Theoretical Analysis of a Multi-Tier Supply Chain Management Process Integration: A Case Study Method

*Muhammad Nauman Abbasi*, Professor, Institute of Management Sciences, Bahauddin Zakariya University, Multan, Pakistan  
*Nadir Munir Hassan*, Assistant Professor, Air University, Multan Campus, Multan, Pakistan  
*Javeria Abbas*, Assistant Professor, Institute of Management Sciences, Bahauddin Zakariya University, Multan, Pakistan

*Corresponding author’s email address: abbasimna@bzu.edu.pk*

**ARTICLE DETAILS**

**ABSTRACT**

**Purpose:** - Case studies of 12 automotive supply chains are used to build a theory of multi-tier supply chain management (SCM) processes integration which links patterns of multi-tier process integration with cost and differentiation strategies of the focal firms.

**Design/Methodology/Approach:** The cases build on previous researches by examining the rationales and extents in which a focal firm integrates the key supply chain management processes across first, second and third-tier suppliers, logistics service providers and authorized dealers. Data was collected in two rounds, followed by codification and analysis.

**Findings:** The analyses suggest that firms with lower scope and span of process integration prioritized cost efficiency and firms with larger scope and span of process integration prioritized both cost efficiency and customer service differentiation. As a result, propositions for explaining strategic priorities driving multi-tier SCM process integration are developed.

**Implications/Originality/Value:** This study provides managerial accounts and theoretical foundation to explain the needs for different levels, scopes and span of SCM process integration and the extent to which the span of integration (tiers) should be extended.

©2022 The authors, under a Creative Commons Attribution-NonCommercial-4.0


**Introduction**

It is acknowledged by scholars and professionals, that ‘integration’ is the basic ingredient for execution of supply chain management in practice (Vallet-Bellmunt & Rivera-Torres, 2013). By making chain members, integrate resources and abilities, it helps improving both financial and operational outcomes (Huo, Tian, Tian, & Zhang, 2019). To be specific, SCI has been defined as the “comprehensive
collaboration between supply chain network members in strategic, tactical and operational decision-making” (Alfalla-Luque, Medina-Lopez, & Dey, 2013). It’s a multidimensional concept, often considered from multiple view points, including: operational, relationship, information and process integration (Shee, Miah, Fairfield, & Pujawan, 2018). Likewise, SCI is also categorized as supplier, internal and customer integration (Song, Song, & Sun, 2019). While, certain scholars have inspected various integration types, including process (Shee et al., 2018), technology (De Vass, Shee, & Miah, 2018) and information integration (K. Yu, Luo, Feng, & Liu, 2018).

The need to integrate supply chain processes beyond the first-tier has been widely acknowledged (Cooper, Lambert, & Pagh, 1997; Croxton, 2003; Croxton, Garcia-Dastugue, Lambert, & Rogers, 2001) and supported by certain previous empirical investigations (e.g., Ragatz, Handfield, & Scannell, 1997; Salam, 2011). Unfortunately, there has been a lack of theoretical advancement since the seminal work of Cooper et al. (1997) and Lambert et al. (1998). However, despite acknowledging the benefits, previous studies have focused only on unilateral relationships (e.g., buyer-supplier relationship, bargaining power, and the comparison of single-tier value creation stages) and neglected the impact of the relationships within a multi-tier supply chain (Adner & Kapoor, 2010).

Initially, literature across the stream of supply chain management categorized it into eight key SCM processes (Cooper et al., 1997). Afterwards, Lambert et al. (1998) theorized that it is desirable for a focal firm to establish different levels of integration for different processes with different supply chain actors or tiers. The case studies of Lambert et al. (1998) provide some indications that some processes have been integrated to a greater extent with actors in specific tiers of a supply chain. Number of authors, have concentrated on multiple aspects of SCI, including available levels of integration (Robinson, Manrodt, Murfield, Boone, & Rutner, 2018; Wiengarten & Longoni, 2015), enablers (Mora-Monge, Quesada, Gonzalez, & Davis, 2019) and a detailed insights into the SCI and performance connection (Ataseven & Nair, 2017; Fabbe-Costes & Jahre, 2008; Feyissa, Sharma, & Lai, 2019; Zhao, Feng, & Wang, 2015).

Considering, the variety of outcomes available in literature, SCM researchers are prompted, to dig deep into other available aspects, related with integration in SC networks. For example, Wiengarten, Li, Singh, and Fynes (2019), responded to this, by providing additional details into the topic, they raised questions, on commonly accepted philosophy of higher SCI and performance relation, and termed it not to be universally true. According to him, SCI is a complex and dynamic process, with certain contextual aspects attached to it, which must be considered, before establishing the SCI and performance relationship. Additionally, Hassan & Abbasi, 2020 also highlighted, that execution and implementation of levels, extents and types of SCI need, configurational considerations. Still, it is unclear which strategic priorities drive the integration of which processes with which tiers. So, greater understanding can be achieved when we are able to develop a theory to explain the drivers behind the arcs or patterns of integration of different SCM processes in a multi-tier supply chain.

Therefore, this study builds onto previous research by examining how eight SCM processes (Cooper et al., 1997) are being differentiated for integration with multi-tier supply chain actors (Lambert, Cooper, & Pagh, 1998) and explains the key drivers behind this. The aim is to build a theory to explain the different arcs or patterns of integration of different SCM processes in a multi-tier supply chain. Particularly, we address the following research questions about multi-tier SCM process integration:
Is differentiating the integration of different SCM process (scope) with different tiers (span) desirable?
Are the different patterns of multi-tier SCM process integration driven by specific competitive priorities? If so, why?

