

Supply Chain Integration and Performance: A Literature Review

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ABSTRACT

The purpose of this article is to provide an overview of the literature covering the area of Supply Chain Integration (SCI), Supply Chain Performance (SCP) and other Supply Chain Management Factors (OSCMFs) in Supply Chain Management (SCM). Supply Chain Integration (SCI) is considered one of the major factors in improving supply chain performance. It is provoked by the increasing attention the two fields of SCI and SCP have recently attained, stimulated by an augmenting competitive pressure companies are facing. For supply chain practitioners to realize the existing potentials, effective SCI are necessary. In order to facilitate future research in the field of SCI, which consequently also benefits practitioners; it is necessary to consolidate the extant literature. To do so and to identify promising avenues for future research is the purpose of this article. We provide a literature review that covers the main aspects of SCI, SCP and OSCMFs in context of SCM. To account for quality of publication, the analysis is restricted to top international journals.

Keywords: Supply Chain Performance, Management Factors, OSCMFs

1. INTRODUCTION

Traditionally, companies have measured their performance mainly based on financial perspective. However, in the past two decades, researchers have recognized the weaknesses and vagueness of previous management approaches and have identified several criteria to consider when developing a performance measurement system. We cannot improve what we cannot measure. Measuring performance is the first step for managers to improve any decision-making process in a company. Without understanding the current performance, there is no baseline for managers to set up an improvement plan. Gunasekaran et al. (2001) indicated that Performance measurement and metrics have an important role to play in setting objectives, evaluating performance, and determining future courses of actions.

The earlier era of performance measurement in the industrial supply chain was focused on production. In operations such as automobile production, there are plenty of concrete processes that can be precisely measured.

However, in the modern economy, industries are not mass production driven anymore but knowledge-oriented production driven. In this environment, companies focus more on elusive processes in the supply chain functions, such as customer service. As a result, different performance measurement metrics have increased in the past two decades. Companies are also starting to pay attention to develop an entire performance measurement system instead of individual metrics in measuring supply chain performance. Vaart & Donk, (2008) suggested that Supply chain integration is considered one of the major factors in improving performance.

Lee et al. (2007) have identified that internal integration is the most important contributor to cost-containment while integration with the supplier is the best strategy to achieve supply chain reliable performance. The potential of supply chain integration to be used as a business competitive strategy have been explored in the supply chain literature since the first steps of its development. Now days, supply chain integration is considered to be of significant importance by both academics and practitioners and has

fully emerged as a dominant theme in the supply chain management.

2. GENERAL METHODOLOGY AND PAPER SELECTION

The amount of literature on SCM is growing rapidly. For the present task, we selected 29 journals that can be considered as major academic journals within the area of SCM, and that have contributed to developments in the field of SCM. From these journals, we identified almost all papers from year 1999 onwards with the word Supply chain integration and Supply chain performance in the abstract plus one or more of the words supplier integration and customer integration. From all the retrieved titles, we initially selected a subset of 67 papers. In this selection

process, abstracts were assessed to find out whether or not these papers really fitted with our research objectives. These researches are on the relationship between SCI, SCP and OSCMFs and if not, they were rejected. Table 1 shows the distribution of these papers across the 29 journals in the field of SCM. With respect to SCI and SCP, most researchers choose to look at integration with suppliers and customer and relate that directly or indirectly to the SCP of the focal company.

Our search resulted in a total number of 67 articles in the selected 29 journals. The majority of these articles from the logistics and SCM journals. Within this group of journal maximum articles were published in the two journals "Supply Chain Management: An International Journal" and "Journal of Operations Management" with a total number of 32 articles (Table. 1). From the "International

