Analysing Supply Chain Integration through a Systematic Literature Review: A Normative Perspective

Abstract

Purpose – Over the last decade, Supply Chain Integration (SCI) has gained increasing attention in the Supply Chain Management (SCM) context, both from the practitioners' perspective and as a research area. In realising the global transformations and competitive business environment, a number of organisations are collaborating with their Supply Chain (SC) partners, in order to conduct seamless SC operations. Given the significance of the SCI research area, this paper focuses on systematically analysing and synthesizing the extant research published on SCI area. More specifically, we aim to answer three questions: "*Q1 – What are the factors (e.g. both driving and inhibiting) that influence SCI?*", "*Q2 – What are the key developments (e.g. both in research and industry) in SCI area?*" and "*Q3 – What are the approaches employed/discussed to integrate supply chains?*".

Design/methodology/approach – A systematic and structured literature review is carried out to observe and understand the past trends and extant patterns / themes in the SCI research area, evaluate contributions, summarise knowledge, thereby identifying limitations, implications and potential directions of further research. Thus, to trace the implementation of SCI practices, a profiling approach is employed to analyse 293 articles (published in English-speaking peer-reviewed journals between 2000-2013) extracted from the Scopus database. We followed the Systematic Review Approach proposed by Tranfield *et al.,* (2003), to analyse and synthesize the extant literature on SCI area.

Findings – The analysis presented in this paper has identified relevant SCI research studies that have contributed to the development and accumulation of intellectual wealth to the SCI and SCM area. Each of the 293 papers was examined for achieving the aim and objectives of the research, the method of data collection, the data analysis method and quality measures. While some of the papers provided information on all of these categories, most of them failed to provide all the information, especially for Q2 and Q3 that resulted in 23 and 21 papers respectively.

Research limitations/implications – This study would have benefited from the analysis of further journals; however, the analysis of 293 articles from leading journals in the field of operations and supply chain management was deemed sufficient in scope. Moreover, this research has implications for researchers, journal editors, practitioners, universities and research institutions. It is likely to form the basis and motivation for profiling other database resources and specific operations and SCM type journals in this area.

Practical implications – This systematic literature review highlights a taxonomy of contextual factors driving and inhibiting SCI for researchers and SC practitioners to refer to whilst researching or implementing SCI. It also exemplifies some areas for future research, along with the need for researchers to focus on developing more practical techniques for implementing SCI and improving organisational performance.

Originality/value – The prime value and uniqueness of this paper lies in analysing and compiling the existing published material in relation to Q1, Q2 and Q3, including examining other variables (such as *yearly publications*, *geographic location of each publication*, *type of publication*, *type of research methods employed*), which lacks in the recent published five SCI literature review based articles (by Kim, 2013; Leuschner *et al.,* 2013; Alfalla-Luque *et al.,* 2013; Parente *et al.,* 2008; Fabbe-Costes and Jahre, 2007). This has been achieved by extracting and synthesising existing publications using '*Supply Chain Integration*' keyword. This paper provides a critique of the conceptual and empirical works in SCI discipline and offers research agendas that can stimulate future researchers to carefully explore the topic.

Keywords: Supply Chain Management, Supply Chain Integration, Factors, Developments, Approaches, Profiling, Scopus Database, Systematic Literature Review.

Article Type: Literature Review

1. INTRODUCTION

In a globalised and competitive business environment organisations can no longer function in isolation. Farooq and O'Brien (2012) and Mungan *et al.,* (2010) argue that organisations instead should focus on collaborating with the entire SC (i.e. from raw material supplier, to goods manufacturer, to wholesalers and retailers, through to buyers/consumers) of their business. Organisations understand that to stay ahead of their competitors, the implementation of Supply Chain Management (SCM) is a prerequisite (Chong and Bai, 2014). Nevertheless, owing to the ever-increasing influence and pressures of globalisation, Chuah *et al.,* (2010) note that the organisations and their associated SC partners have not only to be agile within the organisation but at the same time be highly receptive in providing rapid and consistent provision of high-quality products and services cost-effectively. Van der Vaart *et al.,* (2012) affirm that the latter is a necessary underpinning for those organisations that aim to develop a viable competitive advantage, improve SC performance and to sustain at the precursor of excellence in a competitive and hostile market environment. Supply chain management incorporates different insights (e.g. flow of goods, interlinked networks, work-in-process inventory) and has been the object of various research studies e.g., operations management, procurement, marketing, and purchasing and logistics (Halley and Beaulieu, 2009). Over the last two decades, a significant shift in both researchers' and practitioners' thinking and attention towards SCM is evident, predominantly pertaining to the manner in which SC partners interconnect.

According to Stuart *et al.,* (2012) what had conventionally functioned in a combative way i.e. where traders being "cavorted" against other traders in a price-oriented submission process – has been essentially substituted in a more progressive structure including cooperation and strategic supplier-distributor integration. Integration is now extensively considered as the core component of a successful SCM – as rightly defined by Lambert and Cooper (2000, p. 66) "*Supply chain management is the integration of key business processes from end user through original suppliers that provides products, services and information that add value for customers and other stakeholders*". The latter definition evidently articulates the fact that whilst implementing SCM, integration of processes from sourcing, to manufacturing and to distribution across the SC is prerequisite (Richey *et al.,* 2009). From the latter perspective, Vijayasarathy (2010) perceives that integrating business processes within and across organisational environs is an essential element of SCM. For instance by integrating business processes and stimulating information and knowledge sharing, SC partners intent to curtail the interruptions related with the bull-whip effect (Lee *et al.,* 1997). Thus, successful SCM implementation involves a change from handling distinctive functions to integrating activities into strategic SC processes (Themistocleous *et al.,* 2004). The ever-increasing number of research studies on SCM has significantly broadened our understanding of integration and its importance in facilitating the SC partners for developing cooperative relationships, collaborative ventures, sharing knowledge and experiences and sustainable organisational performance.

Despite the significance of SCI as a research area, developing a well-established, integrated and concerted SC network with partnering organisations is still considered as a challenge (Kauremaa *et al.,* 2010). In essence, the latter challenge is related to the relational and functional integration of independent businesses to reduce overheads, increase revenues, and enhance asset consumption. This is supported by Amer *et al.,* (2010) who state that a core dilemma facing organisations today is to understand how to scrutinise and manage the performance across the entire SC (i.e. in the context of functioning as individual entities). According to Chong and Bai (2014) this issue has become problematic for many organisations worldwide as a result of their globalised business environments resulting in the need to operate with international trading partners positioned in distant areas. Aryee and Naim (2008) reports that focusing on incremental steps towards SCI can bring about competitive achievements, nevertheless, aiming on the key SC processes can be a preliminary step towards enhanced performance and SC collaborative ventures. Danese *et al.,* (2013) argues that the concept of SCI is pivotal issue in SCM research area. Although most researchers distinguish that SCI can contribute towards improving SC performance and achieve competitive advantage (e.g. Frohlich and Westbrook, 2001; Halley and Beaulieu, 2009), the discussion is still wide open in the normative literature with more research articles anticipated on SCI focusing on ways to maximise its impact on organisations (Zhao *et al.,* 2011). For instance, after having looked at some recent articles (e.g. Swink *et al.,* 2007; Amer *et al.,* 2010; Kauremaa *et al.,* 2010; Mungan *et al.,* 2010) it is evident that the

concurrent integration of customers and suppliers is deemed as an essential circumstance to guarantee the accomplishment of substantial benefits.

Contrary to the latter argument, Mouritsen *et al.,* (2003) report that analogous levels of SCI implementation practices do not result in equivalent developments whatsoever the context is, henceforth, it is vital to explore the circumstances under which SCI can be more beneficial. In the same disposition, van Donk and van der Vaart (2005) establish the fact that in certain settings a low-level of integration could be an applicable strategy to pursue. Nevertheless, in order to better understand and provide more insights to the concept of SCI, the authors respond to the special issue call on "*Building Theory in Supply Chain Management Through 'Systematic Reviews' of the Literature*" by focusing on the "*Supply Chain Integration*" theme and investigating the extant literature for factors, developments and approaches in this research area. The scope and applicability of SCI solutions and practices clearly indicate that this area can and has addressed a plethora of organisational SC complications (e.g. see Themistocleous *et al.,* 2004; Wong *et al.,* 2013).

1.1 Research Aim

Following the earlier normative research studies (including a meta-analysis) conducted by Fabbe-Costes and Jahre (2007); Parente *et al.,* (2008) and more recently by Alfalla-Luque *et al.,* (2013); Leuschner *et al.,* (2013) and Kim (2013) on SCI (in tandem with firm performance, marketing, information integration, coordination and organisational relationship), this paper attempts to broaden the scope of their reviews by further assessing the factors, developments and different types of approaches employed/discussed in SCI area. Although these researchers have studied different aspects of SCM area, Flynn *et al.,* (2010) and Chen *et al.,* (2013) ague that there is still a lack of a comprehensive and methodical approach to understand the conception of SCI. Moreover, explicitly in respect of the conclusions offered by these five literature review articles (where either the focus is limited to survey-based research articles published in few selected journals with operations management and business logistics orientation or limited number of articles analysed), this research specifically aims to:

> "*analyse, synthesize and present a comprehensive structured analysis of the normative literature in supply chain integration domain to support the signposting of future research directions*"

1.2 Research Objectives

This research intends to assess the extant research published on SCI by employing a profiling approach and to highlight the driving and inhibiting factors influencing SCI implementation, prominent research and industrial developments in SCI area and the approaches employed/discussed to integrate SC. From the empirical findings (using a single keyword i.e. "*Supply Chain Integration*"), initially 370 papers were identified from the Scopus database during the period from 2000 to 2013. After assessing the 370 publications, 293 papers were selected and taken forward for further investigation[1]. Since 2000, a number of academic outlets including among others: *Journal of Operational Management*, *International Journal of Production Economics*, *International Journal of Production Research*, *International Journal of Operations & Production Management*, *Production Planning & Control*, *Supply Chain Management: An International Journal*, *International Journal of Physical Distribution & Logistics Management*, etc., have been dedicated to publishing research on SCI. These sources offer a true reflection of the SCM and SCI areas and have emerged as quality outlets for publishing research in this field. As reflected in Table 1, contributors from across the world have made contributions to the SCM and SCI area. Nevertheless, given the limitations in these existing five SCI literature review studies (as reported earlier in Section 1.1), the rationale for undertaking this research is to provide a comprehensive systematic analysis of the SCI area and in better understanding the different types of factors, developments and approaches. In this respect, a review of the relevant operations and SCM outlets would help to shed light on SCI research to depict the evolution of the domain in future. Thus, the objectives of this paper are to identify the:

- influential factors driving/inhibiting SCI;

[1] Note: For detailed view of how these 293 articles were extracted, refer to the Research Methodology section.

- academic/industrial developments in SCI area; and
- approaches employed/discussed in integrating SC.

To supplement this research and the above three objectives, we also identified the:

- number of publications in each year;
- geographic location of each publication;
- types of integration concept employed/discussed in each SCI publication;
- publication-industry/sector type (i.e. this variable specifically focuses on the type of industry/sector: such as manufacturing, construction, retail, education, fashion apparel, service sector, etc.);
- types of publication (i.e. research or technical paper, literature review, viewpoint, etc.);
- types of research methods employed (i.e. case study, mixed method, analytical, etc.);
- types of data analysis methods employed (i.e. structural equation modelling [SEM], confirmatory factor analysis [CFA], exploratory factor analysis [EFA], etc.); and
- types of journal; and

This type of profiling research is essential in order to establish an understanding of the SCI area and the state-of-the-art growth in the theory and application of SCI within different industrial sectors. This paper is predominantly descriptive and inductive in nature, as the authors were interested in understanding the concept of SCI and its distinctiveness as practiced by different industrial sectors (i.e. as observed from the research articles analysed – see Table 3). In this paper, the authors do not propose any propositions because, as stated by Malhotra (1999), "propositions go beyond research questions since they are testimonials of associations or suggestions rather than simply questions to which responses are required." As a result, the authors intended simply to enhance their understanding of SCI research area, with the opinion that this descriptive information will help guide the development of explanatory models and frameworks with testable propositions in future research endeavours. Thus, by conducting a systematic literature review on SCI, we will contribute to both the academic and professional communities. For researchers, we will present what is identified from the literature (i.e. based on what is presented in the whole of this paper) and suggest some lines for further research (i.e. future research works as presented in Section 5.3). For professionals, we will provide some managerial recommendations regarding the impact of SCI practices and implementation.

The remainder of this paper is structured as follows. Section 2 highlights the significance the SCI area in the context of SCM. Thereafter, Section 3 presents the research methodology highlighting the overall research conducted in this paper. Then, in Section 4, we analyse and discuss the different variables (i.e. objectives) in SCI research studies including responding to the three questions Q1, Q2, and Q3. Finally, conclusions, implications for theory and practice, limitations and future research directions are given in Section 5.

2. SUPPLY CHAIN INTEGRATION: A NORMATIVE PERSPECTIVE

SCI is an emerging multi-dimensional research area that instigates from a systems perspective (Parnaby, 1979) and has been termed as "the definitive fundamental competency of an organisation" (Fine, 1998) to a "facilitator of winning business models" (Lyons, 2003). According to Zhao *et al.,* (2008, p. 374) SCI can be defined as: "*the degree to which an organisation strategically collaborates with its SC partners and manages intra- and inter-organisation processes to achieve effective and efficient flow of products, services, information, money, and decisions, with the objective of providing maximum value to its customers*". As SCI is a multi-dimensional concept (Flynn *et al.,* 2010), literature classifies SCI into two main types, such as: Internal Integration (II) and External Integration (EI) (Swink *et al.,* 2007; Vijayasarathy, 2010; Yu *et al.,* 2013). Internal integration (or inter-functional and inter-departmental integrations) is about collaborating, coordinating and integrating the operational areas within the organisation so that the departments and functions within the organisation function as an interrelated process (Braunscheidel and Suresh, 2009; Yu *et al.,* 2013). Accordingly, internal integration is categorised by overall systems visibility across core organisational functions e.g. procurement, production, logistics, sales, marketing, and distribution (Boon-itt and Wong, 2011). On the other hand, researchers such as Vickery *et al.,* (2003) argue that external integration that

comprises supplier integration (i.e. also relates to upstream integration, involves offering information and directly contributing towards making decisions) and customer integration (i.e. also relates to downstream integration, involves understanding the collaboration between the supplier's products and processes and the customer's business) is more powerful than internal integration, because it is considered as the key strategic approach to acquire competitive advantage in an uncertain environment (Quesada *et al.,* 2008). The significance and scope of SCI studied thus far diverges substantially; however, in the context of this paper, the authors aim to respond to three key questions initially set in the paper (as diagrammatically illustrated in Figure 1) and explained thereafter.