**Literature Review**

**Supply Chain Integration**

Supply chain integration generally means “the level to which manufacturers strategically collaborate
with its supply chain partners and collaboratively manages intra- and inter organization processes” (Flynn, Huo, & Zhao, 2010; p.59). In line with information processing theory, SCI results in improved quality, thoughtful decisions, by helping stakeholder both within and beyond firms, to interact effectively (Hendijani & Saei, 2020). Similarly, SCI is known for its diversified scope, starting from internal processes, till external coordination (Doering, De Jong, & Suresh, 2019). These definitions suggest that, cooperative mode of actions are at the very base of the concept of integrated supply chains. The literature has, in general, agreed that a better supply chain performance can be achieved when the strength of supply chain integration is greater or the arc of integration is ‘wider’ (Flynn, Huo, & Zhao, 2010; Frohlich & Westbrook, 2001; Swink, Narasimhan, Wang, 2007; Wong, Boon-itt, & Wong, 2011).

Furthermore, in order to establish proper conceptual and theoretical insights into the construct of integration, Autry, et al. (2014) explains integration from operational coordination (i.e. activities in support of planning, information exchanges, and system integration) to tactical cooperation (i.e. recognition and achievement of mutually beneficial activities) and finally a strategic collaboration and integration (i.e. establishment and maintaining of collaborative relationships). While integrating processes there is often a need to consider the integration of physical and information flow, technologies and systems across multiple actors and organizational structures. Process alignment also means that organizations, willing to organize resources in a differentiated manner, may generate better results, in comparison to firms, which don’t reflect on to it (Ganbold, Matsui, & Rotaru, 2020). Hence, process integration is an important perspective, as found across the studies related to the concept of supply chain integration (Chen, Daugherty, & Roath, 2009a).

**SCM Process Integration**

In the same way, number of authors (e.g. (Cooper et al., 1997; Croxton et al., 2001; Lambert, Cooper, & Pagh, 1998) have acknowledged the need to integrate the key business processes across supply chains. Previous studies have indicated that competitive organizational outcomes can be reaped by aligning SC processes, and activities. Yet, researches on enablers of SC process integration and its outcome are very few in number (W. Yu, Jacobs, Salisbury, & Enns, 2013). Supply chain process integration is defined as the interaction and collaboration between supply chain partners that intend to form a network (Huang, Yen, & Liu, 2014). Earlier, Cooper et al. (1997) identified eight key SCM processes i.e. customer relationship management (CRM), customer service management (CSM), demand management (DM), order fulfillment process (OFP), manufacturing flow management (MFM), supply management (SM), product development and commercialization (PD&C), and returns management (RM). These SCM processes cover both base line and generic business related actions which are eminent for smooth running of the basic supply chain operations.

Hence, activities that constitute these processes, such as inventory management (Aviv, 2003; Chu & Jorge,2008; Shin & Benton, 2004; Weng, 2004;), procurement (Narasimhan & Das, 2001), transportation (Mason & Lalwani, 2006), anticipation (Aviv, 2001; Reiner, Natter, & Drechsler, 2009), manufacturing, marketing and distribution (Samaranayake, Laosirihongthong, & Chan, 2011), product enlargement (Naveh, 2005; Srivastava, Shervani, & Fahey, 1999), and reverse logistics (Brown, 2004) can arguably be improved through the integration of different SCM processes. Resultantly, integrating supply chains can result in superior outcomes, ultimately causing improved supply chain performance (Prajogo, Oke, & Olhager, 2016).

The literature also argues that not all SCM processes, actors and tiers within a supply chain are equally important and, therefore, they require different levels of integration. There are several approaches to differentiate levels of integration in the literature (e.g., Stevens, 1989; Trkman, Mojca, Jaklic, & Groznik, 2007; Wagner, 2003) but only few specifically focus on process integration. Based on the process framework of Cooper et al. (1997), Lambert et al. (1998) suggested four levels of integration: managed process links, monitored process links, non-managed process links and non-members process links. According to them, managed process links are the links where a focal firm integrates a process
with one or more customers/suppliers; monitored process links are the links where a focal firm simply monitors or audits their relations with their supply chain partners. Comparatively, non-managed process links are not links that a focal firm is actively involved in, nor are they critical enough to use resources, even for monitoring. Non-member process links are the process links between members and non-members of the supply chain. Non-member links can, however, affect the performance of the supply chain.

Based on case studies, Lambert et al. (1998) suggest that in any supply chain, a focal firm may maintain managed process links for specific business processes with suppliers and their corresponding firm. Meanwhile, for other processes the focal firm may choose to apply monitored process links or non-managed process links. More specifically, they found that DM was the only business process where the focal firms preferred to establish a managed process link with all their first-tier suppliers. They also observed that the focal firms preferred to maintain managed process links with only three (out of five) first-tier suppliers in the PD&C. However, in terms of CRM and OFP, focal firms preferred to maintain managed process links just with two and one first-tier suppliers (out of five) respectively. Contrasted with previous supply chain literature which suggests that all the business processes should be linked across the supply chain, the study of Lambert et al. (1998) provided some evidence that firms strategically choose to integrate some selected key processes and, instead, simply monitor some other processes.

