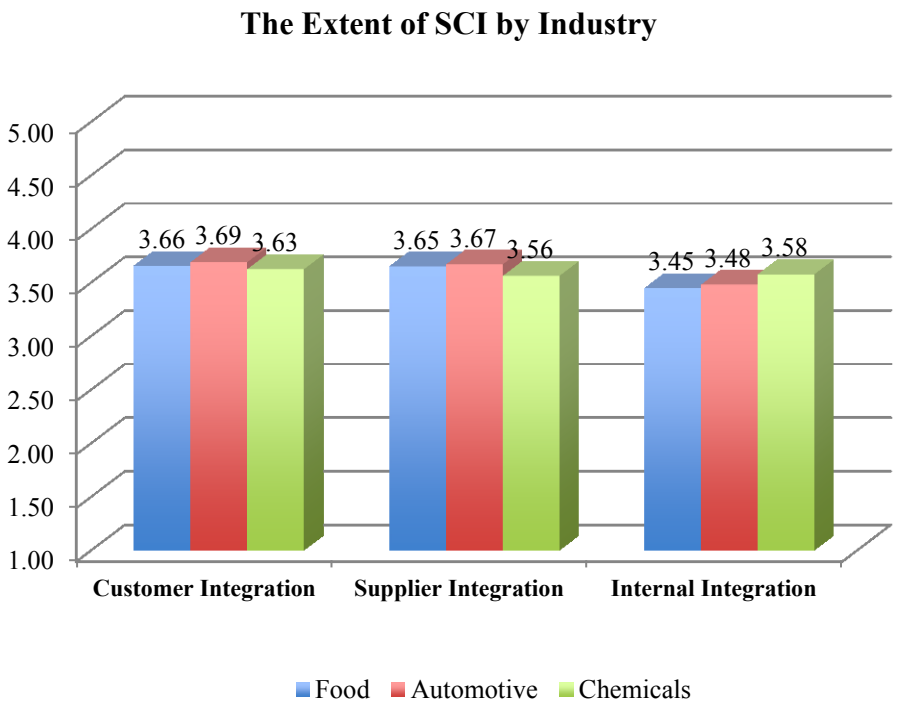

Figure 10. The Extent of SCI for Food, Automotive, and Chemical Industries

CHAPTER 5
DISCUSSION

This study examined the impact of supply chain integration on firm performance and further examined the influence of firms' external and internal drivers on the degree of supply chain integration. We surveyed Indonesian-based manufacturing firms to test our hypothesized relationships. We employed a new scale (that is, internal drivers) and validated scales from established studies (that is, supply chain integration, external drivers, firm performance, and organizational culture) and asked two senior managers from each firm to complete the survey. Both managers from each participating firm were knowledgeable in the respective areas of study, and thus their judgment in completing these perceptual measures was warranted. After approximately four months of data collection, we obtained 223 usable questionnaires (34.15% response rate). The data was checked for normality and multicollinearity assumptions, and then closely examined for non-response bias and common method bias. Furthermore, each scale was assessed for unidimensionality, reliability, construct validity, and discriminant validity. For the supply chain integration (SCI) scale, we also compared and tested four nested models to obtain one that best represented the scale, and the second-order construct model was selected because this model was the best fit with the data. After these rigorous processes, we concluded that, firstly, the psychometric properties of the instrument for this study were reliable and valid, and secondly, the data collected was credible for subsequent analyses (that is, hypotheses testing).

We proceeded to address the five research questions described earlier in the introductory chapter. The first research question inquired about the extent of firms' integration with their supply chain partners. This question became more pertinent since we empirically studied SCI practices in a developing country, which could provide a different perspective than that in

previous studies that mostly examined SCI practices in developed countries. To the best of our knowledge, published empirical research providing evidence of the benefits of pursuing integration with supply chain partners in Indonesia is still scarce, and thus, the current study contributes to the OM literature. Based on the results of this study, the SCI practices implemented by Indonesian-based manufacturing firms seemed to be on par with those implemented by manufacturing firms in Thailand, China, United States (U.S.), Japan, and Korea.