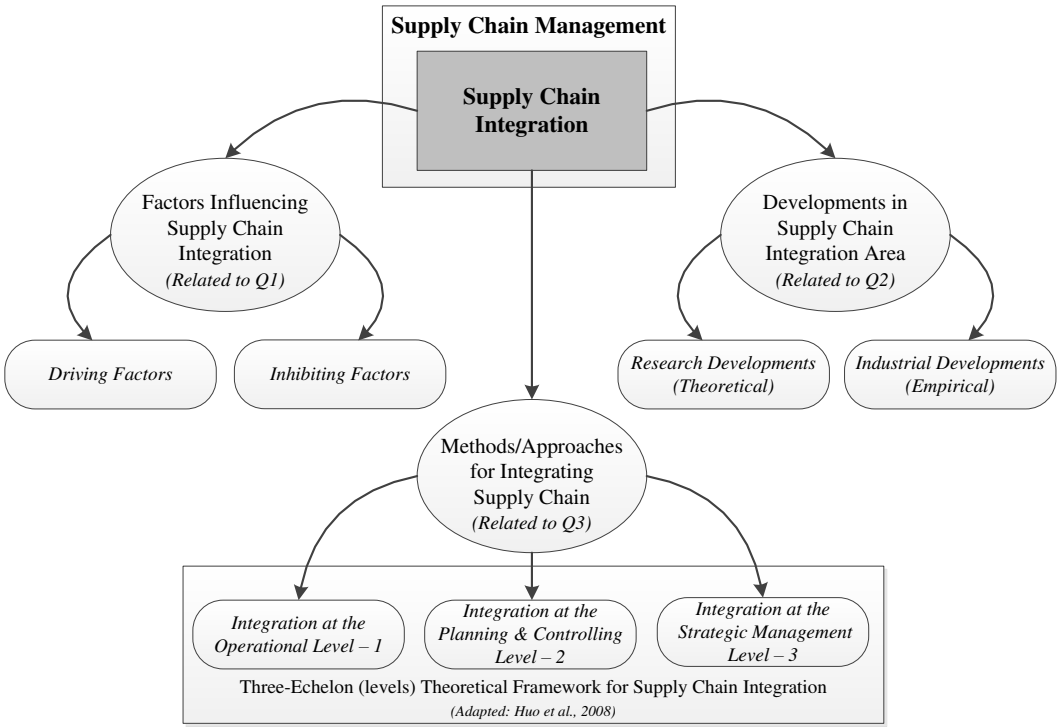

Figure 1: Scope of this Research – Q1, Q2 and Q3

Each of the above is theoretically discussed in the following sections with their empirical findings presented in Sections 4.2, 4.3 and 4.4

2.1 Factors Driving/Inhibiting SCI – Related to Q1

As evident from research articles analysed there are a number of factors that drive as well as inhibit SCI in organisations, such as including among others: firm size (Pagell, 2004); strategic partnership (Ramanathana and Gunasekaran, 2012); interdependence in SC (Vachon and Klassen, 2006); effective communication and coordination (Paulraj *et al.,* 2008). Nevertheless, there are very few studies that claim to report on a comprehensive list of factors. Among the very few studies available are by Bernon *et al.,* (2013) who provide a list of benefits that mainly discuss the link between SCI and organisational performance e.g. including among others are enabling organisations in achieving enhanced process lead times, reduced inventory levels, quality customer service, enhanced process output quality, and increased information visibility. Then we have Pagell (2004) providing an understanding on the factors that enable or inhibit the integration of SC operations, purchasing and logistics, such as enhanced performance, top management support, improved communication, and product development. While the literature has advocated various factors that enable SCI, Chen *et al.,* (2013) assert that among the many reported factors three leading ones emerged from the important journals of operations and SCM e.g. Information Technology (IT) integration, knowledge exchange, and trust between the SC partners. Almost all the articles reviewed as part of this research exercise reported factors driving SCI, whereas few reported on the inhibitors, such as: lack of unified IT infrastructure (Khare *et al.,* 2012); bullwhip effect (Vanpoucke *et al.,* 2009); resistance to change (Hertz, 2006). Among the most cited factors driving SCI are improved firm performance, information

sharing, competitive advantage, improved communication and efficiency and effectiveness of resources.

To address our first question 'Q1', we developed a taxonomy of driving and inhibiting factors for SCI (as presented in Section 4.2) based on the **S**trategic, **M**anagerial, **O**rganisational, **O**perational, **T**echnological, **F**inancial and **E**nvironmental dimensions (adapted from Irani *et al.,* 2014). However, the taxonomy reported herein is an empirical taxonomy of factors derived from the SCI papers reviewed, rather than a normative taxonomy. The analysis and frequency of each driving and inhibiting factor is presented in Section 4.2.

2.2 Research & Industrial Developments in SCI – Related to Q2

The significance of SCI as a research area has been conceptually (i.e. research) and empirically (i.e. including industrial) addressed in the literature and has become well accepted by researchers and practitioners (e.g. McCullen and Towill, 2000; Frohlich and Westbrook, 2001; Halley and Beaulieu, 2009; Flynn *et al.,* 2010; Bernon *et al.,* 2013). Predominantly, this has been brought about by the transformations and developments in the manufacturing and SC strategies, and increased levels of global competitive pressures to enhance service quality and delivery (Ragatz *et al.,* 2002; Cousins and Menguc, 2006). This has enforced many organisations and businesses to reconsider their strategic priorities in bringing innovative solutions for SC related problems in the industry (Laosirihongthong *et al.,* 2011). The latter argument is supported with the recent calls for more systematic exploration of SCI (Zhao *et al.,* 2008; Flynn *et al.,* 2010). This clearly indicates that organisations are needed not merely to enhance their production techniques but to focus on the integration of the supply activities with what SC partners demand (Frohlich and Westbrook, 2001). This encourages confidence among all the SC partners to develop long-term connexions, recurrently communicate, jointly sharing profits and risks, constantly eyeing for ways of sharing information and knowledge and taking collaborative decisions to resolve conflicts.

Nevertheless, further scrutiny of extant SCI literature (articles reviewed as part of the research exercise) uncovers several research and industrial developments i.e. focusing on a number of theories such as Transaction Cost Economics (TCE) theory, Resource-based View (RBV), Contingency Theory (CT), and Fuzzy Sets Theory (FST). Some of the research and industrial developments include e.g. Boyson *et al.,* (2003) provided a solution for the US Department of Defense to develop a portal for their SCI – this project demonstrated the practicability of a real-time support for end-to-end SCM in a complex organisation like the Defense Department. On the other hand from an industrial development perspective, Themistocleous *et al.,* (2004) through their large multinational case study based empirical research emphasised the significance of enhancing SCM through the integration (i.e. employing Enterprise Application Integration [EAI] technologies) of business processes and information systems. Through their empirical research, Themistocleous *et al.,* (2004) addressed the issues of integrating the portfolio of SCM modules both within organisations and through cross-enterprises.

To address our second question 'Q2', we reviewed the papers to extract relevant data on the underpinning theories, models/frameworks proposed, and conceptual contributions from research perspective and from industrial perspective, we focused on case study and survey based research conducted in different industrial sector e.g. manufacturing, transport and logistics sector, automotive, solar energy industry, retail sector, etc., with empirical findings reported in Section 4.3

2.3 Approaches Employed in Integrating SC – Related to Q3

As organisations move towards integrating their internal operations and externally with other SC partners and begin to comprehend the mechanisms of the larger systems to which they belong, such organisations start developing stronger understanding of the scope of SCI (van der Vaart *et al.,* 2012; Chong and Bai, 2014). From the literature analysed, it appears that some organisations focus on upgrading and integrating their SC operations using specific approaches e.g. developing a framework for examining the connexion of collaborative knowledge management practices with SCI and SC knowledge quality (Li *et al.,* 2012), whereas, others focus more on the demand side, specifically seeking to enhance their relationship with their SC partners e.g. by formulating two-echelon single-vendor multi-buyer SC model by applying the vendor and buyers apply Vendor Managed Inventory (VMI) mode of operation (Yao, 2010). Other researchers such as Mason and Lalwani (2006) use a model to exemplify the degree of integration with regards to Third Party Logistics (TPL) providers,

whereas, Tang and Qian (2008) developed a Product Lifecycle Management (PLM) framework to facilitate supplier integration and partnership management in the automotive development process. The analysis indicates that the key to marketplace success is effectively responding to the ever-changing customer needs and this can be achieved by efficiently integrating internal and external operations in parallel (Swink *et al.,* 2007). By doing so, organisations can work towards better provision of significantly enhanced value proposition (Frohlich and Westbrook, 2001; Halley and Beaulieu, 2009; Danese *et al.,* 2013). Organisations need to employ appropriate available SCI approaches to support them carve a place in the ever transforming industrial world.

Consequently, in order to address our third question 'Q3', we reviewed the papers to extract relevant data on the types of approaches employed or even discussed within these research articles. However, to summarise the findings we followed a three-echelon theoretical framework for SCI (Figure 2) proposed by Huo *et al.,* (2008). The empirical findings for this section are reported in Section 4.4

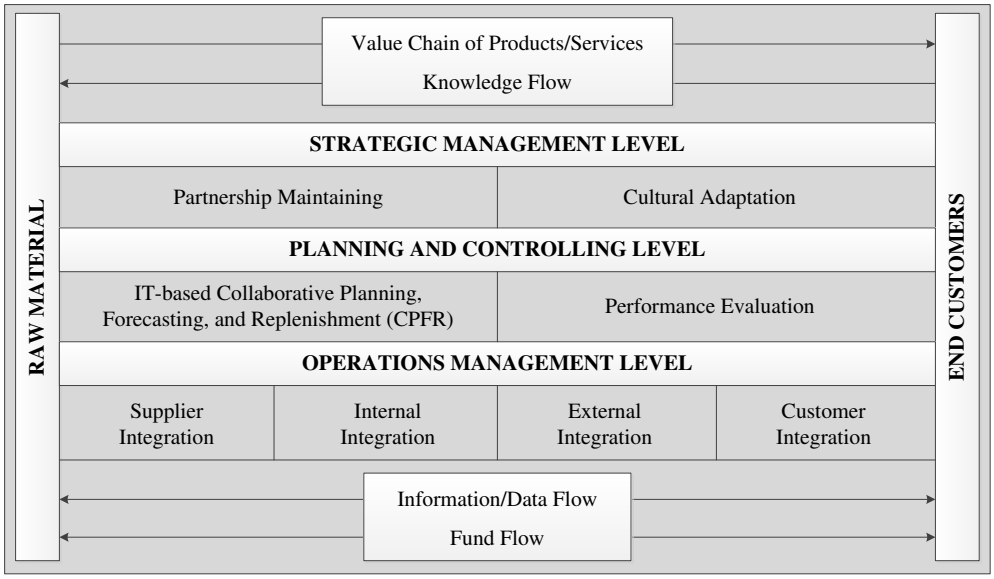

Figure 2: Three-Echelon Theoretical Framework for Supply Chain Integration *(Source: Huo et al., 2008)*

3. RESEARCH METHODOLOGY

Following the research methodology proposed by Tranfield *et al.,* (2003) and successfully employed in previous literature review papers (see e.g. Delbufalo, 2012; Colicchia and Strozzi, 2012; Seuring and Gold, 2012); this study adopts the same systematic literature review design as research methodology to review prior conceptual and empirical research publications on SCI area. According to Alfalla-Luque and Medina-Lopez (2009) and also reported in Alfalla-Luque *et al.,* (2013) the number research publications on SCM is growing rapidly (as evident from the Scopus database with 19,479 papers extracted with '*Supply Chain Management*' keyword from 1982-2014). Moreover, with two special issues dedicated to the SCM area, resulted in literature papers on SC behaviours and relationships, content analysis of SCM area, sustainability and SCM, inter-organisational trust in SC relationships, SC risk management, procurement and supply management, supply networks, and SC agility. As in the words of Tranfield *et al.,* (2003) undertaking a literature reviews to provide the best possible manifestation for enlightening policy and practice in any discipline, is a key research objective for the academic and practitioner communities. This further adds to the significance of such literature review papers that may further result in aiding evidence-based decision-making in the future research endeavours.

The aim of this paper is to analyse, synthesise and present a comprehensive structured analysis of the normative literature on SCI[2] area with a view of developing theory in SCI area. There are other methodologies proposed by reviewing literature e.g. Grounded Theory as a methodology for

[2] Note: The papers extracted from Scopus database are only from Journals and not from conference proceedings or in any other form of publication.

rigorously reviewing the literature by Wolfswinkel *et al.,* (2013). This methodology is less rigorous and thorough compared to the one adopted in this paper. Moreover, the research methodology adopted in this paper differs from the conventional narrative reviews by being more systematic, structured and explicit in the selection of the studies in SCI area (at every stage in this paper), including employing rigorous and reproducible methods of evaluation (Denyer and Tranfield, 2009). According to Delbufalo (2012) a systematic and structured literature review is designed to:

- Support in producing a sense of mutual effort, significance and directness between the research studies in order to inhibit unproductive recurrence of effort,
- Support in connecting potential research to the queries and issues that have been modelled by previous research studies (e.g. most of those paper reviewed as part of this research exercise) and, lastly
- Develop the approaches employed to assemble and synthesize preceding pragmatic evidence.

The systematic review carried out in this paper follows the three-phase approach delineated by Tranfield *et al.,* (2003) and diagrammatically presented in Figure 3:

- Phase I – Planning the Review Process
    - Defining the research aim and objectives (I.1); preparing the proposal (I.2) and developing the review protocol (I.3);
- Phase II – Conducting the Review Process
    - Identifying, selecting, evaluating and synthesizing the pertinent research studies; and
- Phase III – Reporting and Dissemination of the Overall Research Results
    - Descriptive reporting of results and thematic reporting of journal articles.

Following three-phase approach, the next subsection 3.1 summarises the research protocol (Phase I.3) as the defining of the aim and objectives including the proposal (I.1 and I.2) have already been presented in the introduction (under subsections 2.1 and 2.2). Sub-section 3.2 describes the Scopus database searching process of the relevant articles (Phase II). Finally, the reporting and dissemination the overall results (Phase III) will be discussed in Section 4 and with Section 5 concluding the paper.

3.1 The Research Protocol (Phase I.3)

The research review protocol was developed around three questions as outlined in the abstract (i.e. Q1, Q2, and Q3) by following the prescriptive three phased approach. As this literature review focuses on identifying the factors influencing SCI, research and industrial developments in SCI and approaches employed/discussed in integrating SC, it was necessary to considered the domains for this research synthesis as both conceptual and empirical (including both qualitative and quantitative) papers. The research protocol for this literature review paper provides details on the following two points (as also followed by Delbufalo, 2012):

- Point I – Conceptualisation of the factors enabling SCI, research and industrial developments in SCI and approaches employed/discussed in integrating SC (as discussed in subsections 2.1, 2.2 and 2.3).
- Point II – Typology of research studies to be considered in this review exercise and the suitability gauges.

In view of the above, several selections in relation to the typology of research studies to be counted in and the suitability conditions (i.e. the inclusion and exclusion gauges) have been made (Point II), as delineated below:

- *Condition 1* – The review was conducted by searching the Scopus databases. The reasoning for choosing the Scopus database was that it covers nearly 18,000 titles from over 5000 international publishers, including coverage of around 16,500 peer-reviewed journals on different areas. Therefore, it is possible to search for and locate a significant proportion of the published material on SCI area.