The work of Lambert et al. (1998) was later extended in a more extensive study by Mejza and Wisner (2001). Their findings are: (1) a substantial proportion of firms that practice SCM integrate two or more processes with those of other firms in their supply chain; (2) a large proportion of firms practicing SCM integrate a larger number of SCM processes across their supply chains; (3) for some processes i.e. OFP, MFM, SM, CSM, and DM, firms manage moderate levels of integration with their supply chain members; (4) for firms where SCM is practiced, managers concentrate a fair amount of effort and resources to the integration of a broad, diverse array of key cross-functional processes; and (5) the length of SC actions are positively associated with the intensity with organizations arrange their processes in sync with other firms across their chains. So, the given research, may help to conceptualize patterns of SCM process integration: a broader scope of process integration involves more SCM processes in the integration efforts, and a longer span of process integration involves multiple tiers SCI (beyond first-tier). In the end they identify that certain processes, such as, OFP, MFM, CSM, SM and DM are being jointly managed to a greater level than others. Therefore, examining the supply chains from the view point of process integration is significant in causing supply chain performance (Rajaguru & Matanda, 2019). Additionally, chain wise integration of processes, causes the sense of fit among channel members, inspiring them, to become the even ingrained and useful part of diverse chains and networks (Skipworth, Godsell, Wong, Saghir, & Julien, 2015).

Some researchers have particularly propagated the need for empirical work on how multiple SC process integration dimensions merge to effect organizational performance (Eriksson, 2015). The empirical evidence reported by Lambert et al. (1998) and Mejza and Wisner (2001) suggest that firms recognize the strategic importance of different SCM processes and relationships with different actors in a supply chain. This behavior can be explained by strategic choice theory (Miles & Snow, 1978) and competitive priority theory (Hayes & Wheelwright, 1984; Skinner, 1969). While, the Strategic choice theory reflects a firm’s responses to the competitive environment. Following the strategy-structure-performance (SSP) framework of Miles & Snow (1978), Chen et al. (2009b) argue that a firm’s strategy has to fit with the competitive priorities. Strategic orientations tell us the strategic choices made by a firm in order to fit with the environment. Based on these arguments, Chen et al. (2009b) theorize that strategic orientation towards either cost efficiency or customer-orientation (differentiation) can have an influence on the emphasis in internal or external SCM process integration. In Chen et al.’s (2009b) theory, if the strategic priority is to achieve superior service performance for specific customers, then it is more likely for firms to emphasize the integration of OFP, CSM and DM processes with these customers. For firms where
product innovation is rather critical and there might be a need to collaborate with suppliers to design and produce new products frequently then the PD&C and SM processes need to be integrated. For achieving cost efficiency there may be a tendency to focus on MFM, SM and OFM processes.

While different SCM processes have been linked with different competitive priorities the multi-tier perspective has not been taken into account. Hence, there is a need to explain why focal firms need to extend the integration of specific processes beyond the first tier.

**Methods**

**Samples**

Our research questions ask if differentiated SCM multi-tier process integration is desirable for anticipated performance outcomes or not. It is therefore important to study multiple case exemplars in a multi-tier SC setting. Initially, Pakistani automotive industry was considered for the following reasons. The Pakistani automotive industry largely works through franchises, alliances and specific partnership with Korean, Japanese, European, Chinese and Malaysian automakers. In the last five years the auto vendor industry of Pakistan enjoyed an annual growth rate of an average of 35%, reflecting a significant increase in the demand of automobiles. Resultantly, the industry contributed significantly i.e. 2.8% to the GDP of the country. The industry supply chain players vary from local small and medium enterprises (SMEs – 90% of the automotive industry) to multinational giants (MNCs – 10% of the automotive industry). In addition to fill local demand, firms in the automotive industry are also engaged in exports. Countries such as Sri Lanka, Malaysia, Gulf Estates, Singapore, Turkey, Poland, USA, Spain, Germany, Italy, Brazil, and England are the major buyers of Pakistani auto parts.

From two databases: Pakistan Automotive Manufacturing Association (PAMA) and Association of Pakistan Motorcycle Assembler (APMA), twelve automotive OEMs were identified. They are selected because some of them are known to have excelled in customer service, others with a focus on cost efficiency, and some who prioritize both cost and customer orientation (theoretical sampling). Also, they represent all of the major OEMs in Pakistan engaging in assembling/manufacturing, castings and/or forgings of major automotive products.

**Data Collection**

Data was collected through in-depth multiple case studies of twelve OEMs plus a survey questionnaire about the automotive industry in Pakistan. The case studies and survey questionnaires were guided by a structured questionnaire. To study the multi-tier automotive supply chains, we asked the OEMs to consider process integration with the first-tier suppliers (products - steel coils, body paints, tyres, etc.), second-tier suppliers (products – door hinges, brake assembly, door locks, rubber seals, plastic items), third-tier suppliers (products – aluminum, iron, cylinders, etc.), logistics service providers and authorized dealers. Such multi-tier automotive supply chain actors are chosen as the unit of analysis because it is evident from the literature (e.g., Brown, 2004; Frohlich & Westbrook, 2001; Hertz, 2001; Kim, 2006; Naveh, 2005; Reiner, Natter, Drechsler, 2009; Kannan & Tan, 2010; Samaranayake, Laosirihongthong, & Chan, 2011) that a higher level and broader scope and span of supply chain integration with both supplier and customer can lead to remarkable benefits. We purposely chose a wide span or number of tiers in order to limits where the span of integration ends. Additionally, need for execution of SCM and SCI concept on a dyadic, triadic and network perspective, have been on a rise (Huo et al., 2019).