Nevertheless, when we took a closer look, we could find a pattern in terms of specific integrations that Indonesian firms emphasized, as compared to their counterparts in the aforementioned countries. Similar to manufacturing firms in Thailand, China, and the U.S., manufacturing firms in Indonesia emphasized close collaboration with key customers. In these four countries, the extent of customer integration was the highest among the three SCI dimensions. Manufacturing firms in Japan and Korea, on the other hand, had a different pattern. The extent of internal integration of these firms was the highest, whereas, similar to firms in Thailand, China, and the U.S., the extent of supplier integration was the lowest. This phenomenon, that is, having higher internal integration than supplier integration or customer integration, could be due to the JIT philosophy that these Japanese and Korean firms implemented, however, this argument is merely speculative and further studies are needed to validate our contention. A further finding, which showed that Indonesia was the only country that had the lowest extent of internal integration in comparison with the other two SCI dimensions, is also worth a subsequent study.

The remaining research questions were further addressed using statistical analyses, specifically, using structural equation modeling (SEM). The second research question referred to the relationship between SCI and firm performance, while the third and the fourth research

questions referred to the antecedents of SCI. We found empirical support for the positive impact of SCI on firm performance; however, contrary to what we conjectured, we did not find enough evidence to support the positive influence of four antecedents (that is, supply uncertainty, demand uncertainty, technology uncertainty, and anticipation of benefits) on the degree of SCI. Nevertheless, we found support for the positive relationship between the level of customer orientation –as one of the antecedents– and the degree of SCI. These results, along with the implications, are discussed in more detail below.

Our findings supported previous studies related to the positive relationship between supply chain integration and firm performance (e.g., Droge et al., 2004; Flynn et al., 2010; Germain et al., 2008; Wong et al., 2011). Supply chain integration, which encompasses forward or customer integration, backward or supplier integration, as well as internal integration, could improve customer-service levels, reduce delivery time, and accelerate new product development processes (Flynn et al., 2010; Swink et al., 2007). Additionally, supply chain integration could also improve firms' business performance, such as return on sales and return on investment, as well as profit growth and market-share growth (Flynn et al., 2010; Narasimhan and Kim, 2002; Vickery et al., 2003).

In contrast to their counterparts in developed countries that have been collaborating closely with their supply chain partners since the 1980s (Hill, 1994; Lummus and Vokurka, 1999), Indonesian manufacturers only recently initiated integration activities. According to Asosiasi Logistik Indonesia (ALI) or Indonesian Logistics Association, close collaboration among supply chain members was not widely acknowledged by Indonesian-based industries until after the 2007 economic crisis, and the recognition of its importance has grown rapidly

since then. This study further provided evidence of the positive impact of supply chain integration on these manufacturing firms' operational and business performance.

This study also investigated the impact of environmental uncertainty on SCI. Environmental uncertainty, which could exist in the form of supply uncertainty, demand uncertainty, or technology uncertainty, was conceptualized as an external driver that triggered supply chain integration (Davis, 1993; Chen and Paulraj, 2004; Stonebraker and Liao, 2004). High variances in demand, for instance, could pose a challenge for firms in scheduling their production and inventory levels; thus, firms might initiate close coordination with their intermediate customers to reduce the variances. They might also build close relationships with their suppliers to ensure sufficient supplies of raw materials in accordance with these changing production schedules. However, an empirical study by Paulraj and Chen (2007) only partially supported this conception. Out of the three dimensions of environmental uncertainty, only technology uncertainty was found to be significantly related to supply chain integration in 221 manufacturing firms in six different industries; whereas, demand uncertainty and supply uncertainty did not significantly influence supply chain integration.

This study also found similar non-significant influences of supply uncertainty, demand uncertainty, and technology uncertainty on supply chain integration. Specifically, Indonesian-based manufacturing firms did not perceive environmental uncertainty as a significant driver to integrate with their supply chain partners. One plausible explanation for this evidence might be related to the development of industrial growth in Indonesia as a developing country. Indonesia, in contrast to other developing countries that experienced rapid economic growth, such as China, Korea, and Taiwan, was regarded as less industrialized (Kniivilä, 2007). In 2004, industry's share of GDP in Indonesia was 13%, as opposed to 34% of industry's share in China (World

Bank, 2006). According to the more recent report released by the World Bank (2010), Indonesia's manufacturing accounted for 28% of GDP in 2008, while in China, manufacturing's share was 34%. Within eight years, China's manufacturing sector had grown 11.6% annually between 2000 and 2008, while Indonesia's manufacturing sector only grew 4.9% annually (World Bank, 2010). The World Factbook, which is a published reference prepared by the Central Intelligence Agency of the United States, provides 2011 estimates of industrial production growth (that is, including manufacturing, mining, and construction). According to the report, China experienced 13.9% annual growth of industrial production in 2011, whereas Indonesia experienced 3.5% annual growth.