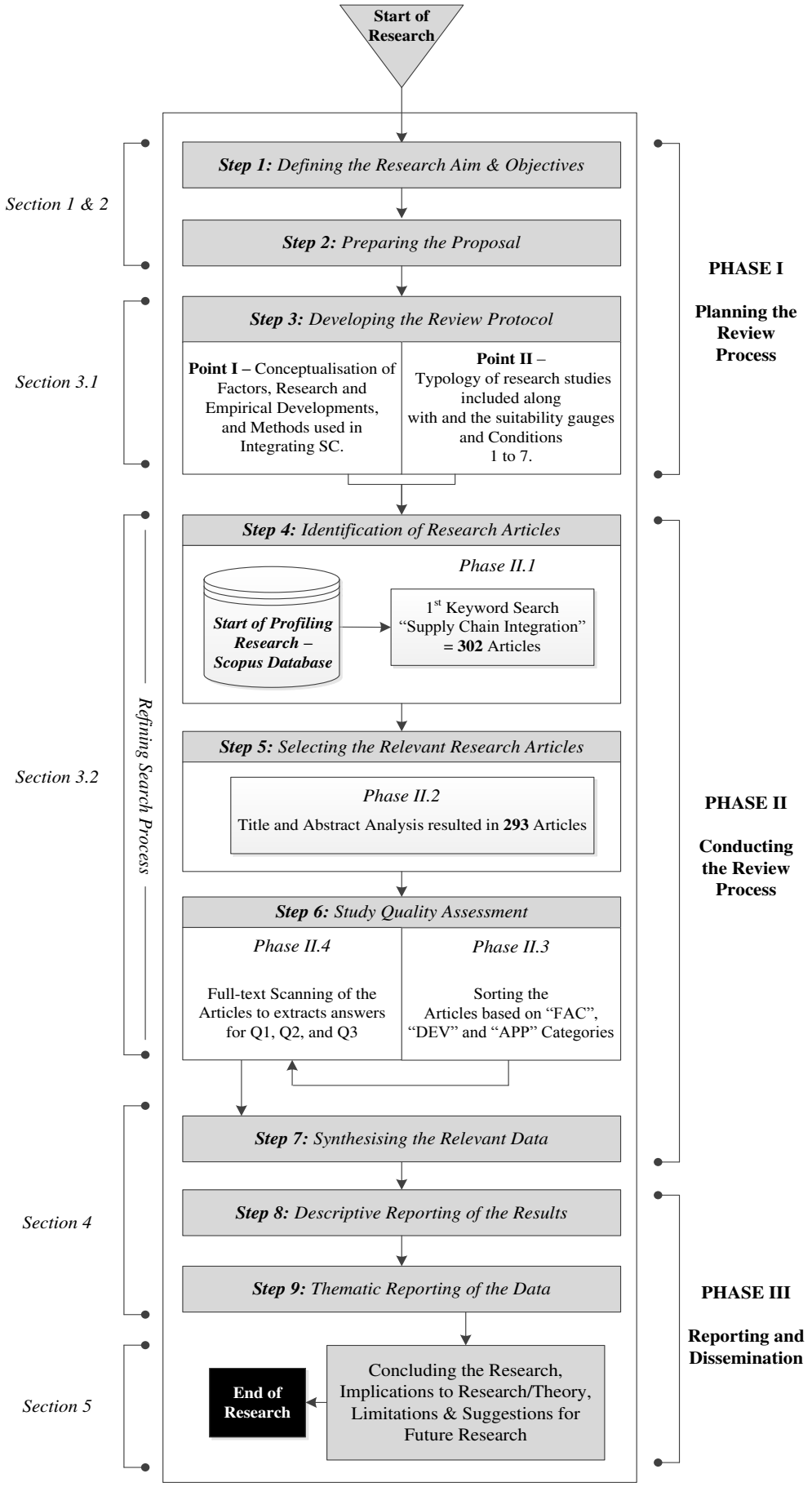

Figure 3: Research Design – Systematic Literature Review Process
(Phases as proposed by Tranfield et al., 2003)

- *Condition 2* – To focus on enhancing quality control (as suggested by David and Han, 2004) only published peer-reviewed journal articles were considered by selecting 'Article' option from the Document Type option. Other document types such as trade publications, books series, article in press, book or book chapter, conference proceedings, and editorials were omitted.
- *Condition 3* – Following David and Han's (2004) enhancing quality control policy, on those articles were selected that were published between January 2000 and December 2013.
- *Condition 4* – Articles published in English language were only selected, excluding the articles published in Chinese, Spanish and Persian.
- *Condition 5* – As the focus of the questions (Q1, Q2 and Q3) is varied, thus it was ensured that the selected articles were not only empirical based (i.e. case-study, survey, results, statistic, etc.) but also those paper that were essentially conceptual so as to identify conceptual research developments in SCI area, including factors that drive and inhibit SCI and approaches used in integrating SC.
- *Condition 6* – Articles' applicability was confirmed by requiring that selected articles contained "Supply Chain Integration" as key phrase throughout the paper including, title, abstract, keywords and the thereafter the whole paper.
- *Condition 7* – Final substantive applicability was confirmed by reading the remaining whole article for essential research perspective and satisfactory empirical data. The latter process forced the alignment between the selected articles and the research review objectives.

The abovementioned conditions itemised in seven points were all firmly followed so as to conduct an effective and reproducible database examining process as pronounced in the following subsection.

3.2 Scopus Database Searching Process and Results – Phase II

Delbufalo (2012) developed a four stage database searching process. This section reports on the steps and activities of the process and demonstrates the outcomes both descriptively and synthetically by searching for relevant articles through the Scopus database.

- *Phase II.1* – Only a single keyword was entered into the Scopus database following the conditions 2, 3 and 4 in subsection 3.1. This process resulted in 370 publications, of which 302 were left as relevant after filtering according to the barring conditions (with 68 articles were not accessible at the time of searching process).
- *Phase II. 2* – A title and abstract analysis was thereafter conducted on the extracted articles based on the conditions 5 and 6. Furthermore, after analysing each individual paper the following nine types of articles were eliminated: six general review papers (i.e. viewpoint/commentary) and three research notes. At the end of this process, 293 articles were considered for further investigation.
- *Phase II.3* – For this step, the authors followed the quality criteria matrix as adopted by Pittaway *et al.,* (2004) and followed by Delbufalo (2012). In this step, the selected 293 articles were further scanned through for searching for both conceptual as well as empirical studies through the criteria highlighted in conditions 6 and 7. By doing so, all articles were grouped into three categories (i.e. FAC refers to Factors, DEV refers to Developments and APP refers to Approaches):
    - Category "FAC" was defined to incorporate all the studies as certainly pertinent because each article either reported or discussed on either a single or more than one driving or inhibiting factors. Thus, all 293 articles were selected for this category. Nevertheless, after analysing the papers for factors (only) all the 293 papers reported on driving factors, whereas, 63 articles reported on inhibiting factors. So for this category all the 293 papers resulted as productive.
    - Category "DEV" was defined for those studies that were relevant for extracting information on research as well as empirical developments. In doing so, 23 articles were finally selected to extract relevant information on key research and industrial developments. It was not possible to include all the 293 articles to fulfil the requirements of Q2, as a result of this; the authors filtered these articles according to the quality of journal (Miemczyk *et al.,* 2012). To certify that only the highest quality

research and industrial development is considered, our analysis for this category specifically focuses on articles published in major English-language European and North American journals. In doing so, the analysis considers only those articles published in journals that are included in the most recent available Association of Business Schools (ABS) ranking, as this journal classification draws from several other highly considered journal quality rankings. As argued by Miemczyk *et al.,* (2012) that although any journal standing is unavoidably debatable, the ABS ranking is extensively regarded as providing a consistent degree of research thoroughness and excellence. Off the 122 types of journals reported in Table 6 (Section 4.1.9), the authors further filter and extracted 59 journals, out of which five journals were rated as 4*, 23 journals rated as 3*, 19 journals rated as 2* and 11 journals 1*. From this list, the authors selected 145 articles published in 28 journals with 4* and 3* ranking for further investigation. After thoroughly analysing the 145 articles, 23 articles were finally selected to respond to DEV category.

- Category "APP" was defined for those studies that reported on approaches employed/discussed in integrating SC or used/discussed in SCI literature. For this category, the articles further analysed were the same as selected for DEV category i.e. 145. This exercise finally resulted in 21 articles for further investigation.

As a result of the above three categories, 293, 23 and 21 articles were considered applicable for responding to Q1, Q2 and Q3, respectively. The applicability assessment was considered as relative, to the degree that the authors' decrees were focused on facets defined within the scope of the review process.

- *Phase II.4* – In this final step, beginning within the FAC category and followed by DEV and MET categories, the full-text version of 293 articles were read thoroughly for FAC (i.e. here the authors reviewed the papers thoroughly to identify the driving and inhibiting factors influencing supply chain integration implementation/practices in organisations), 23 articles for DEV (i.e. here the authors examined the papers thoroughly to identify the key developments [both in research and industry] in the supply chain integration area) and 21 articles for APP (i.e. here the authors reviewed the papers thoroughly to identify the approaches employed or discussed to integrate supply chains) categories, so as to confirm substantive relevance both conceptually and empirically as mentioned in conditions 6 and 7. In order to respond to each Q1, Q2 and Q3 questions, we reviewed each paper to identify the factors (Q1), key developments (Q2) and approaches (Q3) at the same and note on a spreadsheet. However, to authenticate our findings for Q2 and Q3 specifically, we reviewed the papers again to endorse our findings.

This latter analysis was conducted descriptively using a standard template adapted from the works of Delbufalo (2012) to make it relevant to the context of this paper. Besides extracting data related to Q1, Q2 and Q3, this descriptive investigation also produced graphs and tables designed to contain the yearly publications, region of the first author, region(s) of the co-author(s), type of publications, research methods employed, types of integration concept employed/discussed in SCI literature, data analysis approach(s), underlying theory(s), journal name, and context type for all 293 articles. Regarding author and co-authors' analysis, we initially focused on identifying the most productive author(s) and co-author(s) i.e. authors with most number of publications. After reviewing the papers, it was noted that all the authors had no more than one or two publications from the 293 articles extracted. For this reason, the data on first author and co-author(s) was excluded.

4. SUPPLY CHAIN INTEGRATION: EMPIRICAL FINDINGS

4.1 Findings, Analysis and Discussion on Variables

The findings of this study are now presented under different subsections. Each of the nine subsections discuss on the findings in relation to a particular variable.

4.1.1 Yearly Publications

As presented in Figure 4, the largest number of publications were recorded for year 2010 (with C[3] = 44, 15.02%), followed by year 2013 (with C = 39, 13.31%) and year 2011 (with C = 32, 10.92%). With fewer publications (i.e. below the 10 mark) were recorded for 2001 (with C = 9, 3.07%), 2000 (with C = 2, 0.68 %).

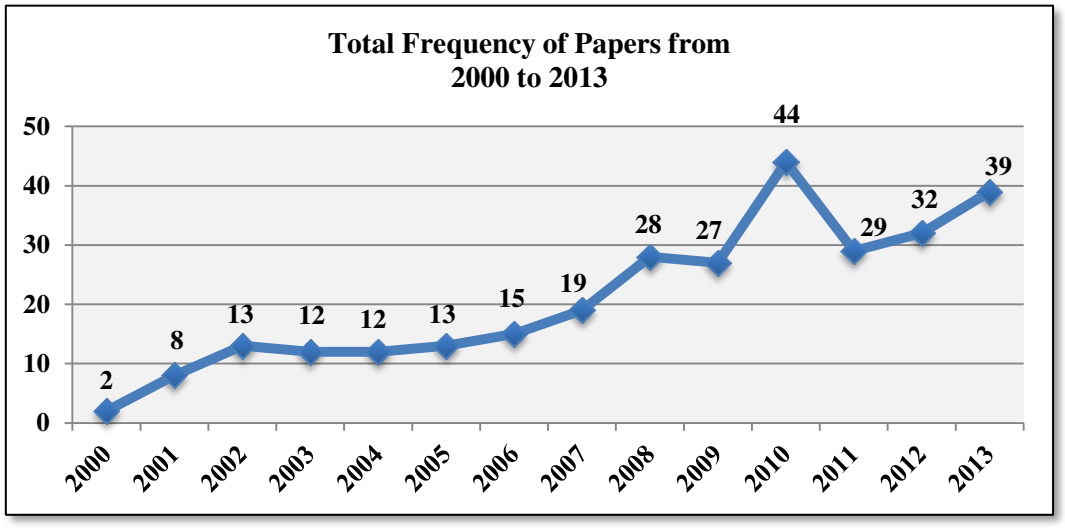

Figure 4: Total Number of Papers Published between 2000 and 2013

Figure 4 noticeably highlights the trend of an increasing number of journal publications in the SCI area from 2000 (January) onwards, until 2011 where a slight decline is noticed. However, since 2011 onwards until 2013 (December) an increase in publication was observed. This increasing trend clearly signifies the significance of the SCI area. On a separate note, the same goes for SCM area i.e. from 2000 onwards where the number journal articles published were 217 in 2010/2011 the figure crossed the 1000 mark to 1,197 articles in 2011[4]. On the whole this increasing trend in the publications highlights the awareness and importance of this area among the researchers and practitioners. As reported earlier, this increasing trend in SCM and SCI publications is supported by Alfalla-Luque and Medina-Lopez (2009) and Alfalla-Luque *et al.,* (2013). However, to some extent the conceptions by these researchers is negated as there is a relative decrease in the number of papers in the year 2011 (with C = 29, 9.87%) compared to the previous year 2010, with 44 papers published. Same goes for SCM publications specifically i.e. in 2011 the number of journal articles were C = 1,197, whereas, in 2012 and 2013 the number of publications reduced to 847 and 786[5], respective. Nevertheless, as compared to the SCM research area, this research has seen limited number of papers on the whole SCI area (not just in the earlier part of the last decade). The reasons for fewer number papers published may be attributable to the fact that SCI is relatively a newer research area (Flynn *et al.,* 2010), and as a result there is limited harmony as to how to capture the real essence of SCI (van der Vaart and van Donk, 2008). On the other hand, the number of publications gradually started to increase 2011 to 2013 i.e. from C = 29 to C = 39. Despite these numbers and given the significance of the SCI area it is anticipated that extensive research is still required to develop possible reference frameworks on which future research could be based for further consolidation of the area itself and knowledge in SCI (Alfalla-Luque *et al.,* 2013).

4.1.2 Number of Regions (Geo-Spatial Coverage)

Table 1 highlights the number of publications from 39 different geographical regions across the globe between 2000 and 2013 on SCI. The total number of 740 seems different to the 293 publications – this is because we added the geographical regions of the co-authors as well. It was considered wise to add these regions otherwise it would have merely indicated that each paper was single authored, which is

[3] C = Count.
[4] These figures as extracted from the Scopus database are accurate as of 31/12/2013.
[5] Same as 5

highly unlikely. From the total number of publications (i.e. 293) analysed, the largest number of contributions came from the USA region (C = 216, 29.18%) – the 216 figure is the total number of researchers across all the 293 publications. This huge figure indicates that there may have been more than one author in the paper but from the same USA region. This is followed by UK (C = 94, 12.70%), China (C = 63, 8.51%) and Taiwan (C = 35, 4.73%). The results in Table 1 evidently specify that the first seven regions have a lead on SCI research area i.e. the upward trends in the first seven regions noticeably indicate that there are clear signals of the growing interest in the SCI area in those regions. The least number of publications came from Hungary, Portugal and Romania with a single publication each. This skewed depiction raises a vital research agenda for SCM and SCI researchers to explore: whether this position is a result of a global SCM digital divide or whether it is due to a lack of interest or lack of essential knowledge and proficiency to undertake SCI research within such countries (i.e. more specifically those regions with five or less publications). In either case, the problem of a potential global SCI divide needs to be examined and academics from countries such as the USA, UK, China, Taiwan, Italy, Canada, Hong Kong, The Netherlands, Korea, Spain, Sweden, and other European countries should contemplate collaboration with researchers from under-represented regions so as to undertake more productive research which is critical to the global emergence of SCI.