The multiple case studies for the twelve OEMs are conducted in two rounds. In the first round, questionnaires are distributed to targeted sample (two to six), from multiple sections such as marketing, sales & supply chain etc. within all organizations. Each respondent is asked to reveal the current and desirable levels of integration of eight SCM processes (according to Cooper et al. (1997) with the immediate and extended tiers of suppliers and customers, and provide further contextual explanations. When necessary, explanations of the meaning of each SCM process are given to the respondents, were
asked to label their view point for existing and expected level of SCI across multi-layered SC participants (i.e. 1st, 2nd, 3rd tier suppliers, LSP and intermediaries) on each of the items measuring the SCI extent.

To develop shared opinion among respondents of single firm, variation in their responses was noticed. Second level of data seeking included, discussions on the differences. While, participants, with diversified viewpoints were asked to elaborate reasons behind their identified varied thought patterns. After fetching the base line information, all respondents were asked to reflect onto the question on, whether one given extent of integration can be considered across each of the SCM process, or not. Respondents are also asked to explain the strategic choices they made with regard to the levels of integration for each process-actor link.

Coding and Analysis
In addition to the data collected by the two-round data collection and verification processes, further triangulation of the data is carried out by examining supporting secondary (e.g. meeting memos, minutes of meetings, and training schedules etc.). The qualitative accounts of the desirable and actual levels of integration are compared with the quantitative responses calculated in terms of means and standard deviations. When large differences were found, further follow up interviews with the respondents were conducted until the results converged.

To code the levels of integration (current and desirable) without being biased, we draw onto the related literature (Croxton, 2003; Croxton et al. (2001); Goldsby & Garcia-Dastugue, 2003; Morris & Davis, 1992; Parvatiyar & Sheth, 2001; Rogers & Tibben-Lembke, 2001; Selen & Soliman, 2002; Vollmann, William, & Whybark, 1997) and divided following five levels of integration in to a Likert scale.

Strategic collaboration: the highest level of integration, where supply chain partners share resources, risk and rewards, promote teamwork and joint decision-making, and establish joint goals at strategic/corporate level to attain supply chain objectives.

Functional interaction: a medium level of integration, where supply chain members manage mutuality, particularity, and the firms’ abilities, whilst at the same time coping with and positively using inconsistency in its dealings with others.

Operational cooperation: a low level of integration, where supply chain members observe informal relations and low level of commitment to attain joint goals.

Transaction-based interaction: the level of integration that is limited to transactional interaction, where involvement of the supply chain member is limited to only one transaction.

No integration: the firm (intentionally or unintentionally) does not want to establish relationships with their supply chain member(s) because manager(s) may not be able to comprehend the contribution and/or effect of those members towards their supply chain objectives/performance.

Similarly, we refer to the definitions of strategic cost efficiency or customer-orientation (Chen et al., 2009b) in order to examine the competitive priorities of the OEMs. For example, when cost efficiency has been repetitively mentioned it is a clear indication of cost efficiency orientation. Customer service orientation is normally demonstrated by the efforts to please the customers by providing additional services and product features. Additionally, the data analyses are conducted in two stages: within and across case analysis. Case analysis helped us to examine multi-tier SCM process integration in a single firm context, while the across case analysis helped to identify similar patterns in different setting or firm contexts (Yin 2013).

Cross Case Analysis
The cross case analyses below cover two aspects: (a) an analysis of the desirable and actual scope and span of integration of each of the eight processes at an aggregated level for the twelve OEMs, and (b) categorization of the twelve OEMs in terms of the patterns of multi-tier SCM process integration and
competitive priorities.

**Desirable and actual scope and span of process integration**

Table 1 summarizes the desirable and actual levels of process integration for the twelve OEMs at an aggregated level. The numbers in brackets represent the average scores for the levels of integration by the OEMs. The higher the average scores the lower the levels of integration. The average scores of the current (labeled “C”) levels of integration clearly indicate that the OEMs had desires to achieve and actually achieved different levels of integration with different tiers for each process. SM is the only process in which the OEMs have achieved the highest possible level of integration (strategic collaboration) with authorized dealers. In average, OEMs are using the second highest level of integration (functional/departmental interaction) in other crucial processes such as CRM, CSM, DM, and OFP with authorized dealers but two of these processes have lower levels of integration with the suppliers, another evidence of customer-facing integration. However, OEMs are simply maintaining the third level of integration (operational cooperation) in the process of returns management, indicating that not all processes require equal level of integration.

Table 1 – Average levels of integration between OEMs and actors from different tiers