Table 1: Overview of Journals and Selected Papers

<i>Sr. No.</i>	<i>Name of Journals</i>	<i>No. of selected papers</i>
1	Supply Chain Management: An International Journal	25
2	Journal of Operations Management	7
3	International Journal of Production Economics	3
4	International Journal of Physical Distribution & Logistics Management	3
5	International Journal of Logistics Management	3
6	International Journal of Operations & Production Management	2
7	Journal of Manufacturing Technology Management	2
8	International Journal of operation and production management	1
9	European Journal of Operational Research	1
10	International Journal of Business Management and Social Sciences	1
11	Operation Management Research	1
12	Journal of Systems and Information Technology	1
13	Journal of the Chinese Institute of Industrial Engineers	1
14	Journal of Business & Industrial Marketing	1
15	Journal of Enterprise information Management	1
16	Computers & Industrial Engineering	1
17	Journal of Management Information Systems	1
18	Journal of Management	1
19	International Journal of Services Technology and Management	1
20	Omega	1
21	International Journal of production research	1
22	Journal of Purchasing & Supply Management	1
23	Decision Science	1
24	Business Process Management Journal	1
25	Journal of Business Logistics	1
26	Industrial Management & Data Systems	1
27	Information Systems Frontiers	1
28	Industrial Marketing Management	1
29	Journal of Business & Industrial Marketing	1

Journal of Production Economics”, “International Journal of Physical Distribution & Logistics Management” and “International Journal of Logistics Management”, we see a similar pattern; and selected three articles each. “International Journal of Operations & Production Management” and “Journal of Manufacturing Technology Management”, which provide a total no. of 2 articles and all the other journals, provide a single article each over the 12-year period.

Regarding occurrence of articles there are substantial difference in number of articles can be observed from 1999 to 2011 (please note that the last row/bar only refers to 1 year, while the other rows refer to a 2-year span) (Table. 2). However, the total amount of articles is still moderate, when considering that every journal provides less than one relevant article per year on average. We find minimum article in span 1999-2000, where as we get maximum article (18) in the years 2007-2008.

Table 2: Distribution of Research Articles Over Time

Sr. No.	Years	No. of articles
1	1999-2000	3
2	2001-2002	11
3	2003-2004	6
4	2005-2006	14
5	2007-2008	18
6	2009-2010	13
7	2011	2
	Total	67

The difficulty with this initial grouping is that different authors use a wide variety of items and constructs to measure the identical, or at least closely related, SCM factors. The major SCM factors “supply chain integration”

have suggested by following authors. Marcos et al. (2010) suggested that Supply chain Integration mechanisms may enhance interaction and collaboration in the firm supply chain, especially in the buyer-supplier interface. Zolait et al. (2010) identified that all three dimensions of supply chain process integration were statistically significant to firm performance and also information flow integration shows a greater influence than physical and financial flow integration.

Stuart et al. (2010) identified the influential factors comprising the supplier integration strategy have positive influence on the long-term lean manufacturing adoption in small- and medium-sized firms. Lin (2009) analyzed that supplier integration contributes to the performance of a firm’s time-based competition; some integration practices are more effective than others.

Kim (2009) said that coordination between market-related diversification strategies and supply chain management strategies will lead to better performance than when the two strategies are pursued independently. Richey et al. (2009) finds that firms with a desire to improve, operating in a challenging competitive environment typically experience high levels of performance and barriers to supply chain integration can actually increase the firm’s ability to achieve firm performance. Allen N. Shub et al. (2009) identified the relationship of human resource and organization variables with supply chain integration and performance.

Wong et al. (2008) indicated that the implementation of supply chain integration is found to be associated with environmental uncertainty and institutional norms. Smart (2008) and Sezen (2008) suggested that integration and information sharing are correlated with performance measures, but their relative effect sizes are lower than supply chain design, where as Vaart et al. (2008) and