These figures could represent indicators of the rate of change and growth of the economy, encompassing demand and supply. They could also be a proxy of technological change and improvement in the respective countries. The findings in this study indicated that manufacturing firms in Indonesia did not perceive production technology as changing frequently and thus the level of technological obsolescence was relatively low. They might also view the fluctuations of supply and demand as generally low, or at least, predictable. Regardless of the degree of integration they pursued with their supply chain partners, these manufacturing firms did not perceive environmental changes as pertinent factors in initiating supply chain integration.

This argument, as a matter of fact, might explain similar empirical findings in Gonzalez-Benito et al.'s (2010) study, which surveyed 96 manufacturing firms in Brazil. Based on the 2010 World Bank report, Brazil experienced moderate growth in industrial development. In particular, the annual rate of manufacturing growth in Brazil was 3.1% between 2000-2008, and manufacturing's share of GDP was 16% in 2008 (World Bank, 2010). Gonzalez-Benito et al. reported that environmental dynamism (which was measured by the variability of demand and

competitors' actions) only affected supplier development, but did not significantly influence supplier evaluation, supplier involvement, and logistics integration as this study had hypothesized.

Aside from the economic growth of one country, another argument that might explain the insignificant findings in this study is related to the type of industry. Fine (2000) introduced the notion of 'industry clockspeed', which is characterized by the acceleration of product redesign and life cycle, product complexity, as well as demand changes. He argued that Internet services, personal computers, and multimedia entertainment could be categorized as fast-clockspeed industries, whereas others, such as automotive industries, could be categorized as slow-clockspeed industries. This study did not control for industry type, and thus the non-significant results could be potentially explained by this industry effect. Furthermore, we gathered data from slow-clockspeed industries, such as textiles and chemicals, which might not experience major technological and demand changes over time.

To gain a better understanding of the findings, a follow-up analysis was performed to compare three industries (that is, food, automotive, and chemical industries). We found different factors that triggered the SCI implementation in these industries. For food and chemical industries, the only antecedent that was significantly related to SCI was customer orientation. This result was consistent with the result of the full model. On the other hand, for the automotive industry, supply uncertainty and demand uncertainty also played a role in driving firms to engage in close collaboration with their supply chain partners. This latter finding provides insight and might be worth further study to explain the significant relationship between environmental uncertainty and the degree of SCI in the automotive industry.

This study further looked at the elements or dimensions of integration separately, and we found that demand uncertainty and technology uncertainty actually induced units within a focal

firm to work together and synchronize their supply chain activities. Frequent changes in customer orders and process technology, for example, might drive the logistics unit to better coordinate with the marketing and/or engineering units, and consequently, might trigger teamwork and joint managing of activities among these units. This finding was actually consistent with an argument by Hill (1994), who described that the process of supply chain integration often started from internal integration (in which units within a firm eliminated their functional barriers to improve their coordination) and then advanced to suppliers in order to synchronize activities related to material flows.

Supply uncertainty, on the contrary, did not significantly affect any dimensions of integration, possibly because (1) firms did not view this uncertainty as the biggest challenge relative to other uncertainties, and (2) supplier issues had become daily problems since firms were established and thus firms were conditioned to deal with these issues through their existing routines and procedures. This uncertainty did not necessarily lead to a higher degree of partnership with their supply chain members.

Another trigger of supply chain integration was internal motivation, or, specifically, the anticipation of benefits and customer orientation. This study provided evidence for the positive influence of customer orientation on supply chain integration. As the level of firms' customer orientation increases, the need to satisfy their customers increases as well, and as a result, firms attempt to achieve this satisfaction by collaborating internally and working closely together with their supply chain partners. To the best of our knowledge, this study was among the first to examine the influence of customer orientation on supply chain integration. A study by Kaynak and Hartley (2008) extended quality management into the supply chain management domain, however, the survey, in which 263 US-based manufacturing firms participated, mainly found that

firms' levels of customer focus was positively and directly related to the quality of information shared among supply chain members. Their study did not investigate its impact on the degree of integration among supply chain members.