<table>
<thead>
<tr>
<th>Process</th>
<th>3rd Suppliers</th>
<th>Tier</th>
<th>2nd Suppliers</th>
<th>Tier</th>
<th>1st Suppliers</th>
<th>Tier</th>
<th>LSPs</th>
<th>Dealers</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRM</td>
<td>C: TI (4.66)</td>
<td>C: TI (3.99)</td>
<td>C: OC (2.71)</td>
<td>C: TI (4.42)</td>
<td>C: FI (1.83)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: TI (3.70)</td>
<td>D: OC (2.59)</td>
<td>D: SC (1.50)</td>
<td>D: TI (3.95)</td>
<td>D: SC (1.39)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSM</td>
<td>C: TI (4.12)</td>
<td>C: OC (3.26)</td>
<td>C: FI (2.09)</td>
<td>C: OC (2.84)</td>
<td>C: FI (2.37)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: OC (3.28)</td>
<td>D: FI (2.38)</td>
<td>D: FI (1.53)</td>
<td>D: OC (2.75)</td>
<td>D: SC (1.38)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DM</td>
<td>C: TI (4.34)</td>
<td>C: TI (3.81)</td>
<td>C: OC (3.01)</td>
<td>C: TI (4.04)</td>
<td>C: FI (2.22)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: TI (3.59)</td>
<td>D: OC (2.71)</td>
<td>D: FI (1.92)</td>
<td>D: OC (3.49)</td>
<td>D: SC (1.47)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OFP</td>
<td>C: TI (3.80)</td>
<td>C: OC (2.97)</td>
<td>C: FI (2.07)</td>
<td>C: OC (2.71)</td>
<td>C: FI (2.24)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: OC (3.27)</td>
<td>D: FI (2.29)</td>
<td>D: FI (1.68)</td>
<td>D: FI (2.23)</td>
<td>D: FI (1.64)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MFM</td>
<td>C: TI (4.21)</td>
<td>C: OC (3.48)</td>
<td>C: FI (2.23)</td>
<td>C: TI (3.81)</td>
<td>C: OC (3.36)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: OC (2.66)</td>
<td>D: FI (2.41)</td>
<td>D: FI (1.70)</td>
<td>D: OC (2.75)</td>
<td>D: OC (2.66)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SM</td>
<td>C: TI (3.78)</td>
<td>C: TI (3.31)</td>
<td>C: FI (2.06)</td>
<td>C: FI (2.24)</td>
<td>C: SC (1.41)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C: TI (3.31)</td>
<td>C: OC (2.66)</td>
<td>C: FI (1.92)</td>
<td>C: FI (2.19)</td>
<td>C: SC (1.39)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PD&amp;C</td>
<td>C: TI (4.20)</td>
<td>C: TI (3.53)</td>
<td>C: OC (2.61)</td>
<td>C: TI (3.83)</td>
<td>C: OC (3.05)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: TI (3.62)</td>
<td>D: OC (3.00)</td>
<td>D: FI (1.94)</td>
<td>C: TI (3.75)</td>
<td>D: OC (2.91)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D: TI (4.50)</td>
<td>D: TI (4.05)</td>
<td>D: TI (3.54)</td>
<td>D: TI (3.88)</td>
<td>D: TI (3.76)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The eight processes: Customer relationship management (CRM), customer service management (CSM), demand management (DM), order fulfilment process (OFP), manufacturing flow management (MFM), procurement/supply management (SM), product development & commercialization (PD&C), and returns management (RM); The five degrees of integration: strategic collaboration (SC), functional interaction (FI), operational cooperation (OC), transactional-based interaction (TI), and no integration (NI), current degree of integration (C), desirable degree of integration (D); numbers in brackets are means of the integration degrees (n=12 OEMs).

Furthermore, it is observed that the levels of integration become weaker as the process moves upstream from the first tier suppliers towards second and third tier suppliers. For example, OEMs have functional interaction in most of their SCM processes (i.e. CSM, OFP, MFM, and SM) with first tier suppliers. However, comparatively weaker levels of integration for the same processes (i.e. operational cooperation or transaction-based interaction) with second and third tier suppliers are observed. Even though OEMs have functional interaction with first tier suppliers in many of their SCM processes, weaker levels of integration in some of the other processes (i.e. CRM, DM, and PD&C) are observed as well. This means the OEMs desired to integrate with lower-tier suppliers to some degree – is an indication of multi-tier SCM process integration differentiation. The results in Table 1 also reveal that OEMs have weaker levels of integration, either at operational level or transaction-based interaction in most of their SCM processes (i.e. CRM, CSM, DM, OFP, MFM, PD&C, RM) with logistics service
providers. Surprisingly, SM is the only SCM process where OEMs are managing functional interaction with LSPs.

The desirable (labeled “D”) levels of integration indicate that dealers are the most critical actors requiring strategic collaboration and functional interaction in many processes. The above results suggest that the OEMs recognize the need to integrate certain processes with dealers at different levels of integration. In terms of the strategic priority, CRM, CSM, DM and SM require the highest level of integration (strategic collaboration). Other less prioritized processes such as OFP require functional interaction, while, MFM and PD&C require operational cooperation. Instead, RM only requires a transaction-based interaction. These observations reflect the strategic priorities which focus on processes matter to supplier and customer relations, demand management and customer service with respect to the dealers, indicating the priority in terms of customer-orientation.

The first tier suppliers are the next strategic partners for integration of SCM processes, after the dealers. However, only one process (CRM) is regarded as the process, which deserves strategic collaboration while most of the other processes need functional interaction or operational cooperation with the first tier suppliers (except for RM). The second tier suppliers are not regarded as strategic partners. For second tier suppliers, functional interaction is recommended as the optimal level for CSM, OFP, and MFM, which reflect the importance of the second tier suppliers in manufacturing, services and order management in the automotive industry of Pakistan. Among others, CRM, DM, SM, and PD&C processes are SCM processes where OEMs anticipate maintaining operational cooperation with second tier suppliers. RM remains a transaction-based interaction for dealers, first tier and second tier suppliers. Furthermore, for third tier suppliers and the logistics service providers, the desirable levels of integration for all processes falls to the operational cooperation and transaction-based interaction except for OFP and SM, where functional interaction is suggested with LSPs. It is interesting to see that the OEMs need an equal level of integration with the first tier suppliers and dealers in terms of SM and RM, have put more emphasis on OFP and MFM with the first tier suppliers.

While assessing the differences between the desirable (labeled “D”) and current (labeled “C”) levels of integration, some interesting gaps emerged. In five cases, the gaps between current and desire levels are greater than one level. Results in Table 1 reveal that OEMs want to establish strategic collaboration in CRM, CSM and DM with authorized dealers compared to the current level i.e. functional interaction. Furthermore, OEMs aim to establish operational cooperation with the logistics service providers as compared to transaction-based interaction in MFM. Similarly, higher levels of integration (as opposed to the current levels) are recommended for CRM with first and second tier suppliers, while, functional interaction has been suggested for MFM with second tier suppliers. From a process point of view, CRM, DM, OFP, MFM, and SM are clearly the processes experiencing many gaps between the OEMs and other members of the supply chain. These gaps reflect serious concerns facing the supply chain.