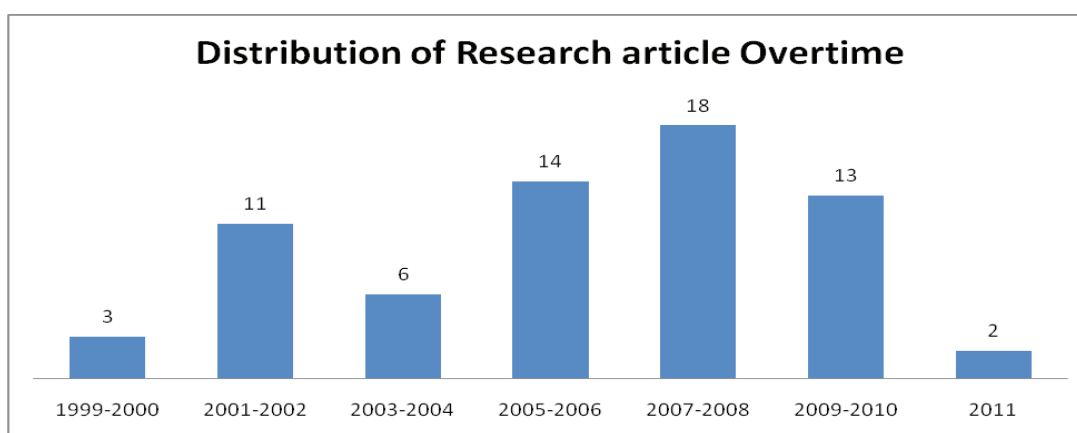


Figure 1: Distribution of Research Articles Over Time

Costes et al. (2007) are suggested that SCI is considered one of the major factors in improving performance.

Quesada et al. (2008) suggested that firms that use delivery, customer service, quality and flexibility as order winners present differences in the extent to which they integrate their external supply chains. Francis (2008) find that the term Supply chain visibility is widely used in the supply chain management and logistics communities many vendors, third party logistics providers, transportation and other companies profess to have or provide it. Where as Percy et al. (2008) identified that larger firms were more likely to use integrative types of e-procurement and Aryee et al. (2008) suggested that companies are still grappling with internal process integration with very few companies achieving closer integration with their customers.

Trkman et al. (2007) identified that business renovation, the effective utilization of information technology and the role of business process modeling and simulation, are all vital in supply chain integration projects. Kim (2006) finds that, in small firms, efficient SCI may play a more critical role for sustainable performance improvement, while, in large firms, the close interrelationship between the level of SCM practices and competition capability may have more significant effect on performance improvement where as Cagliano et al. (2006) is suggested that the adoption of the lean production model has a strong influence on the integration of both information and physical flows along the supply chain.

Stonebraker et al. (2006) find that the stage of life cycle variables is associated with the various dimensions of supply chain integration and Amit Sachan et al. (2006) proposed the models the Total Supply Chain Cost of green supply chain and analyses the effectiveness of the various types of integration possible in the green supply chain. Kannan et al. (2005) suggested that the extent to which just in time, supply chain management and quality management are correlated and they impact business performance.

Bagchi et al. (2005) that supply chain integration affects operational performance and the degree of integration also influences cost and efficiency, while performance has been shown to have improved as a result of collaboration with suppliers and customers alike in areas such as supply chain design, inventory management and customer relationship management (CRM), where as Power (2005) focused on implementation of Supply chain integration processes.

Campbely et al. (2005) identified that the inductive development of a framework for enhancing the integration

of supply chain partners. Zailani et al. (2005) realized that only if the interrelationships among different parts of the supply chain are recognized, and proper alignment is ensured between the design and execution of the company's competitive strategy. Droge et al. (2004) suggested that both internal and external integration are related to time-based performance, which in turn is related to firm performance.

Gunasekaran et al. (2004) suggested that companies are attempting to find ways to improve their flexibility and responsiveness and in turn competitiveness by changing their operations strategy, methods and technologies that include the implementation of SCM paradigm and information technology. Cousineau et al. (2004) presents a description of the implementation of supplier source integration program at a large manufacturing company, and the challenges faced in the pursuit of new processes, methodologies and techniques.

Appelqvist et al. (2004) propose an approach for integration in product life cycle modeling systems and Narasimhan et al. (2002) examines the effect of SCI on the relationship between diversification and a firm's competitive performance. Lambert et al. (2000) identified that successful supply chain management requires cross-functional integration and marketing. Gilmour (1999) States that considerable progress has been made in measuring the performance of the individual elements of the corporate supply chain.

The other major SCM factor "supply chain performance" have identified by following authors. Kurien et al. (2011) presents an overview and evaluation of the performance measures used in supply chain models and Kim (2009) examine the causal linkages among SCM practice, competition capability, the level of SCI, and firm performance. Shub et al. (2009) finds that firms with a desire to improve, operating in a challenging competitive environment typically experience high levels of performance.