Geo-Spatial Coverage	Frequency of Publications	Per cent	Geo-Spatial Coverage	Frequency of Publications	Per cent
USA	216	29.18%	France	7	0.94%
UK	94	12.70%	South Africa	6	0.81%
China	63	8.51%	Belgium	6	0.81%
Taiwan	35	4.73%	Greece	5	0.67%
Italy	30	4.05%	Ireland	5	0.67%
Canada	24	3.24%	Thailand	5	0.67%
Hong Kong	24	3.24%	Turkey	5	0.67%
The Netherlands	20	2.70%	Denmark	4	0.54%
Korea	20	2.70%	Serbia	4	0.54%
Spain	19	2.57%	Mexico	3	0.40%
Sweden	18	2.43%	Norway	3	0.40%
India	17	2.29%	Saudi Arabia	3	0.40%
Iran	16	2.16%	Switzerland	3	0.40%
Australia	14	1.89%	UAE	3	0.40%
Slovenia	13	1.75%	Brazil	2	0.27%
Germany	11	1.48%	Cyprus	2	0.27%
Finland	10	1.35%	Hungary	1	0.13%
Malaysia	9	1.21%	Portugal	1	0.13%
New Zealand	9	1.21%	Romania	1	0.13%
Singapore	9	1.21%	**Total**	**740**	**100%**

Table 1: Frequency of Publications in each Geographical Location between 2000 and 2013

4.1.3 Types of Integration Concepts Employed/Discussed in each SCI Publication

Integration in the context of SCI area is categorised as either internal integration or external integration (Swink *et al.,* 2007; Vijayasarathy, 2010; Yu *et al.,* 2013) with its individual extensions to customer and supplier integration, horizontal or vertical integration, forward or backward integration to downstream and upstream integration, etc. (Vickery *et al.,* 2003; Prajogo and Olhager, 2012). In this research 'search' exercise, we identified different types of integrations undertaken or discussed within the articles reviewed. This exercise was intentional conducted in order to identify a list of terminologies used as part of the SCI research area to further understand the scope and scale of this area. Although each of them may be related to the prime concepts of internal and external integration at different levels, they were individually discussed or critiqued as a significant component of SCI in the literature. From the findings reported in Table 2, supplier, internal, customer, external, vertical, information and process integration types are predominantly discussed in the literature. A number of research studies refer to these types of integration concepts as SCI dimensions. For instance, Flynn *et al.,* (2010, p. 59) report that SCI is a multi-dimensional conception and that the diverse dimensions of SCI can eventually be divided into three dimensions: customer, supplier and internal. On other hand,

Lau *et al.,* (2010a) exhibit through their research that SCI involves three dimensions, i.e. supplier, customer and internal integration, and it involves several organisational processes that cut across these three dimensions. Thus, SCI should be seen as a multifaceted concept, which requires a fine-grained empirical analysis (Campbell and Sankaran, 2005).

Type of Integration Employed/Discussed within SCI Reviewed Literature	Frequency Count
Supplier Integration	77
Internal Integration	75
Customer Integration	58
External Integration	52
Vertical Integration	43
Information Integration	39
Process Integration	36
Business/Organisational/Firm Integration (inter, intra)	26
Downstream Integration	23
Upstream Integration, IT Integration (Infrastructure)	21 (each)
Enterprise Integration (inter, intra, cross, multi), Functional Integration (inter, cross)	19 (each)
Logistics Integration (marketing, production)	17
Application Integration, Electronic Integration	14 (each)
Systems Integration	12
Network Integration	10
Forward Integration	9
Backward Integration, Operational Integration	8 (each)
Horizontal Integration, Virtual Integration, Data Integration, Design Integration	7 (each)
IS/ICT Integration	6
Resource Integration	6
B2B Integration, Demand Integration	4 (each)
Value Chain Integration	3
4PL Integration, Supply Integration, Service Integration, Back-End Integration	2 (each)
Knowledge Integration, Database Integration, Fractal Integration, Distributor/Distribution Integration, Production Integration, Myopic Integration, Relational Integration, Semantic Integration, Workflow Integration, Schema Integration	1(each)

Table 2: Frequency of Type of Integration Employed/Discussed within SCI Literature between 2000 and 2013

4.1.4 Publication-Industry/Sector Type

From the total of 293 publications selected, a list of 34 context types was used by different researchers, academics and practitioners across the world to publish their research. Manufacturing industry can be divided into three divisions such as the heavy manufacturing (e.g. large scale industries, big plants covering large area and capital intensive), light manufacturing (e.g. developing small products procured by individual consumers, small-scale units, and with limited investment capital) and high-tech manufacturing (e.g. making high-value products using state-of-the-art technology, housed in small units with at times with heavy capital investments to do research and development) (e.g. McCullen and Towill, 2000; Lau *et al.,* 2010a; Mungan and Sarker, 2010). In this context, most of the context types reported in Table 3 fall under this manufacturing sector category, but as the type of organisations was specifically mentioned, we counted them as separate. A relatively similar categorisation of paper context type is conducted by Dwivedi *et al.,* (2008). According to the findings illustrated in Table 3, 'Manufacturing Sector' was the most researched (with C = 147, 50.17%), followed by papers that did not specifically mention the sector names, thus were categorised under the 'General View of SCI Literature' (C = 27, 9.21%) and 'Automotive Sector' (with C = 19, 6.48%). The 'Various Sectors' category was selected for those papers that either focused on more than case study or conducted surveys in across different sector organisations e.g. one paper focused on "Hard Disk Drives & Telecommunication Industry, Steel Industry, and Biochemistry industry". The remaining context types and their frequencies and percentages are presented in Table 3.

Publication-Industry/Sector Type	Total Frequency	Per cent
Manufacturing Sector	147	50.17%
General View of SCI Literature	27	9.21%
Automotive Sector	19	6.48%
Food Sector, Retail Sector, Various Sectors	11 (each)	3.75% * 3
Construction Sector	10	3.41%
Electronics Sector	7	2.38%
Transport and Logistics Sector	6	2.04%
Seaport Sector	5	1.70%
Computing Discipline	3	1.02%
Petroleum Sector, Service Sector, SMES, Textile Sector	3 (each)	1.02% * 4
Financial Service Firms, Healthcare Sector Package Printing Sector, Telecommunication Sector	2 (each)	0.68% * 4
Aeronautics Sector, Beauty & Personal Care Sector, Chemical Sector, Defense Sector, Education Sector, Government Sector Engineering Sector, Fashion Apparel Sector, Grocery Distribution, IT Sector, Large Multinational Organisation, Paint Sector Semiconductor Sector, Shipping Sector, Solar Energy Sector, Virtual Enterprises	1 (each)	0.34% * 16
Total	**293**	**100%**

Table 3: Frequency of each Publication-Industry/Sector Type between 2000 and 2013

4.1.5 Types of Publication

In this section, the authors categorise their list of 293 papers based on the type of publication. The authors used a fairly similar list of publication types to that employed by Dwivedi and Mustafee (2010). This list is also similar to those identified by the publisher – Emerald. The data presented in Figure 5 demonstrates that the vast majority of the publications are research papers (C = 253, 86.35%), followed by literature review (with C = 14, 4.78%) and case study and conceptual papers (with C = 12, 4.09%, respectively). The remaining publication type i.e. technical papers were omitted anyway following conditions narrated in the research methodology section. The large number of research papers clearly indicates the significance of the SCI area in different sector organisations (primarily manufacturing sector) and that most researchers and practitioners are focused on developing and proposing SCI solutions to different issues e.g. developing optimum replenishment policy using a simple algebraic method to solve the n-stage, multi-customer, non-serial SC inventory problem, difficulties encountered in integrating SC in the UK construction industry.

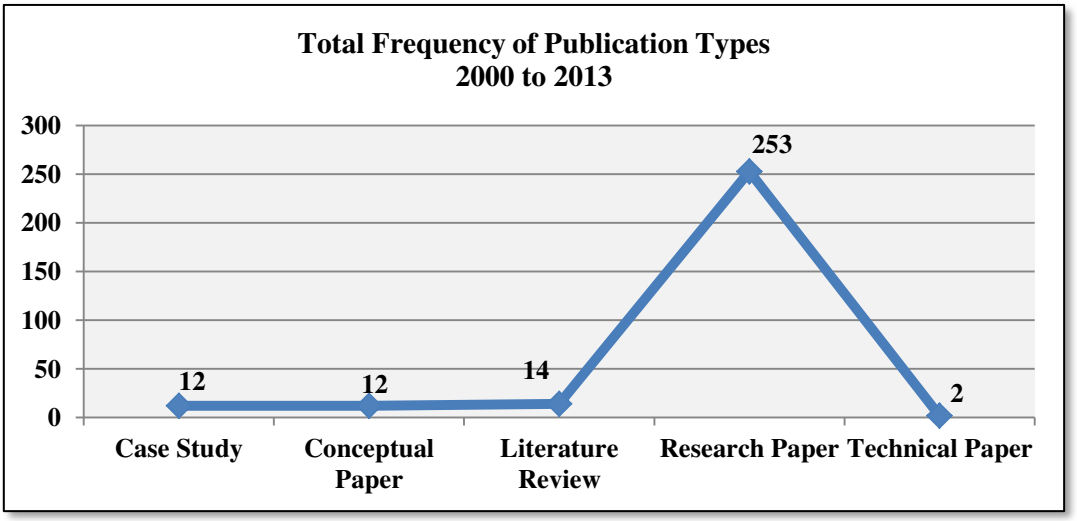

Figure 5: Classification of Publication Types between 2000 and 2013

4.1.6 Types of Research Methods Employed

The research methods employed by the SCI researchers in the selected 293 papers were coded under different categories with previous research studies by Dwivedi *et al.,* (2008), Dwivedi and Mustafee (2010) following similar categories. The readers are referred to these studies to find comprehensive information on the research method categories. The findings suggest that although a total of 13 different research methods were recorded from our data analysis, the majority of studies employed survey-based research method (C = 121, 41.30%) – this mainly included mail or web survey as the methodological approach, followed by case study (C = 63, 21.50%) and conceptual / descriptive / theoretical (C = 27, 9.21%) methods. With regard to the analytical method (with C = 25, 8.53%) – it was denoted as a combination of five different methods i.e. statistics, computer programming, simulation, algorithm and mathematical modelling, as also followed by Dwivedi and Mustafee (2010) and Irani and Kamal (2014). A small number of the selected articles employ mixed method (with C = 8, 2.73%) approach to conduct their research. As reported by Jack and Raturi (2006) that the use of triangulation in the SCI research can develop the comprehensiveness of the investigation more than a single research method (Jack and Raturi, 2006). Although the number of studies focusing on mixed method approach is limited, given the significance of this approach (as both the approaches complement each other) we anticipate to have research studies in the future conducting SCI research employing mixed methods approach. Jack and Raturi (2006, p. 316) reports that the use of mixed methodology may positively impact on the validation of the research: triangulation should further develop "the ability of researchers to draw conclusions from their studies and might result in a more robust and generalisable set of findings" (Jack and Raturi, 2006, p. 316). The other categories with their associated counts and percentages are presented in Figure 6.

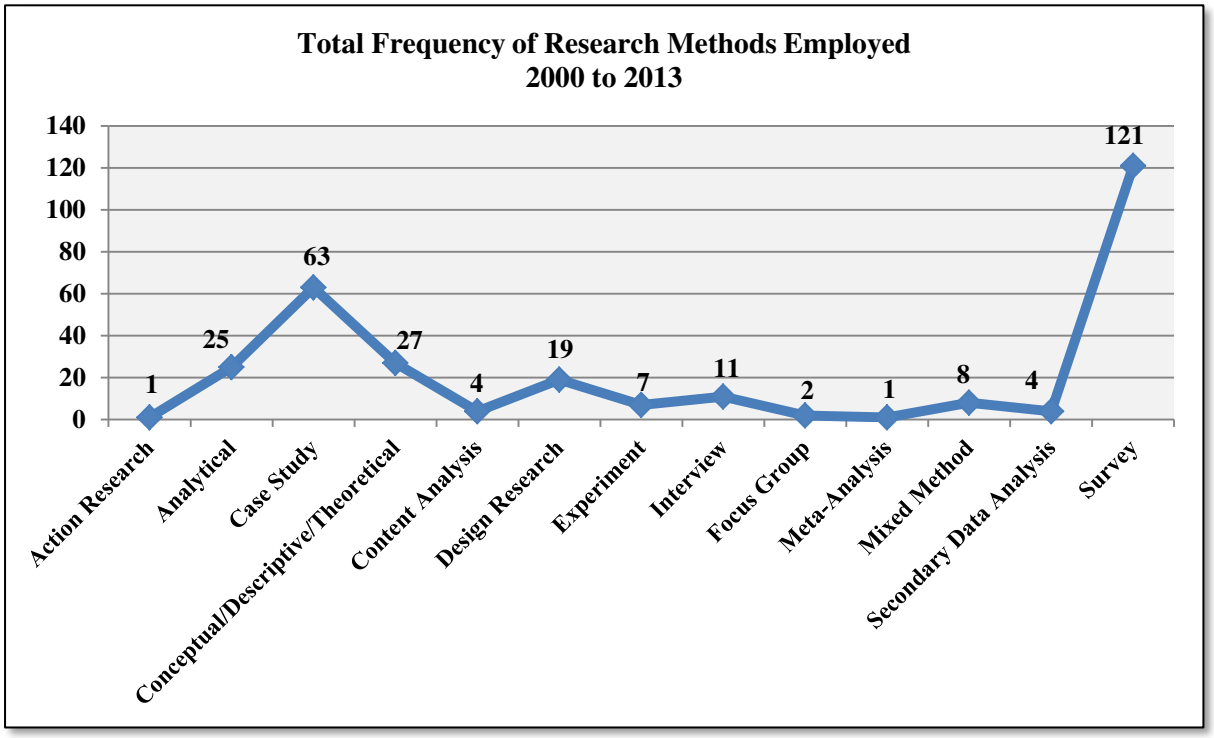

Figure 6: Classification of Research Methods between 2000 and 2013

4.1.7 Types of Data Analysis Methods Employed

Data analysis can be in the form of simple descriptive statistics to more sophisticated statistical inference (Casella and Berger, 1990). According to Hair *et al.,* (1995) data analysis methods can include univariate analysis (e.g. analysis of single-variable distributions), bivariate analysis, and more commonly employed method is the multivariate analysis. Hair *et al.,* (1995) further highlights that multivariate analysis is about all those statistical approaches that concurrently examine manifold dimensions on each individual or an object under investigation; *per se*, a number of multivariate techniques are additions to the univariate and bivariate analysis. Regardless of employing any data

analysis method, what is more important is that a researcher while selecting a data analysis method needs to ensure that the suppositions linked to the method are satisfied (Gefen *et al.,* 2000). Findings reported in Table 4 highlight a number of data analysis methods used in the articles analysed with confirmatory factor analysis (with C = 15, 5.12%) and structural equation modelling (with C = 12, 4.09%) leading as mostly used data analysis methods. It not the intent to claim which data analysis method is the best but explain the outcome of the findings illustrated in Table 4, and it is clearly evident that confirmatory factor analysis and structural equation modelling seems to be the optimal choice of researchers (as standalone or used in conjunction with other data analysis methods). SEM is typically employed for performing CFA by using some of most prevalent software programs e.g., LISREL, EQS, AMOS, and Mplus. Conversely, CFA is recurrently used as a first step to assess the proposed measurement model in a SEM. Nevertheless, a number of rules of interpretation regarding assessment of model fit and model modification in SEM apply correspondingly to CFA (Zhao *et al.,* 2008; Lau *et al.,* 2010a; Wong *et al.,* 2011; Prajogo and Olhager, 2012; Wong *et al.,* 2013).