Multi-tier SCM process integration and competitive priorities

The above analyses broadly highlight the constant pressures to increase the level, scope and span of integration in the supply chains for cost reduction and service improvement. Cost reduction is the priority for all the twelve OEMs, it is mainly driven by the economy and competition. Even though the Pakistani automotive industry has enjoyed remarkable growth in last few years, tighter economic conditions and energy crisis place more pressure on OEMs to integrate with, especially, first-tier suppliers and dealers to reduce cost. The increased cost pressure to integrate is also driven by brutal market competition due to liberal trade policies of the government to import reconditioned vehicles and high interest rates by the government to demoralize banks for car financing and leasing.

Customer service is another strategic priority for some OEMs. Today, it is believed that the survival of firms in the Pakistani automotive sector is subjected to their service offerings. Therefore, the role of dealers has emerged substantially, with them emerging as an important source of interaction between
OEMs and their clients. Hence, some OEMs believe that dealers are expected to act as a catalyst to promote the sales and to build long lasting relations with ultimate customers. Instead of working with general dealers, each OEM in the industry has established its own exclusive dealers’ network. The authorized dealers work as franchisees of the firm. Therefore, strategic collaboration is suggested as the desirable level for CSM, CRM and DM with authorized dealers for some OEMs.

The importance of CRM and CSM, particularly, is evident from the OEMs’ strategic collaboration with the authorized dealers, such as 3S (sale, spare-parts and services), 2S (service and spare-parts) and 1S (spare-parts). Additionally, OEMs are providing frequent trainings to technical experts, in anticipation of prompt and superior customer service. As the automotive industry in Pakistan is a demand-driven industry, and authorized dealers act as strategic partners of their firms, they are actively engaged in demand management processes. Today, firms launch their new products (models) in collaboration with their authorized dealers. Dealers aggressively promote the offerings (new & existing products) of their firms and use personal contacts to generate valuable demand for their firms. This also explains why DM is becoming very important. Similarly, OEMs aim to extend the integration efforts to their core (mostly 1st tier but also some 2nd tier) suppliers and strategic (part/modules) suppliers by actively involving them in inventory management, designing of new modules, implementing error-free production, and helping them to reduce operational costs. Additionally, OEMs expect to engage their suppliers even in the process of acquiring, partnering and retaining ultimate customers (e.g. CSM).

While the integration with dealers focuses on CRM, CSM and DM, the integration with suppliers and places more emphasis on CSM, MFM, OFP and SM in general. However, there are slight differences, depending on the dominant operations strategies. Our analyses reveal that Pakistan’s automotive OEMs can be broadly classified into three different patterns of SCM process integration each with distinct set strategic competitive priorities.

Table 2 – Arcs of process integration between OEMs and actors from different tiers

<table>
<thead>
<tr>
<th>Integration typology</th>
<th>X – Low arc of integration, but not with 2nd tier suppliers</th>
<th>Y – High arc of integration, but not with 2nd tier suppliers</th>
<th>Z – High arc of integration, and also with 2nd tier suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case companies &amp; primary strategic priorities</td>
<td>PQML, SAML (Cost efficiency)</td>
<td>PSM, DYM, A-GTL, H- PML, HMPL (Cost efficiency)</td>
<td>IMCL, HACL, AHL (Cost efficiency &amp; customer-orientation)</td>
</tr>
<tr>
<td>Characteristics of case companies</td>
<td>Motor-bikes Pakistani &amp; JV (Chinese) Low &amp; high volume</td>
<td>Cars, pick-up, motor-bikes, etc. JV &amp; technical cooperation Low, medium &amp; high volume</td>
<td>Cars, pick-up, motor-bikes, etc. All JV (Japanese) Medium &amp; high volume</td>
</tr>
<tr>
<td>Integrated processes with dealers</td>
<td>SM</td>
<td>CRM, DM, CSM, OFP, SM</td>
<td>CRM, DM, CSM, OFP, MFM, SM, PD&amp;C</td>
</tr>
<tr>
<td>Integrated processes with LSPs</td>
<td>Nil</td>
<td>OFP, SM</td>
<td>CSM, OFP, SM</td>
</tr>
<tr>
<td>Integrated processes with 1st tier suppliers</td>
<td>Nil</td>
<td>SRM, DM, CSM, OPF, MFM, SM, PD&amp;C</td>
<td>SRM, DM, CSM, OPF, MFM, SM, PD&amp;C</td>
</tr>
<tr>
<td>Integrated processes with 2nd tier suppliers</td>
<td>Nil</td>
<td>Nil</td>
<td>CSM, OFP, MFM, SM, PD&amp;C</td>
</tr>
</tbody>
</table>

Note: - Abbreviations used to maintain the privacy of the organizations.
The first group comprises of two firms include PQML and SAML, both with low level, scope and span of integration with the dealers and first tier suppliers, and almost negligible levels of integration with the lower-tier suppliers. They are those firms who aim to offer economical and standard products (vehicles). These firms produce low and high volume motorbikes. They prioritize only cost efficiency because they target low income group(s) with affordable prices. They have basically low levels of process integration with the multi-tier supply chain members (narrow scope and span of integration). Low level of integration is required because these firms are at the initial stages of investment and may have financial limitations to extend levels of integration in all processes. Secondly, high levels of integration in all SCM processes may extend operational cost which resultantly may restrict them to attain their strategic priority i.e. cost efficiency. Both of them have integrated SM process with dealers, while, only PQML is maintaining functional interaction in SM and OFP with LSP’s and 1st tier suppliers respectively.