Vaart et al. (2008) identified that SCI is considered one of the major factors in improving performance. Sezen (2008) investigate the relative effects of supply chain integration, supply chain information sharing and supply chain design on supply chain performance. Elmuti et al. (2008) shows that positive and substantial improvements in overall performance as a result of integration and coordination of the internal functions within the firm and effectively linking them with their external suppliers.

Richard et al. (2008) examined whether supply chain process variability is a complete or partial mediator of

Table 3: Frequencies of SCM Factors and OSCMFs

<i>Authors</i>	<i>SCI</i>	<i>SCP</i>	<i>OSCMFs</i>
Coronado et al. (2011)			Distribution management, Performance measurement, Closed-loop supply chains
Kurien et al. (2011)		✓	Performance management, Performance measurement.
Kannan et al. (2010)			supplier and customer integration
Marcos (2010)	✓		Internal integration
Zolait et al. (2010)	✓		Firm performance, Information, physical and financial flow integration
Nasiri et al. (2010)			Distribution and inventory management, Inventory control
Stuart et al. (2010)	✓		lean production
Frank Wiengarten et al., (2010)			Collaborative supply chain practices, Information quality, Operational performance
Ru-Jen Lin (2009)	✓		Supplier integration, Firm performance
S.W. Kim (2009)	✓	✓	
Helena Forslund et al. (2009)			Supplier relationship obstacles
Richey et al. (2009)	✓		Firm performance, Performance management
Allen N. Shub et al. (2009)	✓	✓	
Henrik Palsson et al. (2009)			Radio frequency identification technology
Daekwan Kim et al. (2009)			Interfirm activity integration, Interfirm system integration, Supply chain responsiveness, Firm performance
Wong et al. (2008)	✓		
Alan Smart (2008)	✓		
Taco van der Vaart et al. (2008)	✓	✓	
Bulent Sezen (2008)	✓	✓	Information sharing ,Supply chain design
Gioconda Quesada et al. (2008)	✓		Customer satisfaction
Vernon Francis (2008)	✓		Supply chain visibility
Kenneth et al. (2008)			Organizational performance , Logistics performance
Dean Elmuti et al. (2008)		✓	Organizational performance
Pearcy et al. (2008)	✓		E-procurement
Gilbert Aryee et al. (2008)	✓		Organizational performance
Germain Richard et al. (2008)		✓	Supply chain variability
Swink et al. (2007)			Product- process integration
Lee et al. (2007)		✓	Internal integration
Peter Trkman et al., (2007)	✓	✓	Information sharing
Nathalie Fabbe-Costes et al. (2007)	✓		Performance levels
Robert Mason et al. (2007)			Horizontal integration , Transport management
Haozhe Chen et al. (2007)			Firm performance , Firm-wide cross-functional integration
Bhagwat et al. (2007)		✓	Balanced scorecard, Performance measurement
S. W. Kim, (2006)	✓	✓	
Cagliano et al. (2006)	✓		
Das et al. (2006)			Direct communication, Manufacturing cycle times
Eric T.G. Wang et al. (2006)			Information technology, Supplier development
Cousins et al. (2006)			Scheduling, Order management, Forecasting and operational planning
Stonebraker et al. (2006)	✓		Vertical integration theory
Stefan A. Seuring (2006)			Performance management