This study did not provide support for the positive relationship between the anticipation of benefits and supply chain integration; however, the follow-up analysis provided additional insight. Firms that expect to improve delivery reliability and speed, as well as reduce costs, engage in collaboration initiatives, but more internally and towards their suppliers, rather than towards their customers. Their goal to improve delivery and reduce costs should motivate firms to share information, to engage in long-term partnership with their key suppliers, and to ensure flexibility through quick ordering systems with their major suppliers. This improved-performance expectation might also lead firms to collaborate internally, for instance, through enterprise resources planning (ERP) systems and through the use of cross-functional teams.

Equally important were the findings pertaining to the influence of organizational culture on supply chain integration and its antecedents. The following discussion will address our last research question.

This study argued that firms with a high flexibility orientation would have a higher degree of supply chain integration than their counterparts with a low flexibility orientation. Yet, this argument was not supported by empirical evidence. Apparently, firms with a higher level of flexibility orientation engaged in business partnerships with their supply chain members as much as those with a lower level of flexibility orientation. In other words, having *control* orientation (that is, low flexibility orientation) does not hinder firms from initiating and pursuing a higher degree of collaboration; likewise, having *flexibility* orientation (that is, high flexibility orientation) does not necessarily translate into a higher degree of integration with supply chain partners.

One possible explanation for this contrary finding was that supply chain integration required firms to execute and control four broad activities, that is, logistics synchronization, information sharing, incentive alignment, and collective learning (Simatupang et al., 2002). These activities might require firms to be flexible, such as innovatively synchronizing their logistics activities (for example, delivery or warehousing) with their logistics providers, creatively developing reward and incentive systems that could benefit all supply chain members, or proactively sharing technology and knowledge; however, these activities might also demand firms to have control, such as ensuring stability in the material flows by applying formal structures and procedures, as well as maintaining efficiency in managing these integration activities.

One of the often-cited practices in supply chain integration that may help us better understand these unexpected findings is the Wal-Mart – P&G partnership. Wal-Mart has established a long-term relationship with one of its key customers, Procter & Gamble (P&G), since 1988 (Grean and Shaw, 2003). Both companies started their partnership by finding innovative ways to reduce costs while improving their business relationship. According to Grean and Shaw, Wal-Mart began to share demand and inventory data with P&G, so P&G could replenish Wal-Mart's inventory based on this data. P&G further substantially changed its replenishment process by linking Wal-Mart's inventory data with the systems at its distribution centers. Over time, both parties formalized their supply chain activities while continuously improving their systems in order to reduce variances, create stability, and increase efficiency (Grean and Shaw, 2003). Being innovative, flexible, and receptive to change to improve current conditions are essential characteristics of a flexible-oriented culture, which was apparent in both companies. At the same time, having the need to control and maintain stability are fundamental

characteristics of a control-oriented culture, which was also shown by both companies and enabled them to have a long-term relationship.

Hence, firms needed both attributes (that is, control and flexibility) in order to collaborate and coordinate more effectively, not only internally, but also with their supply chain members. It would be interesting to empirically examine whether having the balance between control and flexible orientations would be more favorable in pursuing supply chain integration as opposed to having either extreme (that is, a highly control orientation or a highly flexible orientation). However, such investigation is beyond the scope of the study and therefore left to be addressed in future research.

Finally, this study provided empirical evidence of the significant influence of having an external focus, rather than an internal focus, in pursuing a higher degree of supply chain integration. As the findings suggested, firms were driven to engage in collaboration and partnership by internal motivation –especially their orientation towards customer satisfaction– rather than by external pressures. Therefore, it would be more conducive to have an external-oriented culture (or external focus) as opposed to an internal-oriented culture (or internal focus). An external focus culture emphasizes results, achievement, and partnership with other organizations, which fit the nature of supply chain integration activities; whereas, an internal focus culture values loyalty, consensus, and internal development. While these attributes, to some extent, might also be pertinent to pursuing internal integration, external focus culture enabled firms to be more motivated to develop alliances or partnerships, as well as be more willing to share information and knowledge with all supply chain members. This study provided empirical evidence for the positive influence of external focus culture on the relationship

between customer orientation and supply chain integration. The implications of the overall findings will be discussed in the next section.