Data Analysis Methods	Frequency Count	Per Cent
• Articles with No Data Analysis Method Employed	128	43.68%
• Confirmatory Factor Analysis	15	5.12%
• Cross-Case Analysis	13	4.44%
• Structural Equation Modelling	12	4.09%
• Sensitivity Analysis	8	2.73%
• Regression Analysis	6	2.04%
• Exploratory Factor Analysis	5	1.71%
• Hierarchical Regression Analysis	4	1.36%
• Multiple Regression Analysis	4	1.36%
• Confirmatory Factor Analysis & Exploratory Factor Analysis	3	1.02%
• Confirmatory Factor Analysis & Structural Equation Modelling	3	1.02%
• Exploratory Factor Analysis & Confirmatory Factor Analysis	3	1.02%
• Structural Equation Modelling & Confirmatory Factor Analysis	3	1.02%
• Confirmatory Factor Analysis & Cluster Analysis	2	0.68%
• Confirmatory Factor Analysis & Hierarchical Regression Analysis	2	0.68%
• Confirmatory Factor Analysis & Multiple Regression Analysis	2	0.68%
• Confirmatory Factor Analysis & Regression Analysis	2	0.68%
• Conjoint Analysis	2	0.68%
• Correlation Analysis	2	0.68%
• Data Envelopment Analysis	2	0.68%
• Exploratory Factor Analysis & Structural Equation Modelling	2	0.68%
• Linear Regression Analysis	2	0.68%
• Partial Least Squares & Confirmatory Factor Analysis	2	0.68%
• Structural Equation Modelling & Partial Least Square	2	0.68%
• Systematic Analysis	2	0.68%
• Analysis Of Company Records & Cross-Case Analysis	1	0.34%
…	…	…
• Within-Case Analysis & Cross-Case Analysis	1	0.34%
Total	**293**	**100%**

Table 4: Frequency of Types of Data Analysis Methods Employed in each Publication between 2000 and 2013

4.1.8 Types of Underpinning Theories

One of the main constituents of reviewing the literature is to establish the type of theory(s) used to examine the questions in a scholarly study. According to Reeves *et al.,* (2008), theories offer intricate and comprehensive theoretical understandings of things that cannot be pinned down, e.g. how societies and organisations operate, why individuals interact in certain ways. In quantitative research studies, researchers and academics often test theories as an interpretation for the responses to their research enquiries (e.g. Shou *et al.,* 2013 using resource dependency theory and Wong *et al.,* 2013 using ambidexterity theory in their individual survey-based research studies). Whereas, from the qualitative research perspective, the use of theory is much more diverse (e.g. Lockström *et al.,* 2010 using grounded theory in their case study based research). Moreover, in the latter case researchers often explain their theoretical underpinnings at the start of the research as a lens that forms the basis of what is enquired about e.g. ethnographic research studies. In other cases, they may generate a theory as the final outcome of the study e.g. grounded theory. Findings reported in Table 5 indicate that a huge mass of the articles (C=189) revised did not discuss on any underpinning theory followed by 15 papers using multiple theories in their research. For instance Wong *et al.,* (2011) used contingency theory and organisational information processing theory to explain higher environmental uncertainty in relation to the salient operational performance outcomes of SCI. Following leading theories include resource-based view and transaction cost economics theory (with C = 12, 4.09 %) respectively. The remaining theories with their frequencies and percentages are presented in Table 5.

Underpinning Theories	Total Frequency	Per cent
No Underpinning Theory	189	64.50%
Multiple Theories	15	5.11%
Contingency Theory	14	4.77%
Resource-based View	12	4.09%
Transaction Cost Economics Theory	12	4.09%
Resource Dependence Theory	5	1.71%
Grounded Theory	3	1.02%
Innovation Diffusion Theory	3	1.02%
Adaptive Structuration Theory	2	0.68%
Fuzzy Sets Theory	2	0.68%
Network Theory	2	0.68%
Organisational Learning Theory	2	0.68%
Organisational Theory	2	0.68%
Organisational Capability Theory	1	0.34%
…	…	…
Theory of Socialization	1	0.34%
Total	**293**	**100%**

Table 5: Frequency of Underpinning Theories in each Publication between 2000 and 2013

4.1.9 Types of Journals

From the total of 293 articles selected, a list of 122 different types of journal was used by researchers and academics to publish their research. To avoid lengthy tables in the paper, the authors excluded those journals that had a frequency of one and denoted with '…' i.e. out of the 122 journals used, 81 journals had a frequency of one. According to the findings illustrated in Table 6, the International Journal of Production Economics was the most used by researchers (with C = 25, 8.53%), followed by the JOM and SCM: An International Journal (C = 21, 7.17% respectively), International Journal of Operations & Production Management and International Journal of Production Research (C = 16, 5.46% respectively). The scope of these leading journals in the area of operations and SC is broad, covering all stages of the manufacturing lifecycle. Moreover, these journals are key resources for researchers, practitioners, and students on advances and innovation in operation management, sustainability, scheduling, estimating, cost control, quality control, labour productivity, inspection, contract administration, construction management, computer applications, and environmental concerns (e.g. Irani and Kamal, 2014). The remaining journals and their frequencies and percentages are presented in Table 6.

Type of Journal Extracted from Scopus	Total Frequency	Per Cent
International Journal of Production Economics	25	8.53%
Journal of Operations Management	21	7.17%
International Journal of Operations & Production Management	16	5.46%
International Journal of Production Research	16	5.46%
International Journal of Physical Distribution & Logistics Management	11	3.75%
Computers & Industrial Engineering	6	2.04%
European Journal of Operational Research	6	2.04%
Industrial Management & Data Systems	6	2.04%
Transportation Research Part E: Logistics and Transportation Review	5	1.71%
Decision Sciences	4	1.36%
Expert Systems with Applications	4	1.36%
IEEE Transactions on Engineering Management	4	1.36%
Integrated Manufacturing Systems	4	1.36%
International Journal of Logistics: Research and Applications	4	1.36%
Journal of Business & Industrial Marketing	4	1.36%
Business Process Management Journal	3	1.02%
International Journal of Computer Integrated Manufacturing	3	1.02%
International Journal of Information Management	3	1.02%
Production Planning & Control	3	1.02%
Production Planning & Control: The Management of Operations	3	1.02%
Journal of Enterprise Information Management	2	0.68%
Benchmarking: An International Journal	2	0.68%
British Food Journal	2	0.68%
Computers in Industry	2	0.68%
Decision Support Systems	2	0.68%
Human Systems Management	2	0.68%
Information and Management	2	0.68%
International Journal of Services and Operations Management	2	0.68%
International Journal of e-Business Research	2	0.68%
International Journal of Productivity and Performance Management	2	0.68%
International Journal of Technology Management	2	0.68%
Journal of Business Logistics	2	0.68%
Journal of Manufacturing Technology Management	2	0.68%
Journal of Supply Chain Management	2	0.68%
Management Research Review	2	0.68%
Operations Management Research	2	0.68%
Production and Operations Management	2	0.68%
Promet – Traffic & Transportation	2	0.68%
Supply Chain Management	2	0.68%
Transportation Journal	2	0.68%
MISQ	1	0.34%
…	…	…
The Accounting Review	1	0.34%
Total	**293**	**100%**

Table 6: Type of Journals and their Frequency between 2000 and 2013

4.2 Findings, Analysis and Discussions on Factors Driving/Inhibiting SCI

The literature reviewed so far evidently represents the fact that there is lack of consent on factors driving and inhibiting SCI practices with exception to Pagell (2004), Bernon *et al.,* (2013) and Chen *et al.,* (2013) who do report on certain benefits including some enabling and inhibiting variables but their focus is limited. In another study by Alfalla-Luque *et al.,* (2013), a conceptual framework based on the literature review of SCI area is proposed. Through this conceptual framework, Alfalla-Luque *et*

al., (2013) aim to support SC researchers and practitioners in understanding the different dimensions and variables of SCI area, specifically facilitating the practitioners in quantifying the levels of integration and exploring methods for further developments. Nevertheless, the dimensions and scope highlighted within their framework is frequently discussed within the vast majority of SCI and SCM literature (e.g. Swink *et al.,* 2007; Braunscheidel and Suresh, 2009; Flynn *et al.,* 2010; Vijayasarathy, 2010; Yu *et al.,* 2013; Yu *et al.,* 2013) and is limited to few enabling variables. This indicates the need for the development of classification of SCI factors that may be used across different sectors and regions to develop deeper understanding on the significance of SCI in order to accomplish analogous results. Therefore, based on the prior research on SCI variables, a taxonomy has been developed (Figure 7). The taxonomy clearly exhibits that SCI is significant and highly implementable through understanding the multidimensional driving factors. The taxonomy is presented based on the Strategic, Managerial, Organisational, Operational, Technological, Financial, and Environmental dimensions, with driving factors on the top and inhibiting factors in the bottom. Both driving and inhibiting factors are coded[6] and added to this taxonomy along with their individual frequencies. These frequencies denote the occurrence of each factor within the articles reviewed.

From the factors driving SCI, the most cited factors are: improving firm performance (C = 87), effective coordination and communication (C = 69), facilitating information sharing (C = 68), operational efficiency and performance (C= 55), improved financial performance (C = 45), effective customer service and responsiveness (C = 40), followed by improved product quality, management and delivery (C = 36), and SC agility, flexibility and visibility (C = 35). Whereas from factors inhibiting SCI only four factors seem to be crucial i.e.: lack of unified IT infrastructure (C = 10), lack of technical resources, skills and knowledge on integration (C = 9), resistant to change (C = 9) followed by lack in cross-trained experienced workforce (C = 7). Although all the factors reported in Figure 7 are vital; however, these factors with higher count clearly signify the importance of these factors in driving and/or inhibiting SCI implementation. The motivation for SCI is to enhance overall SC performance. In line with this, successful collaborative SC implementation by Wal-Mart has stimulated many manufacturing organisations e.g. DELL Computers, Procter & Gamble, Coco Cola, Hewlett-Packard Co, and Zara to initiate collaboration by integrating their SC (Chae *et al.,* 2005; Simatupang and Sridharan, 2008). Farooq and O'Brien (2012) also report that in realising the global transformations and competitive business environments, a number of manufacturing organisations have collaborated with their SC partners such as suppliers and customers in order to achieve seamless SC integration. In line with Cassivi's (2006) empirical research, the level of SCI (internally) and virtual collaboration within the SC resulted in greater significance towards firm performance. In the context of green SC practices, Azevedo *et al.,* (2011) assert that for organisations implementing green SC collaboration practices, it is vital to assess their impact on overall SC performance. This is because it may enable the management in better understanding towards SC partners' integration while at the same time enlightening the effects of policies and likely prospects in SCM. Thus, integrating the SC facilitates in streamlining the mutual (as well as individual) objectives of all the trading partners to achieve the common goal of enhancing productivity and environmental performance. The latter conception is supported by Zhang and Huo (2013) who is convinced that SCI results in sharing knowledge, dilemmas and functioning collaboratively and this simply does not only benefit the customers but also benefit the whole SC in developing mutual understanding, interdependence and trust, and eradication of no-blame culture.

Thus, effective and efficient collaborative and integration strategy is anticipated to enhance SC performance by enabling decision-making process that echoes an extensive sight of the SC and considers seamless communication SC partners.

4.3 Findings, Analysis and Discussions on Academic/Industrial Developments in SCI Area

Table 7 (Appendix A) provides a synoptic view of the descriptive analysis on some of the noted key research (theoretical) and empirical (industrial) developments in the area of SCI. These research and empirical developments were identified and reported herein based on their unique contributions towards both theory and industry. However, at the same time, the authors do not refute the significance of other studies reviewed as part of this literature review exercise, as these remaining 270 (i.e. 23 minus from total 293) articles provided deeper understanding on SCI area and supported in

[6] Refer to Appendix for detailed list of factors and the complete titles.

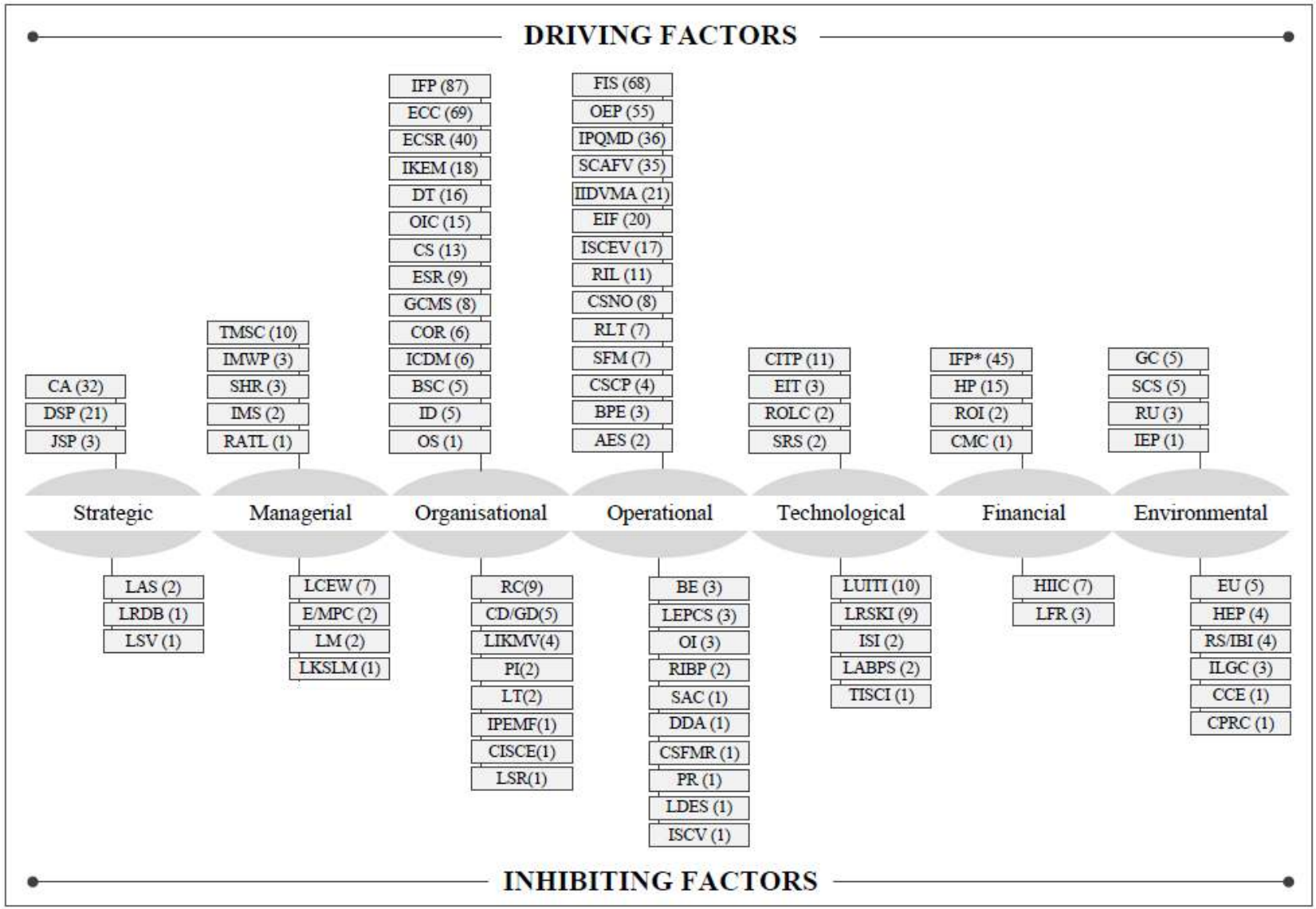

Figure 7: Empirical Taxonomy of Driving and Inhibiting Factors Influencing SCI *(See Appendix C for Full List of Factors and their Names)*

extracted contextual factors influencing SCI implementation in organisations. After analysing the developments from 23 articles published in some of the leading journals following common themes were extracted. The authors analyse and discuss on these themes from both research and practical development perspective:

- *Theme 1:* Leveraging internal integration and external integration to achieve product innovation and performance and improved organisational capability:
    - Internal and external integration are broadly acknowledged as having the capacity to develop operational performance results, for instance: quality, cost, delivery and flexibility (Yu *et al.,* 2013). Despite the fact that there is some empirical confirmation which supports the significance of internal and external integration in facilitating product innovation (Lau *et al.,* 2010b), Wong *et al.,* (2013) argues that the literature is still being confronted by a lack of conjectural justification and experiential confirmation about the mutual effects of internal and external integration on product innovation. It appears that managers and practitioners can no more consider internal and external integration as independently; in effect, they need to focus on using a comprehensive approach to manage SCI in product innovation.
- *Theme 2:* Investing in supplier integration to develop fast supply network structures to improve overall SC performance:
    - Internationalisation of supplier network structures plays a vital role as it is acknowledged as a disrupting source of ambiguity that imposes organisations to collaborate with SC partners to efficiently manage the supply chain management processes e.g.: procurement, production and delivery plans, so as to sustain quality, cost-effectiveness, and deliver performances (Kauremaa *et al.,* 2010; Yuan *et al.,* 2012). Danese *et al.,* (2013) identifies that supplier network internationalisation positively regulates the association between the adoption of SCI practices and responsiveness performance. This indicates that when organisations depend on their international SC partners the advantage on responsiveness of SCI implementation maybe greater.
- *Theme 3:* Focus on internal and external integration to achieve customer satisfaction and improve financial performance:
    - Customer satisfaction and relationship with organisations is increasingly influencing the performance of supply chain management. To be competitive in the global market, Shao (2013) reports that organisations must align with suppliers and customers to streamline organisational as well as financial operations and collaborate to achieve a level of agility. Yu *et al.,* (2013) advocates the latter argument and states that gratifying customer is fundamental for a better financial performance and that better customer service provision is anticipated to provide greater openings for profit returns and development. The capacity to be receptive to satisfy customer demands has become an essential attribute of competitiveness and of manufacturing success.
- *Theme 4:* Developing organisational power;
    - Empirical investigation focusing on power and SCI has attracted great research attention. For instance, Crook and Combs (2007) report that strong members with higher authority in SC secure much of the direct benefits, as compared to those members with limited or no powers. Krajewski *et al.,* (2005) further reports that a firm's power pertaining to its customer/supplier stems from e.g. a supplier's market segment of a certain component, buyer purchasing a specific component from several suppliers, the income generated by a supplier from a single buyer, etc. Intensely considering the intricate customer–supplier relationship will help organisations balance their position in the SC and pool resources efficiently (Shou *et al.,* 2013).
- *Theme 5:* Moving towards e-Supply Chains – Focus on IT and e-Business solutions for effective coordination, and efficient management and integration of SC operations:
    - Recent technological advancements have the potential to facilitate organisations to seamlessly coordinate and enhance competitiveness, in turn; this enables the virtual integration of the whole SC (So and Sun, 2011). However, to develop such flexibility, Simchi-Levi *et al.,* (2003) argue that the SC partners can restructure the SC design by

streamlining the distribution system, product, production process, and inventory management so as to capture knowledge and to be cost-effective and flexible enough to equal supply with varying customer demands. For instance, in the case of Zara (an attire company), who capitalised on IT to capture knowledge on topical fashion developments and synchronise product delivery from manufacturers to retailers in short span of ten days. By redesigning SC structure, Zara managed to acquire faster response i.e. from fashion draft to product delivery at stores that resulted in improved profits and reduced costs.

- *Theme 6:* Greening of the SC and global reach:
    - The focus of sustainable/greening of SC has been to integrate environmental necessities into product manufacturing due to growing ecological needs across the globe (Wu, 2013). Researchers have recognised the need for including environmental considerations in inter-organisational SC operations, mainly for emission intensive activities for instance universal transportation and shipping of products (Cervellon and Wernerfelt, 2012). For instance, the energy required whilst constructing buildings or highways starts amassing long before the buildings or highways construction resources are on-site. Manufacturing organisations can thus scrutinise and enhance the environmental performance of their energy products by evaluating environmental effects during the product development lifecycle phases. However, the intricacy of such scrutiny process can be a hard activity as it entails time and huge investments.
- *Theme 7:* Knowledge management and information integration to enhance SC relationships and performance:
    - The organisations' requisite to establish close connections with businesses and SC partners requires coordination, transfer and exchange of knowledge and best practices (Chen *et al.,* 2013). Knowledge is hard to handle as it is somewhat intangible, nevertheless, it is a vital source that distinguishes the 'best value supply chains' from the customary SC. Its creation and transfer are particularly essential for continuing affiliations and enhancing the relationship performance in the economics exchanges (Yang, 2013). Whereas, KM focuses not only on managing the knowledge assets of an organisation, but also on managing the processes (e.g. creating, preserving, using and sharing knowledge) that act on these key resources. Therefore, KM becomes one of the main elements to facilitate collaborating organisations to supplement each other's strengths and shape their association and SC strategies (Liu *et al.,* 2013).
- *Theme 8:* Integrated SC leading towards socialisation.
    - Cousins and Menguc (2007) report that socialisation evidently has a positive effect on how organisations perform and conduct businesses with their SC partners. Choi *et al.,* (2002) also state that to achieve integration either backward or forward, the organisation must have a robust SC collaborative venture with their partners. The latter not merely enhances the information flow within the SC partners, but also enables the SC to be highly receptive. It appears that SCI phenomenon, collaboration and the concept of socialisation (Gupta and Govindarajan, 2000) is closely interconnected with each other. However, Cousins and Menguc (2007) argue that if organisations intent to operate with the latter three types of strategies then they need to prudently assign resources and consider the types of socialisation activity that delivers the desired results across the supply chain.

The analysis and discussion presented for each of the extracted themes evidently indicate that SCI is a multi-dimensional area (Zhao *et al.,* 2008) that has been researched from different perspectives and furthers our knowledge on the relationship between SCI and firm performance in achieving global competitiveness (as also supported by Fabbe-Costes and Jahre, 2007; Kim, 2013). Nevertheless, as the SCI area is still emerging (Flynn *et al.,* 2010); with the types of themes extracted it opens up new avenues for further research in the SCI research discipline.

4.4 Findings, Analysis and Discussions on Approaches Employed in Integrating SC

Extant research studies on SCI predominantly focuses on external (with supplier and customer) and internal integration approaches (e.g. Alfalla-Luque *et al.,* 2013), whereas, others report on the same

including process integration and information/data and physical/materials flows integration (e.g. Quesada *et al.,* 2008; Halley and Beaulieu, 2009). The articles analysed clearly indicate that organisations from different regions (see Table 1) have focused on entering global operating systems (i.e. global SC) to increase their market share and raise efficiency, resulting in their local as well as international businesses becoming more developed and profitable. For example, taking the case of Walmart – who over the last several years has transformed itself into world's largest and perhaps the most influential retailer with the highest sales per square foot, including inventory turnover, and operating profit of any discount retailer. Walmart who transited from being a regional retailer to global inspiration largely owes this huge success to changes in and effective and efficient management of its SC. Table 8 (Appendix B) also provides a synoptic view of the descriptive analysis on some of the approaches used in integrating SC. In order to categorise the integration works reported in the SCI literature, we adopted the three-echelon SCI framework (Huo *et al.,* 2008).

Out of the 21 research works reported in Table 8 (Appendix B), research on SCI approaches from:

- *Nine* research articles are categorised based on the 'Integration at the Operations Management Level (coded as Criteria 1: IOM)',
- *Ten* research articles categorise based on 'Integration at the Operations Management Level' and 'Integration at the Planning and Controlling Level' (coded as Criteria 2: IOM/IPC), and
- *Two* research article that focuses on all three levels i.e. Integration at the Operations Management Level & Integration at the Planning and Controlling Level & Integration at the Strategic Management Level (coded as Criteria 3: IOM/IPC/ISM).

It appears that major focus on integrating SC has been from the process and technological perspective. The latter findings are supported by the works of Mukhtar (2014), who highlight that one of the most significant technological enabler that will provide SC with the much-needed advantage over their competitors is widespread use of Information and Communication Technology (ICT). Christiaanse and Kumar, (2000) further accentuate that the availability of highly flexible and cost-effective ICT for example the Internet presents new opportunities in restructuring the SC for superior performance. On other hand, Simatupang and Sridharan (2002) assert that SCM systems are strategic in achieving not only increased value to customers at reduced cost and shorter cycle times, but also taking out costs from the SC. Collaboration between geographically parted organisations mostly take place virtually – in this context implementing a suitable technological collaboration tool is another key enabler for achieving green SCM. Zahay and Handfield (2004) in their case study research indicate that organisations that have the capability to acquire knowledge and share information are most likely to successfully automate their SC through advanced technological solutions.

These findings verify the literature outcomes (McCullen and Towill, 2000; Themistocleous *et al.,* 2004; Lau *et al.,* 2010a) on the use and implementation of relevant technological solutions to enhance SC. Huo *et al.,* (2008) reports here that effectively integrating SC, organisations can be more competitive and increase their capability to compete globally.

5. CONCLUSIONS

The SCI phenomenon has been primarily noted as a means for integrated coordination of material and seamless flow of information between and among the supply chain partners. Moreover, SCI has been viewed as an essential component for enhancing firm competitiveness and performance by exploring and using market knowledge to exploit cost-effective prospects in a volatile environment. In such a business environment that is progressively transforming into a state of hyper-competitiveness, communication, knowledge sharing and inclination towards strategic collaboration between SC partners is thus becoming a constituent element of competitive advantage (Bhattacharjee and Mohanty, 2012). As argued by Lamming (1993), the global competitive scenario and customers' demands for faster and on-time delivery have shifted the focus from single company to SC. Increasingly, organisations are recognising that integrating supply chain is a key strategic issue with the potential for a lasting impact on organisational performance (Eriksson, 2010; Farooq and O'Brien, 2012). Researchers and practitioners have long expressed the need for a close, integrated affiliation between manufacturers and their SC partners (e.g., Lambert *et al.,* 1978; Armistead and Mapes, 1993). However, only recently has there been a call for a systematic approach to SCI, as increasingly

global competition has instigated organisations to reconsider the necessity for cooperative, conjointly helpful SC collaborations and the joint improvement of inter-organisational processes has become a high priority (Azevedo *et al.,* 2011; Zhang and Huo, 2013).

This literature review paper aimed to reveal the past and current state of SCI research published in a number of key operations and SC management journals, thereby focusing on the past trends and current patterns in SCI practices in different sector organisations. Following Tranfield's *et al.,* (2003) 'Systematic Review Approach', this paper extracted and reviewed 293 journal articles from 2000 to 2013 from the Scopus database – as a result fulfilling the aim of this literature review paper (as indicated in Section 1.1). Figures 4 and 7 and Tables 1 to 8 clearly indicate the past trends and current patterns in the number of papers published on SCI area. For instance, the proposed taxonomy clearly indicates that there are more driving factors as compared to the inhibiting factors. The most cited driving factors reported include:

- improving firm performance,
- effective coordination and communication,
- facilitating information sharing,
- operational efficiency and performance,
- improved financial performance,
- effective customer service and responsiveness,
- improved product quality,
- management and delivery and
- SC agility, flexibility and visibility.

Moreover, the gradual interest (as indicated from Figure 4) and the use of SCI practices (e.g. Tables 2 and 8) specifies that in future research studies; academics, researchers and practitioners may focus on these SCI driving and inhibiting factors, types, developments, approaches and practices to propose robust solutions to the problems of SC in the manufacturing sector organisations (Ragatz *et al.,* 2002; Cousins and Menguc, 2006; Laosirihongthong *et al.,* 2011). The intention in conducting this detailed investigation was to provide a useful and usable resource of information for future researchers. The findings of this study indicate an increase in the number of papers published on SCI area from 2000 to 2010, although there is a decrease in the number of papers in 2011. But in the very next year, a gradual increase in number of publications is seen. However, increasing support to the SCI area given by the global corporations and manufacturing organisations in the future (in order to conduct empirical research) is expected to encourage researchers and academics to publish more papers on SCI area from 2013 onwards.

5.1 Research Implications to Research and Practice

The systematic review of the literature has provided a number of useful insights into the extant status of research into SCI, how it is defined and conceptualised (also in terms of types of integration concepts employed/discussed), the key research methodologies employed to date, and the types of data analysis methods employed. The prime emphasis on quantitative data/methods (i.e. survey based research articles [FC = 121] as highlighted in Figure 6), thereafter, qualitative data/methods (i.e. case study based articles [FC = 63]), and other articles focusing on e.g., design research, analytical, action research, experimental, content analysis, across the literature illustrates the new, emerging nature of this area and the necessity for it to be developed further in an intensive way. The authors assert that more practical insights into SCI can be attained by utilising the findings of this systematic literature review to enlighten and direct research towards a more holistic view of the SCI area.

- ***Implications to Research:*** The role of SCI in improving firm performance has been identified in previous research (e.g. Azevedo *et al.,* 2011; Farooq and O'Brien (2012; Zhang and Huo, 2013). The main contribution of this research is the comprehensive review, analysis, and synthesis of the SCI literature using a Systematic Research Approach (Tranfield *et al.,* 2003). The various aspects (i.e. findings on variables as presented in Sections 4.1.1 to 4.1.10), driving and inhibiting factors influencing SCI, key developments (e.g. both in research and industry) in SCI area as well as approaches employed/discussed to integrate supply chains are explored revealing the dynamic and significance of this multidimensional area. The authors

assert that these specific findings were previously absent from the literature. These findings also indicate that SCI supports in developing trust within all the partners involved provided availability of transparency and visibility of information (van der Vaart *et al.,* 2012). Moreover, this research has implications for researchers, journal editors, practitioners, universities and research institutions. It is likely to form the basis and motivation for profiling other database resources and specific operations and SCM type journals in this area.

- ***Implications to Practice:*** In addition to the theoretical contribution, the role of integration in creating supply chain responsiveness has managerial implications. For instance:
    - Integrating supply chain has been shown to increase the speed and flexibility with which seamless operational activities can be accomplished. The unified process of moving goods from a customer order through supply, production, and distribution of products to the customer requires logistics abilities that can respond to continuously fluctuating conditions and environment, including ultimate customer request(s). Furthermore, because the level and type of SCI can determine the efficiency and effectiveness of the collective efforts, it is essential that firms become more knowledgeable about the role and types of integration approaches in achieving improved supply chain performance.
    - From the evidence of the performed literature review a further managerial insight can be derived on how to manage the SCI process resulting in sustainable collaborative ventures. In order to explore sustainable energy futures, supply chains across the globe need to reduce their CO2 emissions through developing their green credentials; however, assimilating environmental concerns into production, SC, and logistics is considered as a complex process. The managerial implication is that the implementation of integration approaches, evaluation and collaboration with partners (from across different regions globally) seems to be effective in extending sustainable practices to SC partners. However, more recent results and the collaborative paradigm stress that availability or knowledge of integration approaches alone may not enough; firms need to engage in green collaborative practices.