Amit Sachan et al. (2006)	✓		Supply chain effectiveness, Total supply chain costs
Kannan et al. (2005)	✓		Supply chain coordination
Bagchi et al. (2005)	✓		Information Integration
Damien Power (2005)	✓		
Campbely et al. (2005)	✓		
Suhaiza Zailani et al. (2005)	✓	✓	
Premaratne Samaranyake (2005)			Distribution networks, Visibility, Flexibility and maintainability
Droge et al. (2004)	✓		External integration
Gunasekaran et al. (2004)	✓	✓	Information technology
Pagell (2004)			Internal integration, External integration
Melissa Cousineau et al. (2004)	✓		Supplier source integration
Patrik Appelqvist et al. (2004)	✓		Product life cycle modeling
Romano (2003)			Functional integration, Logistic integration, Information integration, Process integration
M. T. Frohlich (2002)			E- integration, E- business, Operational performance
Narasimhan et al. (2002)	✓		Supplier and customer integration
Bagchi et al. (2002)			Information Integration, Organizational Integration
Fawcett et al. (2002)			Cross-functional process integration, Forward integration, Backward integration
Togar M. Simatupang et al. (2002)			Logistics integration, Information sharing, Incentive alignment and collective learning
Gunasekaran et al. (2001)			
Frohlich et al. (2001)		✓	Arc of integration
Stank et al. (2001)			Internal & external collaboration, Logistical service performance
Charu Chandra et al. (2001)			Overall performance, Coordinated information and material flows
Jeremy F. Shapiro, (2001)			Integrated planning
Remko van Hoek, (2001)			Operational performance, E-business
Lambert et al. (2000)	✓		
Peter Gilmour, (1999)	✓	✓	
Paul Ireland, (1999)			Information technology , Systems integration , Value chain

the relationship between organizational structure and performance. Lee et al. (2007) suggested that internal integration is the most important contributor to cost-containment while integration with the supplier is the best strategy to achieve supply chain reliable performance. Trkman et al., (2007) identified that a combination of these methods how the performance of the supply chain can be improved with the renovation and integration of processes at various tiers in the chain and by the sharing of information between companies.

Bhagwat et al. (2007) develops a balanced scorecard for supply chain management (SCM) that measures and evaluates day-to-day business operations from following four perspectives: finance, customer, internal business process, and learning and growth where as Kim (2006) finds that, in small firms, efficient SCI may play a more

critical role for sustainable performance improvement, while, in large firms, the close interrelationship between the level of SCM practices and competition capability may have more significant effect on performance improvement.

Zailani et al. (2005) suggested that relationship between supplier and customer integration improved supply chain performance where as Gunasekaran et al. (2004) more concern about the improvement their flexibility and responsiveness. Gunasekaran et al. (2001) identified that performance measures dealing with suppliers, delivery performance, customer-service, inventory and logistics costs in a SCM where as Gilmour (1999) States that considerable progress has been made in measuring the performance of the individual elements of the corporate supply chain.

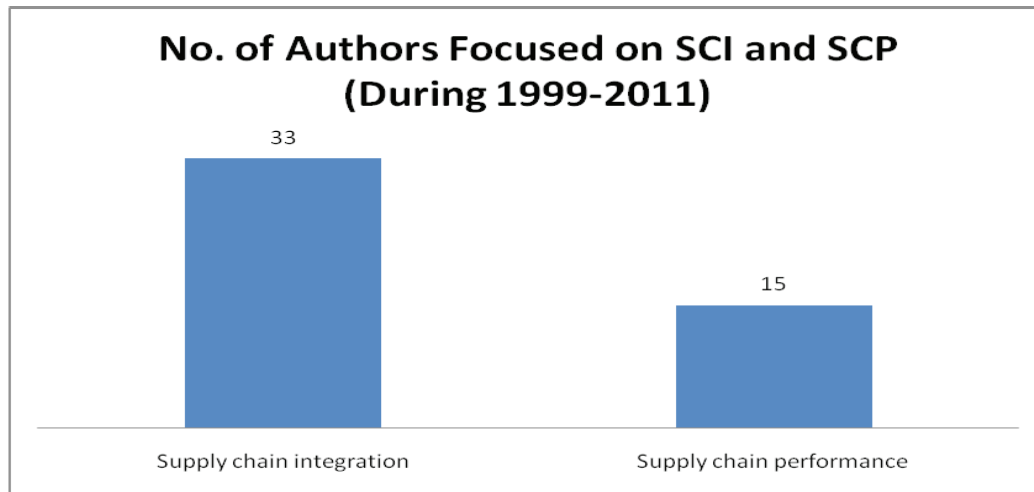
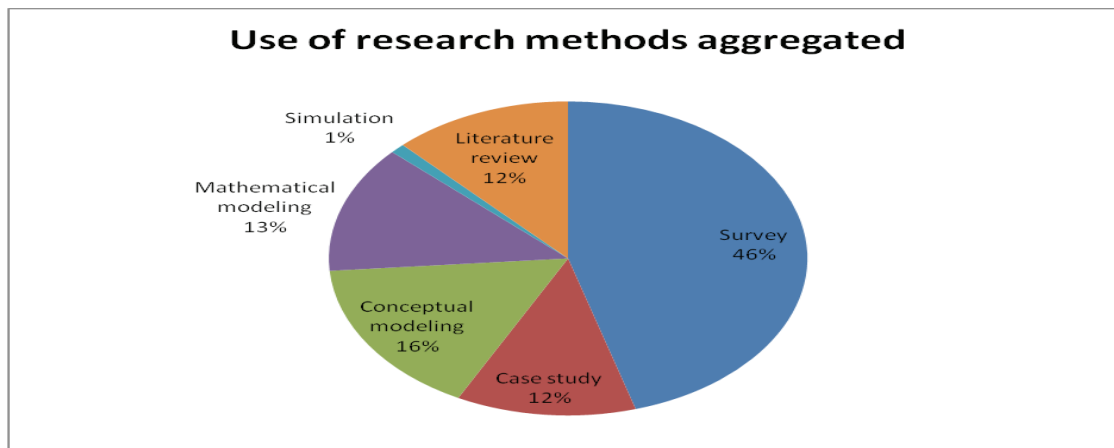
Table 4: Frequencies of Major SCM Factors (SCI and SCP)