The second group including firms such as PSM, DYM, DYL, AGTL, HPML, HMPL (focused on cost efficiency), while, MTL and GNDL (focused both cost efficiency and customer-orientation) have high levels of integration with the dealers and first tier suppliers, but little integration with the lower tier suppliers. These firms produce more variety of vehicles e.g., cars, pick-up and motor-bikes. They emphasize quality operations, reduction in fabrication time, error-free production, on-time delivery, flexibility in volume, design and operations, mostly driven by cost reduction, but some are already considering customer orientation. For these OEMs, the numbers of processes and the span of process integration are greater than the first group. Accordingly, they concentrate on SRM, DM, CSM, OFP, MFM, SM and PD&C and prioritize these processes for integration with their first tier suppliers, and for the dealers CRM, DM, CSM, OFP and SM have been prioritized.

The third group of firms (IMCL, HACL and AHL) focused on both cost efficiency and customer-orientation. They have high level and broad scope of process integration, also with the second tier suppliers for some processes (CSM, OFP, MFM, SM and PD&C). They produce all variety of vehicles. They mostly have joint ventures with the certain famous Japanese automakers (i.e. H & T). For these OEMs, the numbers of processes and the span of process integration are greater.

Accordingly, they concentrate on SRM, DM, CSM, OFP, MFM, SM and PD&C and prioritize these processes for integration with their first tier suppliers. They have made joint investments with key suppliers during the last few years, which have helped them to enhance their production flexibility and have allowed them to attain higher indigenization levels. At present, they are successful in attaining functional interaction in many of the processes like CSM, OFP, MFM and SM with first tier suppliers. Joint ventures and technical collaboration between H & J (bumpers, floor mats, etc.), H & S, Japan (shock absorbers), TE & D, Japan (car air conditioners) are examples of such collaboration in the industry. These measures have extended levels of integration in processes such as PD&C and OFP.

Moreover, the OEMs have introduced e-source applications i.e. SAP, EDI, GLO etc., as e-source platforms to identify, negotiate, contact, select and evaluate suppliers. The measures taken have extended the levels of integration between OEMs and their first tier suppliers, especially in SM. For the dealers CRM, DM, CSM, OFP, MFM, SM, PD&C have been prioritized. More processes are being integrated with the dealers than the first and second group of firms. It is interesting to note that firms those which are focusing on customer orientation (as strategic priority) have greater span of integration (even with 2nd tier suppliers) as compared to firms focusing on cost efficiency only. One of the logical reasoning behind high scope and span of integration across multi-tier supply chain is that these firms are working under the umbrella of Japanese cultures and hence are more inclined towards high quality products with consistency and better services. It is observed that firms like, IMCL, HACL, and AHL are extending integration levels almost in all SCM processes across multi-tiers in order to ensure consistency in quality, reduction in delivery time, promote rapid innovations and error free production.

Interestingly, this third group of firms has chosen to integrate CSM, OFP, MFM, SM and PD&C with
the second-tier suppliers. They recognize the need to maintain relationships with supply chain members beyond the first tier suppliers (including 2nd and 3rd tier suppliers). This is due to the fact that auto-part makers (second and third tier suppliers) in Pakistan are still relatively immature and incapable of providing their supplies in an integrated manner. This is reflected in the case studies: some OEMs have a weaker level of integration both with second and third tier suppliers, but other OEMs have extended their integration efforts to the second tier suppliers particularly in the CSM, MFM and OFP processes. These processes are crucial for maintaining the promised service levels and, therefore, at least operational cooperation is required.

Discussion

Our analyses suggest that different firms desire to achieve different level, scope and span of SCM process integration. Their patterns of SCM process integration are closely related to their competitive priorities. Firms focused on cost efficiency only would have a lower level and narrower scope and span of SCM process integration. Firms attempted to prioritize and excel in both cost efficiency and customer orientation put more efforts in improving the levels and expanding the scope and span of SCM process integration. These observations provide the platforms for developing the following propositions:

Proposition 1: Firms that compete on cost efficiency alone tend to have lower level and narrower scope and span of multi-tier SCM process integration.

Proposition 2: Firms which compete on cost efficiency as well as customer service they do so, by implementing higher level and broader scope and span of multi-tier SCM process integration.

Proposition 3: The higher the level and the broader the scope and span of multi-tier SCM process integration the better is firm performance in both cost and customer services.

When expanding the scope and span of integration firms are selective in terms of which SCM processes they focus on. Such firms that are customer-oriented generally maintain a higher level of integration for processes related to customers such as CRM, CSM, DM, OFP and processes related to suppliers such as SM with authorized dealers. In order to achieve cost sufficiency, CSM, OFP, MFM, SM with the dealers and first-tier (and beyond) suppliers are emphasized. There are also some fundamental levels and scopes of integration. Particularly, integration of CRM, CSM and DM processes with dealers is crucial, regardless of the competitive priorities. Integration of CSM, OFP, MFM and SM are important for first-tier suppliers. Our analyses also extend Mejza and Wisner (2001) study by identifying the span (up to third tier suppliers and dealers) of some SCM process integrations across a supply chain. The analyses suggest that critical processes such as CRM, CSM, DM and SM have been integrated beyond the first-tier suppliers and dealers. This finding, which identifies CRM processes being integrated beyond immediate suppliers or customers, is novel in the literature. As expected, due to lower priorities, it was also found that processes such as PD&C and RM, OEMs are being simply maintained at transaction-based interaction level with the preceding channel actors and second and third-tier LSPs and other suppliers.