Implications for Research

The current research supported previous studies by providing evidence on the positive relationship between supply chain integration and firm performance (Droge et al., 2004; Flynn et al., 2010; Germain et al., 2008; Wong et al., 2011). As discussed earlier, this study contributed to the literature by adding to the sparse empirical findings from developing countries.

This study proposed a framework of drivers of supply chain integration and further empirically tested the framework using data from Indonesian-based manufacturing firms. By doing so, the study extended prior work that explored preceding conditions that triggered firms to initiate integration with their supply chain members (Chen and Paulraj, 2004; Lockström et al, 2010; Wong et al., 2011) and provided a more comprehensive framework of the antecedents of the integration. This framework could be tested in different environments (such as different countries) to gain a richer understanding of the supply chain integration phenomena.

The empirical results of this study partially supported findings by Paulraj and Chen (2007) and Gonzalez-Benito et al. (2010) regarding the insignificant influence of external pressures on supply chain integration. Yet, this study provided evidence of the significant influence of firms' internal motivation in building a supply chain partnership. As the findings suggested, this was especially true in Indonesia, in which economic growth was not as rapid as in other developing countries, such that firms' environment was perceived as more stable or predictable and it did not pose as great a pressure to engage in a close and long-term relationship. This study further contributed to the literature by exploring and further examining the contingency effect of organizational culture. As discussed previously, studies on organizational

characteristics are still limited in the OM literature (McDermott and Stock, 1999; Metters et al., 2010); therefore, incorporating these characteristics into our investigation of OM-related phenomena will deepen our understanding.

Finally, this study contributed in terms of the methodology used in examining supply chain integration in Indonesia. Specifically, this study employed a survey method as opposed to a laboratory experiment or case study, thereby providing enhanced external validity. This study used two informants from each firm and each informant provided responses to different questions about their firm according to their expertise. We had separated survey questions related to independent variables and dependent variables; thus, the common method bias was reduced. This study further followed the two-step testing recommended by Anderson and Gerbing (1988) and thus provided more rigorous results.

Implications for Practice

This study attempted to provide guidance for supply chain management practitioners by confirming the positive impact of supply chain integration on performances. The results of this study showed that, by performing logistics synchronization, information sharing, incentive alignment, and collective learning, firms could improve their responsiveness to the market, as well as their customer service. Therefore, managers are suggested to utilize cross-functional teams in improving material flows and in developing new products. Firms should remove the silo mentality within their functional units and establish better coordination among these units. Only by joint efforts among units, such as marketing, production, and logistics, firms could satisfy their customer orders while, at the same time, maintain their production and logistics efficiency. Firms should continue building a harmonious relationship among units by setting total-system goals and rewards to encourage units to work together in satisfying their end customers, as

opposed to working independently merely to fulfill the units' targets. At the same time, with their focus on improving service level to the end customers, production and logistics units would feel the need to collaborate with their key suppliers, while the marketing unit would feel the need to build partnerships with key intermediate customers. Over time, this internal integration would extend into supplier and/or customer integration, and thus firms would increase the degree of supply chain integration. Firms would experience a more effective and efficient flow of products, as well as improve their responsiveness and customer satisfaction level, which in turn, would increase their bottom line.

This study also revealed pertinent drivers of supply chain integration. In Indonesia, where business environments might be perceived as relatively stable or predictable (that is, in terms of demand, supply, and technological changes) by most managers, the level of customer orientation plays a role in driving firms to engage in supply chain partnerships. Drawing from the findings of this study, firms that are more customer-focused than their competitors would always seek ways to improve their service level and reliability. Therefore, managers might want to develop regular measures of customer service, follow up customer feedback, proactively design ways to enhance customer relationships, and disseminate customer-satisfaction values throughout the units within their firm. In doing so, managers promote a higher level of customer orientation, which should lead to a higher degree of collaboration between the firm and its supply chain partners.