Sr. No.	SCM Factors	No. of Authors
1	Supply chain integration	33
2	Supply chain performance	15

The OSCMF “firm performance” have identified by following authors Zolait et al. (2010), Lin (2009), Richey et al. (2009), Kim et al. (2009) and Chen et al. (2007). The OSCMF “organizational performance” have suggested by following authors Kenneth et al. (2008), Elmuti et al. (2008) and Aryee et al. (2008). The OSCMF “performance measurement” have identified by following authors Coronado et al. (2011), Kurien et al. (2011) and Bhagwat et al. (2007). The OSCMF “internal integration” have identified by following authors Marcos (2010), Lee et al. (2007) and Pagell (2004). The SCM factors “performance management” have suggested by following authors

Kurien et al. (2011), Richey et al. (2009) and Seuring (2006) and the SCM factors “information integration” have identified by following authors Bagchi et al. (2005), Romano (2003) and Bagchi et al. (2002).

The OSCMFs, Information Sharing, external Integration, supplier and customer integration, operational performance, logistics integration, manufacturing cycle times and e- business are identified by two authors each and the OSCMFs, Information-physical and financial flow integration, Forward integration, Backward integration, organizational Integration, e- integration, functional integration, logistic integration, process integration, product life cycle modeling, distribution networks, visibility, flexibility and maintainability, supply chain coordination, supply chain effectiveness, total supply chain costs, vertical integration theory, supply chain variability, product- process integration, e-procurement, customer satisfaction have identified by one author each.

**Figure 2:** Frequencies of Major SCM Factors (SCI and SCP)**Figure 3:** Use of research methods aggregated

The OSCMFs, supply chain visibility, supply chain design, interfirm activity integration, interfirm system integration, supply chain responsiveness, radio frequency identification technology(RFID), supplier relationship obstacles, information quality, collaborative supply chain practices, lean production, distribution and inventory management, inventory control, distribution management, closed-loop supply chains, order management, forecasting and operational planning have identified by one author each.

The OSCMFs, balanced scorecard, direct communication, supplier development, firm-wide cross-functional integration, horizontal integration, transport management, performance levels, information technology, systems integration, value chain, integrated planning, overall performance, coordinated information and material flows, internal & external collaboration, logistical service performance, arc of integration, incentive alignment and collective learning, and cross-functional process integration have identified by one author each.