Proposition 4: Firms selectively maintain high levels of integration for processes that are highly related to cost and customer service performance with the first-tier suppliers and customers and further beyond the first-tier.

Overall, this study presents the first attempt to systematically develop a theory of multi-tier SCM process integration. The study has several contributions. First, this study adds a new perspective in the literature, especially in terms of the desirable level of integration for each of the eight processes, as well as in a multi-tier supply chain perspective. It contributes to the debates concerning the desirable or “right” levels of integration. It adds new perspectives to the concept of “equilibrium point” as suggested by Frohlich & Westbrook (2001). In their seminal work, by Frohlich & Westbrook (2001) argued that periphery-facing (i.e. internal integration along with integration at least at one tier level, either supplier or customer) is the natural “equilibrium point” in terms of integration. Our analyses suggest that the so-
called “equilibrium point” of integration is more the actual level of integration constrained by capability gaps. The integration gaps in CSM, DM and OFP with dealers, CRM and DM with first tier suppliers, CSM, DM and MFM with second tier suppliers we found in this study, are largely explained by the lack of capabilities. A higher level and broader scope and span of integration are desirable, and therefore could be achieved.

Another novel finding worth noting here concerns the influence of the choice of cost and service differentiation strategies on the level and scope of SCM process integration. Furthermore, this is one of the very few studies that systematically demonstrate the strategic integration of SCM processes across a multi-tier supply chain. Previously Chen et al. (2009b) indicate that both cost-orientation and customer-orientation could be related to the scope and span of SCM process integration. Our analyses provide more insights into the processes and their levels and span of integration related to cost and service differentiation strategies. In particular, firms emphasizing cost efficiency are inward-looking, with relatively narrower span and scope of process integration. This corresponds to the theory suggested by Wong et al. (2011) regarding the sensitivity of internal integration to cost-related performance outcomes. Adapting this theory, we can, then, explain why firms with an emphasis on cost. They can more on reducing waste by smoothing the manufacturing flow (MFM) and building up relationships with suppliers (SM) in product development. In contrast SCM processes such as CRM, MFM, OFP and CSM are more related to delivery and flexibility performance and, therefore, firms with service differentiation strategies tend to have higher levels of integration in these processes with longer spans of suppliers and customers.

This study further complements the findings of Mejza and Wisner (2001) and Lambert et al. (1998) and provides the basis for some practical implications. Even though greater levels of integration across multi-tier partners in processes such as CSM, CRM, DM, OFP, MFM, SM and PD&C appear to be desirable. There are many reasons why more asymmetric levels of integration across different tiers of the supply chain and different processes are desirable. In this regard,

It is evident, that superior supply chain performance is a by-product of chain level associations, then that of dyadic or triadic ones. Which strengthen the argument favoring multi-tier SC integration, as a source of superior SCP planning and its implementation. Specifically, this study reveals that certain processes such as CRM, CSM, DM, and SM are the key processes to be integrated particularly with dealers, and first tier suppliers. In the context of Pakistan’s automotive supply chain, an emphasis on the integration with the dealers is reflected in the competitive environment of the marketplace.

Arguably, the roles of first tier suppliers and dealers in CRM are central in nature. Likewise, in order to achieve effectiveness with CSM process, increased integration is recommended through the entire SC. For better DM, this study highlights the primary significance of formal deals, along with first and second tier suppliers. According to the results some other SCM processes that need strong integration across the entire supply chain include OFP, MFM and SM. Finally, this study also reveals that the process of RM is still at its infancy, in countries such as Pakistan because of their squeezed target markets. The levels of integration with first tier suppliers, especially for CSM, DM, OFP, SM and even MFM, should be elevated to the strategic collaboration level in order to achieve better delivery and other operational performance.

**Conclusion**

This study is valuable because, so far, few studies have managed to examine multi-tier perspectives of SCM process integration (e.g., Forza, Romano, & Vinelli, 2000; Mejza and Wisner (2001); Hui, 2004). This study provides managerial accounts and theoretical foundation to explain the needs for different levels, scopes and span of SCM process integration and the extent to which the span of integration (tiers) should be extended. It builds a theory for explaining the competitive priorities as the drivers behind the choices of the level, scope and span of SCM process integration. It reveals that emphasizing on cost
efficiency and service differentiation will have an influence on the types of processes being integrated across multi-tier supply chains. It reveals that, in practice, there is a notion of desirable levels of integration compared to the current levels of integration of various SCM processes across various supply chain actors and tiers. The study also identifies SCM processes that have to be integrated at adequate levels with the first tiers regardless of competitive strategies.

**Limitations and Future Directions**

Despite providing some novel findings, this study is not short of limitations. In order to provide a rich understanding of process integration within a multi-tier supply chain, multiple case studies are chosen. However, that also means the results are valid within the case study settings. To extend the validity of our theories and findings, our approach can be replicated in other industries and countries with larger sample sizes. To verify the competitive priority perspective, further work is required to also statistically prove the links between specific performance and the spans and levels of process integration. In addition, our focus on strategic priorities could have ignored other factors having an influence on the level of integration, one such factor is ability to integrate. Other structural and cultural factors could have an influence as well. Therefore, future studies are required to further advance the theory of differentiated SCM process integration, initiated by this paper.

**References**


of Purchasing and Supply Management, 21(1), 38-50.