Global supply chains in developed regions include several affiliating organisations in the developing regions. As there is little awareness of the issues associated with reducing carbon emissions in developing regions e.g. Russia, China, Brazil, India (also supported via this research that resulted in limited research studies from some of the developing regions – Table 1); researchers highlight the growing need for investigating methods to reduce carbon emissions or to green SC among these regions (Diabat and Simchi-Levi, 2009; Davis *et al.,* 2011). Although supply chain integration may appear to be easier to implement, managers need to go one step further and collaborate with their SC partners. Integration approach(s) may be the first step towards identifying what actions are required for implementing SCI; however, firms need to engage in more than technological collaborative practices with their SC partners to improve sustainability. The latter view is supported by Eriksson (2010) who state that cooperative relationships within the SC partners (also referred to as partnering) is a vital element in enabling the integration of different actors' skills and knowledge and in efforts to mutually solve problems. SC collaboration is one such initiative that has encouraged many inter-organisational SC players to share their knowledge and experiences to strengthen their partnerships (Ramanathana and Gunasekaran, 2012). As in the words of He *et al.,* (2013) SC partnership is most extensively implemented forms of collaborative inter-organisational coalition that supports knowledge acquisition and sustainable organisational as well as environmental performance. For example, multinational organisations such as West-Marine, Procter & Gamble and Hewlett–Packard have developed successful SC partnerships and realised the benefits of SC collaborations such as reduced cost, enhanced sales, better forecast precision, and eco-friendliness. In line with these collaborations, Toktay *et al.,* (2000) states that benefits sharing is the underlying constituent of such strategic SC partnerships. Thus, a mutual controlling mechanism between the partnering organisations also supports shared decision-making, reduced information irregularities and increased knowledge transfer.

5.2 Limitations

We fully acknowledge that our study has some limitations, and readers and future academics and researchers should be aware of it and indeed interpret the material presented in this paper within the context of the limitations. By description, a meta-analysis depends on the available as well as accessible research studies (both conceptual and empirical). While the authors conducted a thorough literature search through the Scopus database to identify all possible relevant articles, it is still likelihood that some research articles were missed (especially those 68 articles that were not accessible through our official University network, for this reason these articles were not included in this paper). Nevertheless, as a result of the number of sample articles that were finally taken forward for further investigation (i.e. 293 articles); the authors were assured that any additional research studies would be improbable to change the output of this paper. Although every single effort was exhausted to acquire all the relevant information essential regarding the three questions (i.e. Q1, Q2, and Q3), we did however; encounter some problems in retrieving information from some of the articles. For example, if the relevant information was not available from the articles extracted and for these we could not impute it otherwise, the authors dropped those articles (i.e. six general review papers that were rather viewpoints/commentary and three research notes) from this literature analysis.

Moreover, even though we consider that this paper has analysed a significant number of papers compared to other existing review papers using the Scopus database, we believe that more comprehensive research is required using other keywords (such as SC collaboration, supplier integration, supplier collaboration, customer integration, customer collaboration) in order to lessen the impact of the existing limitation we have identified in order to provide a greater understanding of the field of SCI research. Moreover, another limitation is related to the proposed taxonomy. As the taxonomy is proposed based on the empirical analysis of the literature and no primary research was conducted to test the taxonomy including the importance of each driving and inhibiting factor.

5.3 Suggestions for Future Research

Building upon the rich foundation of the research findings described and overall understanding acquired in this paper, the authors presents the concerns that merit further research and anticipate that these issues may hold the potential in contributing towards the future research studies. Two areas that may require attention from academics and researchers in the future and further work may be carried out, e.g.:

- ***Validating the Proposed Taxonomy:*** Supply chain integration is a reasonably new phenomena and developing theories in this area will be an important contribution to understanding the SCI area. The next phase for this research is to define the contextual factors proposed in the taxonomy (Figure 7) in detail and then empirically testing through survey-based and case study based research in different industrial sectors i.e. in order to test and explore new factors/variables that help enable superior performance through SCI. Therefore, the proposed taxonomy could be further developed in future empirical studies, particularly linking each factor with the types/dimensions of SCI. Moreover, as this literature review identifies these factors based on their occurrence in the articles reviewed and count presented herein. Researchers and academics can further make use of these findings by further examining the importance and causal relationships of these factors through the use Fuzzy Cognitive Mapping (FCM) techniques and/or Analytical Hierarchy Process (AHP) technique. Therefore, to further investigate this, future studies might build upon the present study by identifying and evaluation additional factors, developments in future research studies and approaches for integrating supply chain.
- ***Regions Producing Limited Publications:*** According to Table 1, the USA region has taken the lead with the highest number of publications followed by UK, China, Taiwan, Italy, Canada and Hong Kong. From the total of 39 regions reported, 22 regions produced less than 10 publications with 3 regions generating one publication each. Looking at the trends from 2000 to 2013, it is expected that more research will be conducted in the years to follow in the top seven regions, leaving many regions behind with no substantial or quality research and few publications. Therefore, academics and researchers from these regions may need to explore more avenues for quality research both conceptually and empirically to generate more publications in SCI area.

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Appendix A: Classification of Research (Theoretical) & Industrial Developments (Empirical) in SCI Literature

References	Research Method	Theoretical Underpinning	Data Analysis Method	Research Development	Industrial Developments
Wong *et al.,* (2013)	Survey	Ambidexterity Theory	Confirmatory Factor Analysis	The research provides novel theoretical explanations to the individual and combined effects of internal integration and external integration on product innovation through the use of new theory i.e. ambidexterity theory. In line with this theory, the researchers highlight that while internal integration and external integration may be implemented by different individuals, it is vital to certify they are leveraging each other so as to accomplish product innovation.	Practitioners can no more consider internal integration and external integration as autonomous; in fact, they need to focus on employing an all-inclusive approach to manage SCI in product innovation. Practitioners also need to be conscious that external integrative endeavours might not be effective when internal integration is unable to complement the process of integrating new knowledge from external sources into its internal processes and resources
Danese *et al.,* (2013)	Survey	Configurational Approach	Confirmatory Factor Analysis & Hierarchical Regression Analysis	From a configurational viewpoint, this research contributes towards theory by investigating the effect of supplier integration and fast supply network structure initiatives, including their synergic effect, on the procuring organisation's performance.	This research suggests the managers and practitioners that vital performance enhancement with regards to efficiency, schedule attainment and flexibility can be accomplished by investing in supplier integration and in measures aimed at building up a fast supply network structure.
Yu *et al.,* (2013)	Survey	Organisational Learning Theory	Exploratory Factor Analysis & Confirmatory Factor Analysis	This research contributes towards SCI literature by linking supply chain integration to the normative literature and principles of organisational learning i.e. by using this theory this research develops a novel approach to explicate the intricate associations among internal integration, external integration, customer satisfaction and financial performance.	From the empirical findings perspective, the structural path analysis highlights that internal integration greatly impacts external integration with customers and suppliers, and that the association among customer integration and financial performance is entirely facilitated by customer satisfaction.
Shou *et al.,* (2013)	Survey	Resource Dependency Theory	Exploratory Factor Analysis, Reliability Analysis, Confirmatory Factor Analysis, Multiple Regression, & Multinomial Logistic Regression	This research contributes through the empirical study conducted in Yangtze River Delta. Shou *et al.,* (2013) report that is a close nexus between the organisation's resources and power in operations management. Moreover, organisation's power is also vital in establishing its power situation pertaining to its suppliers or customers.	This research informs the managers that improvement/advancement competence is highly significant for any organisation as it can develop power in overall control with authority. When an organisation wishes to control information in the supply chain network, through this research it is informed that it is better for the organisation to opt such a supplier that does not have a strong financial position.
Nguyen (2013)	Survey	Neoclassical Theory of Investment	Factor Analysis & Logistic Regression	Regarding the theoretical research contribution, this research develops a general discrete variable investment model that supports to guide the researchers for conducting empirical research where the investment decision can be considered as a discrete variable. Moreover, Nguyen applies it in this study of the decision to adopt e-business by transport and logistics organisations.	Regarding empirical contributions, this research has applied the two-phased data analysis method to study the e-business adoption decision of organisations in the freight and logistics industry. Nguyen suggest that while adopting e-Business practices, the transport & logistic sector can realise effective and efficient coordination, management and integration of SC operations.
Chen *et al.,* (2013)	Survey	Relational View Theory	Partial Least Squares & Factor Analysis	This research contributes towards theory through: • To study SCI, this research uses the relational view of competitive advantage to identify the connections across antecedents to SCI and stressing the role of sharing knowledge in determining hospital-supplier integration. • Distinguishing between IT and hospital-supplier integration to theorise IT integration as a vital asset that affects hospital-supplier integration. • Developing a set of healthcare moderating variables to seizure vital conditions that must be deemed in developing theories.	This research recommends the top managements of healthcare departments to take a methodical and all-inclusive sight in managing the numerous factors and facets involved in hospital SCI. The research also suggests that IT integration and hospital–supplier trust complement each other in that together they influence a hospital's knowledge exchange with its suppliers.
Wu (2013)	Survey	Contingency Theory	Hierarchical Regression Analysis	This research contributes by developing a broad research framework to show the benefits of conceptualizing green supply chain integration, green innovation and environmental uncertainty as multi-dimensional constructs. The author asserts that previous green SCM research has not adopted a	This research suggests that to enhance green innovation performance, practitioners and managers should attempt to integrate resources and capabilities within their organisations, and with their suppliers and customers. Managers need to continually follow demand trends in the marketplace and sustain

				multi-dimensional approach to examine the relationships among these three variables simultaneously.	constricted technological systems between their supply chain partners.
Yang (2013)	Survey	Knowledge-based View & Transaction Cost Economics	Regression Analysis & Factor Analysis	From theoretical perspective, this research contributes by extending the scarce literature on associations between economic exchange parties to a transition economy. This research reports offers compelling evidence that knowledge management plays a significant role in enhancing the relationship performance in the economics exchanges. Moreover, both contractual and relational means of power are similarly important in developing the implementation of knowledge management in the exchanges.	From empirical perspective, this research provides insights into the factors impacting coalition performance and supports organisational managers distinguish the device of harnessing the value of knowledge from manufacturers and their suppliers in joint planning and control functions.
Liu *et al.,* (2013)	Survey	Resource-based View	Hierarchical regression analysis & Confirmatory Factor Analysis	From Resource-based View, this research contributes by adding knowledge on the value-realising mechanism of SCI. In the region of China, this paper offers a multi-aspect description of the connection between SCI, market orientation, and firm performance. This results in proposing a model that describes how the different dimensions of SCI impact on the organisation's performance and regards the moderating effects of market orientation.	From empirical perspective, this research suggests managers with some guidelines on SCI implementation. It states that the conceptualisation of SCI along with information sharing and operational coordination facilitates managers to gain knowledge on different SCI stages. Secondly, the diverse impacts of information sharing and operational coordination support managers in their decision-making to select the suitable integration strategy for improving their performance. Finally, advising managers to note the vital role of market orientation in influencing the link between SCI and firm performance.
Danese *et al.,* (2013)	Survey	Contingency Theory	Statistics and Correlation Analysis & Confirmatory Factor Analysis	This research contributes to the development of theory by offering improved understanding on: • SCI implementation practices in the international supply networking context, • The association between SCI and receptiveness performance, • The situations in which the implementation of SCI practices pledges greater performance enhancements.	From empirical perspective, this paper emphasises the significance for organisations to realise that SCI is an influential method to enhancing receptiveness, and that it is vital in the international supplier networks context. This research highlights to managers that in an international sourcing perspective, external integration can support in dealing with supply uncertainty and increased complexity in material administration, thus equalising receptiveness performance restrictions.
Huo (2012)	Survey	Organisational Capability Theory	Confirmatory Factor Analysis & Exploratory Factor Analysis	This research proposed a framework for SCI and company performance and contributed towards the organisational capability theory, such as by: • Assessing the concepts of internal and external integration concepts along their associations among the two from the organisational capability perspective. • Revealing the impacts of internal, customer, and supplier integration on customer-oriented performance, supplier-oriented performance, and financial performance from the organisational capability perspective. • Exploring organisational capability theory in SCM area by investigating the internal and external integrative abilities, and the associations between them and organisational performance.	From empirical perspective, this research suggests that organisations need to purposefully develop diverse SCI capabilities to achieve different types of organisational performance, e.g.: • Developing internal integration before achieving integration with external partners. • Focusing on customer integration and then supplier integration, including strategic alliance with customers and suppliers. • Providing strategies for managers to decide how to dedicate their efforts regarding different SCI types, and defining how to administer different SCI types to acquire various types of performance.
van der Vaart *et al.,* (2012)	Survey	Contingency Theory	Exploratory Factor Analysis, Principal Component Analysis, Pearson Correlation Analysis, & Structural Equation Modelling	This paper contributes towards theory by explaining that the mechanism through which different dimensions of SCI enhance organisational performance mainly relies on the supply chain context. In this context, this paper identified that "planning information" and "cooperative behaviour" can be positively related to performance in a high supply complexity environment whereas "communication infrastructure" is negatively related to performance. Moreover, "cooperative behaviour" and "communication infrastructure" facilitate "joint improvement" and "planning information" and lastly, "joint improvement" cannot be related with enhanced performance in any context.	This research informs the industrial managers that the: • Effectiveness of SCI implementation appears to rely on the specific condition and explicitly, that the nature of the delivery and manufacturing process me be vital. • Implementation needs both the use of enablers of supply chain practices e.g. "cooperative behaviour" and the development of the practices themselves. • Use of an extra enabler, "communication infrastructure", needs to be stable as in high supply complexity case, the negative direct on performance need to be traded-off against the indirect benefits.
He and Lai	Survey	Service Theory	Exploratory Factor	This research contributes by proposing and examining different effects of	From empirical and managerial perspective, this research suggests that besides