Finally, this study investigated effective organizational cultures that are conducive for firms to engage in supply chain integration processes. Based on its findings, having an external focus would provide support for firms in carrying out supply chain integration, more so than an internal focus. This external-focus culture is characterized by emphasis on achievement, competitiveness, and partnerships. Therefore, managers need to ensure that functional units

within the firm possess these values and are open to collaborations and alliances with external entities. Building a partnership with key suppliers or intermediate customers is not an easy task, and thus managers should be fully committed to the success of the partnership, as well as put efforts in building trust from both parties and in sharing their vision and objectives. Consequently, firms would have a long-term integration with their supply chain members that would provide benefits, not only in terms of operational or financial performance, but also in terms of knowledge gain and sustained competitiveness.

Limitations

This study has a few limitations, and thus its findings should be interpreted carefully. First, this study is cross sectional, and therefore firm performance was measured at the same time as its predictors. The effect of supply chain integration on firms' performance should take time; therefore, the ideal research design should incorporate an appropriate time lag. We have attempted to overcome this issue by requesting informants to evaluate firm performance over the last three years, and thus indicate the performance growth; however, future studies should consider the time-lag perspective when examining supply chain integration. Scholars might also consider conducting a longitudinal study to investigate the impact of supply chain integration on firm performance over time.

A second limitation of this study is the use of perceptual measures of firm performance. Although using multiple items and two informants from one firm reduce potential common method bias, the measurement still uses informants' perceptions as the main source of data. The nature of self-reported instruments also sets a limitation in measuring the constructs of the study. Self-reported instruments rely primarily on respondents to fill in the questionnaire. Future studies should combine perceptual measures with objective data of firm performance to gain more valid

results of the effect of supply chain integration. Future studies should also consider triangulating the findings with different methods to investigate the relationships between supply chain integration, its drivers, and firm performance.

Finally, the third limitation is related to the narrow context of this study. We collected data from Indonesian-based manufacturing firms, and consequently, the findings are specific to this particular context or can be applied to other developing countries that experience moderate industrialized development. It would provide valuable contributions if scholars could compare and contrast results from several countries, as well as from different types of industry (that is, including mining or service companies).

Conclusion

Supply chain integration is a global phenomenon that brings actual and potential benefits to firms in their attempt to be competitive in business. Studies have investigated this practice from different perspectives and used different methods; yet, the area is still rich for mapping and validating (Chopra et al., 2004; Singhal and Singhal, 2012). Drawing from a framework of the theory-building process by Handfield and Melnyk (1998), this area of research could be in the stage of "theory validation", or in the early stage of "theory extension and refinement". Studies are still required to address pertinent questions such as the applicability of supply chain integration frameworks that have been developed thus far.

This study has tested prior theories related to drivers and benefits of supply chain integration, and it further attempted to justify the findings. This study contributed to the literature through a more comprehensive framework, a more rigorous methodology, as well as the context it empirically examined. We expect that the results of this study help better understand supply chain integration practices.

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APPENDIX

APPENDIX A

MEASUREMENT

Questionnaire A

Internal Drivers (adapted from Deshpandé et al., 1993; Lummus & Vokurka, 1999; Frohlich & Westbrook, 2002; Chen & Paulraj, 2004; Kaynak & Hartley, 2008; Lockström et al., 2010)

Anticipation of benefits

Please indicate the degree to which you agree to the following in the context of implementing new management practices (1=strongly disagree; 5=strongly agree).

We expect to improve speed of response.
We seek to improve our service/support.
We seek to improve reliability and delivery.
We anticipate cost reduction.
We expect to maximize our performance.

Customer orientation

Please indicate the degree to which you agree to the following statements in the context of your specific product/market (1=strongly disagree; 5=strongly agree).

We have routine or regular measures of customer service.
Our organization actively seeks ways to improve the primary product in order to achieve greater satisfaction.
We are more customer-focused than our competitors.
I believe this business exists primarily to serve customers.
We follow up with customers for quality/service feedback.

Supply Chain Integration (adapted from Flynn et al., 2010)

Customer integration

Please indicate the extent of integration or information sharing between your organization and your major customer in the following areas (1=not at all; 5=extensive).

The level of linkage with our major customer through information networks.
The level of computerization for our major customer's ordering.
The level of communication with our major customer.
The establishment of quick ordering systems with our major customer.
The frequency of period contacts with our major customer.

Supplier integration

Please indicate the extent of integration or information sharing between your organization and your major supplier in the following areas (1=not at all; 5=extensive).