Table 5: Frequencies of OSCMFs

<i>Sr. No.</i>	<i>OSCMFs</i>	<i>No. of Authors</i>
1	Firm performance	4
2	Organizational performance	3
3	Performance measurement	3
4	Internal integration	3
5	Performance management	3
6	Information Integration	3
7	External Integration	2
8	Supplier and customer integration	2
9	Operational performance	2
10	Logistics integration	2
11	Manufacturing cycle times	2
12	Information Sharing	2
13	E- business	2
14	Information, physical and financial flow integration	1
15	Forward integration	1
16	Backward integration	1
17	Organizational Integration	1
18	E- integration	1
19	Functional integration	1
20	Logistic integration	1
21	Process integration	1
22	Product life cycle modeling	1
23	Distribution networks	1

24	Visibility	1
25	Flexibility and maintainability	1
26	Supply chain coordination	1
27	Supply chain effectiveness	1
28	Total supply chain costs	1
29	Vertical integration theory	1
30	Supply chain variability	1
31	Product- process integration	1
32	E-procurement	1
33	Customer satisfaction	1
34	Supply chain visibility	1
35	Supply chain design	1
36	Interfirm activity integration	1
37	Interfirm system integration	1
38	Supply chain responsiveness	1
39	Radio frequency identification technology (RFID)	1
40	Supplier relationship obstacles	1
41	Information quality	1
42	Collaborative supply chain practices	1
43	Lean production	1
44	Distribution and inventory management	1
45	Inventory control	1
46	Distribution management	1
47	Closed-loop supply chains	1
48	Order management	1
49	Forecasting and operational planning	1
50	Balanced scorecard	1
51	Direct communication	1
52	Supplier development	1
53	Firm-wide cross-functional integration	1
54	Horizontal integration	1
55	Transport management	1
56	Performance levels	1
57	Information technology	1
58	Systems integration	1
59	Value chain	1
60	Integrated planning	1
61	Overall performance	1
62	Coordinated information and material flows	1
63	Internal & external collaboration	1
64	Logistical service performance	1
65	Arc of integration	1
66	Incentive alignment and collective learning	1
67	Cross-functional process integration	1

Table 6: Type of Research Methods

Sr. No.	Type of research methods	No. of Papers	% age
1	Survey	30	45
2	Case study	8	12
3	Conceptual modeling	11	16
4	Mathematical modeling	9	13
5	Simulation	1	1
6	Literature review	8	12

When analyzing the selected articles more deeply, almost an even distribution across the main methods (survey, simulation, mathematical modeling, case study, pure conceptual modeling and literature review) can be observed (see Fig. 3). Exceptions from this are simulations (1%), which are employed relatively seldom only, and surveys (46%), which are used more often than other methods.

3. CONCLUSION

This paper started by expressing our concerns regarding the current usage of research in investigating the relationship between SCI, SCP and OSCMFs. Based on an analysis of 67 papers, selected from 29 reputable journals, a number of the concerns have been confirmed. A general conclusion is that many of the studies considered have hardly built on previous work. Most authors seem to develop a new model with new factors and new measurement scales. As a result, it becomes difficult to group the SCM factors into clearly recognizable clusters. We have tried to make three group of authors who are emphasizes on SCI, SCP and OSCMF.

The assessment of how the various authors measure performance and how they relate SCI to SCP also provided a few noteworthy conclusions. Firstly, in many of the survey studies, there is a clear preference for relating SCI with supply chain partners to the SCP of the focal firm as a whole. In doing so, these studies favor subjective measures that relate performance to that of competitors or to that of a number of years previously. Secondly, we observed that, despite our concerns over methodology, the majority of the surveys do report a positive relationship between SCI, and SCP.

We acknowledge that our study is limited, and that not all the relevant journals have been taken into account. However, this does not alter the fact that the concerns and conclusions are valid for the papers studied in this article. Increasing the number of papers taken into account would not resolve any of the points raised above, and in

all probability would increase still further the variety in concepts, factors and measures. It is also quite possible that the authors of some of the articles reviewed share our concerns over the variety in the measures used, but have valid arguments for their own particular choices.

We were able to distinguish three distinct categories of items: those were concerning on SCI, SCP and OSCMF. We argue that this is an important distinction, and one that should be incorporated in future empirical research.

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