The level of information exchange with our major supplier through information networks.
The establishment of quick ordering systems with our major supplier.
The level of strategic partnership with our major supplier.
Stable procurement through network with our major supplier.
The participation level of our major supplier in the process of procurement and production.

Internal integration

Please indicate the degree of integration in the following areas (1=not at all; 5=extensive).

Data integration among internal functions.
Enterprise application integration among internal functions.
Integrative inventory management.
Real-time searching of the level of inventory.
Real-time searching of logistics-related operating data.
The utilization of periodic interdepartmental meetings among internal functions.
The use of cross functional teams in process improvement.
The use of cross functional teams in new product development.

Questionnaire B

External Drivers (Chen and Paulraj, 2004)

Supply uncertainty

Please indicate the degree to which you agree to the following statements (1=strongly disagree; 5=strongly agree).

The suppliers consistently meet our requirements.
The suppliers produce materials with consistent quality.
We have extensive inspection of incoming critical materials from suppliers.
We have a high rejection rate of incoming critical materials from suppliers.

Demand uncertainty

Please indicate the degree to which you agree to the following statements (1=strongly disagree; 5=strongly agree).

Our master production schedule has a high percentage of variation in demand.
Our demand fluctuates drastically from week to week.
Our supply requirements vary drastically from week to week.
We keep weeks of inventory of the critical material to meet the changing demand.
The volume and/or composition of demand is difficult to predict.

Technology uncertainty

Please indicate the degree to which you agree to the following statements (1=strongly disagree; 5=strongly agree).

Our industry is characterized by rapidly changing technology.
If we don't keep up with changes in technology, it will be difficult for us to remain competitive.
The rate of process obsolescence is high in our industry.
The production technology changes frequently and sufficiently.

Firm Performance (adapted from Flynn et al., 2010)

Operational performance

Please evaluate your company's improvement for the last three years (1=much worse; 5=much better).

Our company can quickly modify products to meet our major customer's requirements.
Our company can quickly introduce new products into the market.
Our company can quickly respond to changes in market demand.
Our company has an outstanding on-time delivery record to our major customer.
The lead time for fulfilling customers' orders (the time which elapses between the receipt of customer's order and the delivery of the goods) is short.
Our company provides a high level of customer service to our major customer.

Business performance

Please evaluate your company's performance in the following areas for the last three years (1=much worse; 5=much better).

Return on sales.
Growth in profit.
Growth in market share.
Return on investment (ROI).

Organizational Culture (adapted from Cameron and Quinn, 1999; Naor et al., 2008; Liu et al., 2010)

Control-flexibility orientation

The glue that holds our organization together is formal rules and policies. Following rules is important.	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7	The glue that holds our organization together is commitment to innovation and development. There is an emphasis on being first with products and services.
Our organization emphasizes permanence and stability. Efficiency is important.	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7	Our organization is a very dynamic and entrepreneurial place. People are willing to stick their necks out and take risks.
Our organization is a very controlled and structured place. Formal procedures generally govern what people do.	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7	Our organization emphasizes growth through developing new ideas. Generating new products or services is important.
The leadership in the organization is generally considered to exemplify coordinating, organizing, or smooth-running efficiency.	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7	The leadership in the organization is generally considered to exemplify entrepreneurship, innovating, or risk taking.
The management style in the organization is characterized by security of employment, predictability, and stability in relationships.	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7	The management style in the organization is characterized by risk-taking, innovation, freedom, and uniqueness.

Internal-external focus

The organization is very personal place. It is like an extended family. People seem to share a lot of themselves.	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7	The organization is very results oriented. A major concern is getting the job done. People are very competitive and achievement oriented.
The organization defines success on the basis of the development of human resources, teamwork, employee commitment, and concern for people.	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7	The organization defines success on the basis of winning in the marketplace and outpacing the competition. Competitive market leadership is key.
The glue that holds the organization together is loyalty. Commitment to this organization runs high.	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7	The glue that holds the organization together is the emphasis on achievement and goal accomplishment. Aggressiveness and winning are common theme.
The leadership in the organization is generally considered to exemplify mentoring, facilitating, or nurturing.	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7	The leadership in the organization is generally considered to exemplify a no-nonsense, aggressive, results-oriented focus.
The management style in the organization is characterized by consensus.	1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7	The management style in the organization is characterized by partnerships and achievement in the market.

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