(2012)			Analysis	operational and strategic SCI on service oriented transformation and firm performance. This research highlights that product-based and customer action-based services are two transformation strategy types for industrial equipment manufacturers. These types have different direct effects on organisational performance. Moreover, this research supplements the organisational structure, culture and human resource management by adding the external perspective of SCI in service oriented transformation.	the operational integration, with the development of service-oriented transformation, strategic integration is also essential. In this regards, organisations are recommended to look for competitive success not only via internal integration of processes and strategic alignment of internal functions, but also via integration and alignment of inter-company processes.
Prajogo and Olhager (2012)	Survey	–	Confirmatory Factor Analysis	This research contributes to the extant research on logistics integration by examining the relations among long-term associations, information integration, logistics integration, and competitive performance. On the whole, this research offers evidence that effective external logistics integration is produced by long-term relations and information integration.	From empirical perspective, this research suggests that SCI is a difficult undertaking as it includes several management facets in terms of hard and soft information exchange mechanisms in support of the logistics integration activities concerning the physical material flow between the two parties. The research suggests that such intricate issues can only be managed where there is a long-term relationship between supply chain partners. Thus, reinforcing the significance of building long-term relationships with suppliers.
Wong *et al.,* (2011)	Survey	Contingency Theory & Organisational Information Processing Theory	Confirmatory Factor Analysis	This research contributes by developing and validating a novel conjectural model on the moderating effects of environmental uncertainty on SCI–performance relationships. The model lays the grounds for the development of a contingency theory of SCI. This paper also contributes by integrate contingency theory and organisational information processing theory. The latter theory enables to establish the benefit of viewing an important firm and its environment from an organisational information processing perspective.	From the managerial perspective, this research suggests that by distinguishing internal from external integration, practitioners can comprehend that both supplier and customer integration are dominant in providing input to the operational tasks needed to enhance time-based and externally sensitive performance outcomes. This implies that managers should focus on investment in external integration to improve time-based performance, as these outcomes are sensitive to input and collaboration with suppliers and customers, particularly under a high environmental uncertainty.
Spralls *et al.,* (2011)	Survey	Resource-based View	Exploratory factor analysis	This research focuses on Inter-firm Distribution Networks (IDNs) connected by extranets. In this paper, the authors identified that communication quality in IDNs leads to greater financial performance and higher efficiency for network SC partners. This research also suggests that communication quality leads to improved receptiveness, efficacy, and innovativeness.	For organisations that aspire to employ networks to accomplish business objectives, this research suggests that a vital capability is extranet capability. In this research extranet capability is conceptualised as the ability to create, manage, and evolve successful IDNs. Moreover for managers and practitioners, this research implies that the network leader in IDNs should seek to develop an extranet capability. Simply investing in e-business technologies is not adequate to offer competitive advantage; instead, an ability to ably implement e-business technologies within the SC is vital.
So and Sun (2011)	Survey	Innovation Diffusion Theory	Structural Equation Modelling & Exploratory Factor Analysis	This research contributes towards theory by theorising (using Innovation Diffusion Theory) that electronic-enabled SCI positively influences the relative advantage of using lean production systems. The latter is achieved by combining Rogers's IDT and Buker's JIT implementation model proposes a new hybrid model to explain lean production adoption in an e-supply chain environment.	From practical perspective, this research suggests that manufacturers may require restructuring their supply strategies such that only those firms who partake and invest in electronic-enabled manufacturing supply chain can become their suppliers. This research reports that Wal-Mart and Pratt & Whitney who have adopted this s approach for better assisting sizable operation improvement programmes.
Amer *et al.,* (2010)	Case Study	–	Discrete Event Analysis	This research contributes by demonstrating a real case application of the order fulfilment model which uses an adaption of Design for Six Sigma (DFSS) and fuzzy logic. By doing so, the case application of the order fulfilment model also contributes to the qualitative understanding of SCM area and performance measurement.	From empirical perspective, this research provides valuable managerial techniques for global SCM and is a practical quantitative model for operations and SC managers to redesign/design, monitor and control the SC order fulfilment process using DFSS and fuzzy logic.
Narasimhan *et al.,* (2010)	Survey	–	Regression Analysis	This research scrutinises strategic customer integration and supplier integration as complementary activities for Product-Process Technology (PPT) integration, with the purpose of supporting manufacturing plant managers to wisely implement jointly supportive integration types.	From empirical perspective, this research highlights positive complementarities between PPT integration and supplier integration regarding quality, delivery, and process flexibility. In addition, positive complementarities exist between PPT integration and customer integration regarding quality and new product flexibility.

Lockström *et al.,* (2010)	Case Study	Grounded Theory	Within-case Analysis & Cross-case Analysis	This research proposes and tests a conceptual framework highlighting key factors that facilitate and inhibit supplier integration in the context of the Chinese automotive industry.	From empirical and practitioner perspective, this research suggests that successful buyer–supplier integration is an important component for both Original Equipment Manufacturers (OEMs) and Chinese suppliers to become successful in China and globally. In addition to the typical performance measurement benchmarks e.g. cost, quality, delivery and flexibility, this research suggests focusing more on the 'softer' standards such as innovation development potential and management support, so as to integrate OEMs and their suppliers at the required performance level.
Lau *et al.,* (2010)	Survey	Theory of Modular Product Design	Structural Equation Modelling	This research scrutinises the association between SCI and modular product design, and their effect on product performance. This research contributes theoretically and empirically and results in identifying three explicit organisational processes within SCI (i.e. information sharing, product co-development and organisational coordination), which affect modular product design and product performance.	The empirical findings reveal that information sharing, product co-development and organisational coordination influence product performance. Managers and practitioners need to emphasis on these particular aspects of SCI, principally when related with modular product design i.e. considering involving suppliers, internal functional units and customer in early design stages.
Zhao *et al.,* (2008)	Interviews	Transaction Cost Theory & Social Exchange Theory	Exploratory Factor Analysis & Structural Equation Modelling	This research contributes by extending the power–relationship commitment theory established in Western marketing literature and links it with SCI, through investigating, proposing and testing a model based on the relationship between power, relationship commitment including the integration between manufacturers and their customers.	The empirical results offer directions to practitioners and managers in developing power in SC associations. The proposed and validated model establishes the fact that normative relationship commitment is intensely connected to customer integration, evidently displaying the position of handling SC connections. Therefore, this research develops a linkage between power–relationship commitment theory and SCI.
Cousins and Menguc (2007)	Mixed Method	Theory of Socialisation	Confirmatory Factor Analysis	In this paper, the researchers report that as organisations move towards each other they move towards more integrated supply chains and this results in socialisation – which is a progressively significant mechanism in enabling and improving overall supply integration processes and operations.	The findings demonstrate that socialisation is vital for the development of any significant business relationship and the enhancement of a supply integration strategy.

Table 7: Classification of Research (Theoretical) & Industrial Developments (Empirical) in SCI Literature

Appendix B: Classification of Methods/Approaches Employed or Discussed in Integrating SC

Type of Integration Level *(according to the three-echelon theoretical framework for SCI)*	**Methods/Approaches Employed/Discussed in Integrating Supply Chain**	**FOCUS – SCI Types/Dimensions Employed in the Method**	**References**
Criteria 1: IOM	This research focuses on coupling both internal integration and external integration approaches to synchronise new product development processes within and across organisations.	Internal Integration / External Integration	Wong *et al.,* (2013)
Criteria 1: IOM	This research focuses on adopting e-Business practices to accomplish efficient and effective coordination and integration of all operations and functions of the supply chain.	Systems Integration	Nguyen (2013)
Criteria 1: IOM	This research focuses on focus on the integration of product knowledge in Engineer-To-Order (ETO) products development organisations. This integration improvement project was developed based on four phases: project delimitation, product analysis, product redesigning and finally, process adaptation. This project aimed at SC product knowledge integration and resulted in reducing information exchange with suppliers required during the specification of customer-specific product and enhancements in product design.	Internal Integration / External Integration	Haug (2013)
Criteria 1: IOM	This paper contributes by presenting a Knowledge-based Customisation System for Supply Chain Integration (KCSSI) developed based on three core technologies: visualisation of topologies, network analysis, and knowledge-based system in order to obtain quantified actionable information and formulating strategies for SC configuration leading the long-term success.	Network Integration	Cheung *et al.,* (2012)
Criteria 1: IOM	This paper develops a Collaborative Knowledge Management Practices (CKMP) framework that dynamically integrates manifold SC partners and enables various knowledge users to collaborate for decisions that would influence the interests of all SC partners. Thereafter, it focuses on real-time interaction capabilities and computerised work flows implied by CKMP facilitate sharing knowledge and skills. Then appropriate access to trading partners' knowledge databases is also provided. Overall, CKMP enables relationship development between knowledge users from remote SC partners, and boosts risk sharing.	Internal Integration	Li *et al.,* (2012)
Criteria 1: IOM	This research presents a two-echelon network prototype for integrated production and distribution planning where non-multi-functional plants supply multiple types of products with limited quantities to the customers via capacitated warehouses.	Distributor Integration / Production Integration	Yuan *et al.,* (2012)
Criteria 1: IOM	This research contributes by identifying five integration scenarios derived from an initial set of 14 cases and validated using a total of 112 real-world company projects. These B-2-B integration situations signify (in a technology-agnostic way) how organisations develop electronic connections between internal Information Systems (IS) with external partners' IS. This research identified the following types of integrations: • Scenario 1: Heterogeneous ERP Systems, External System Access • Scenario 2: Heterogeneous ERP Systems, EDI, Direct Partner Integration • Scenario 3: Heterogeneous ERP Systems, EDI, Connection to Intermediaries. • Scenario 4: A Centrally Operated, Integrating ERP System. • Scenario 5: Integrating Platform Run by a Service Provider	B-2-B Integration	Schubert and Legner (2011)
Criteria 1: IOM	This research focuses on developing and testing a model of Inter-firm Distribution Networks (IDNs) connected by extranets.	Information Integration / Electronic Integration	Spralls *et al.,* (2011)
Criteria 2: IOM/IPC	This research investigates on the supply chain structures within two multinational textile enterprises. One enterprise integrates the market side by merging a brand owner. The other seeks an integration solution to compensate from its loss of control of sub-manufacturing sites which during corporate expansion were registered as independent organisation. Both have initiated their global logistics management projects to balance the demand and supply. This research offers a joint solution by building up the e-Fashion global supply chains to overcome the barriers (e.g. lack of information visibility, diverse distribution activities, etc.) of these two enterprises.	Upstream Integration Downstream Integration Vertical Integration	Wang and Chan (2010)
Criteria 2: IOM/IPC	This research discusses and evaluates the role and effectiveness of RosettaNet standard in integrating the telecommunications supply chain. In doing so, the integration efforts of a global manufacturer of infrastructural equipment for mobile telecommunications networks are investigated in order to develop system-to-system integration supported processes towards its customers and telecommunications operators.	Inter-organisational System-to-System Integration	Kauremaa *et al.,* (2010)
Criteria 2: IOM/IPC	This research presents an order fulfilment optimisation model that enhances supply chain integration and collaboration across SC partners through effective monitoring and controlling of supply chain variables. It considers the critical to customer requirements at the SC design onset making it a useful model for dealing with customer differentiation and channel separation.	Partial Integration Internal Integration External Integration	Amer *et al.,* (2010)

Criteria 2: IOM/IPC	Although this research mainly explores the organisational and technological factors that describe the adoption of e-Business function, however, it also confirms that organisations need to migrate from EDI-based infrastructure to XML-based e-Business frameworks. This research also confirms that the XML-based e-Business infrastructure provides better support for e-Business functions.	Forward Integration Backward Integration Application Integration Electronic Integration Vertical Integration Technology Integration	Nurmilaakso (2008)
Criteria 2: IOM/IPC	This research proposes an agent-mediated, constraint-based decision and coordination method for integrating supply chain in a web-based environment. This research further suggests that by adopting e-Business solutions, coordination and cooperation between competitors and partners, rather than optimisations of individual functions, is a competitively successful for modern supply chains.	Service Integration Information Integration Enterprise Integration	Wang *et al.,* (2008)
Criteria 2: IOM/IPC	This research proposes a heuristic methodology to enable the development and assessment of process plans for distributed manufacturing facilities. This proposed methodology facilitates the integration of planning and manufacturing in a distributed manufacturing environment.	Downstream Integration Upstream Integration	Woo *et al.,* (2007)
Criteria 2: IOM/IPC	This research examines the shareholder value effects of setting up industry exchanges – considering this as a prominent mechanism used in achieving supply chain integration in organisations. Moreover, some electronic integration mechanisms reported are: • EDI, XML – Technologies to integrate business partner systems. • Extranet – Browser based access to business partner systems. • Private marketplace – Firm owned online market to buy or sell products. • Industry exchange – Consortia based online exchange to integrate business partner systems. • Neutral exchange – Third party online market to buy or sell products	Information Integration Supplier Integration	Mitra and Singhal (2008)
Criteria 2: IOM/IPC	This research contributes in explaining how business process modelling can be used so as to accomplish enhancements in information sharing and integration of processes. Moreover, this research discusses on the use of inter-organisational IS and applied technology as crucial enablers for supply chain integration in achieving improved organisational performance.	Process Integration	Trkman *et al.,* (2007)
Criteria 3: IOM/IPC/ISM	This research explores strategic integration operations in four areas, carried out at the manufacturing plant level such as four types of methods used in integrating supply chain e.g. strategic customer integration, strategic supplier integration, product-process technology integration and corporate strategy integration.	Design Integration Tactical Integration Operational Integration Value Chain Integration	Swink *et al.,* (2007)
Criteria 2: IOM/IPC	In this paper, SCI in the form of logistical and technological integration was considered for its effect on environmental practices in the supply chain. Technological integration with primary suppliers and with major customers was positively linked to environmental monitoring and environmental collaboration. Nevertheless, logistical integration only has an impact on green supply chain practices with primary suppliers but not with the major customers. Finally, as the supply base shrinks the degree of environmental collaboration with the primary suppliers' increases.	Information Integration Supplier Integration	Vachon and Klassen (2006)
Criteria 2: IOM/IPC	This research discusses on the Co-OPERATE system project that aims to develop a set of new concepts, methodologies and Web-based communication tools for improved coordination of production planning and control operations in the supply chain network. To accomplish the latter, decentralised coordination architecture was employed primarily as it corresponds directly to the peer-to-peer nature of the supply chain network, maintains local decision autonomy and supports existing local planning systems.	Information Integration Intra-Firm Integration Inter-Firm Integration Application Integration	Xu *et al.,* (2005)
Criteria 3: IOM/IPC/ISM	In examining SCI evaluation, this research proposes a framework for evaluating the portfolio of integration technologies that are used to unify inter-organisational and intra-organisational IS in organisations. This research defines and classifies the variations of IS available based on their features and integration needs. This research demonstrates the significance of enhancing SCM through the integration the supply chain business processes and associated IS.	IS Integration Inter-Organisational Integration Intra-Organisational Integration Process Integration	Themistocleous *et al.,* (2004)
Criteria 1: IOM	This research reports on the case of Motorola that integrates supplier roadmap information directly into its internal roadmaps to plan technology and product evolution.	Enterprise Integration Information Integration	Petrick and Echols (2004)

Table 8: Classification of Methods/Approaches Employed or Discussed in Integrating SC

Appendix C: Full Abbreviation Description of Driving and Inhibiting Factors (*FC = Frequency Count)

Inhibiting Factors

- **Strategic**
  - Lack of Strategic Alignment (LAS) FC = 2
  - Lack in Readiness of Business Partners (LRDB) FC = 1
  - Lack of Shared Vision (LSV) FC = 1

- **Managerial**
  - Lacking in Cross-trained Experienced Workforce (LCEW) FC = 7
  - Executive/Managerial Poor Commitment (E/MPC) FC = 2
  - Lack of Motivation (LM) FC = 2
  - Lack of Knowledge and Skill on Logistics Management (LKSLM) FC = 1

- **Organisational**
  - Resistant to Change (RC) FC = 9
  - Cultural Distance, Geographic Dispersion (CD/GD) FC = 5
  - Lack of Information/Knowledge Management and Visibility (LIKMV) FC = 4
  - Power Imbalance (PI) FC = 2
  - Lack of Trust (LT) FC = 2
  - Internal Planning and External Monitoring Failures (IPEMF) FC = 1
  - Conflict of Interests of Supply Chain Entities (CISCE) FC = 1
  - Lack of Shared Resources (LSR) FC = 1

- **Operational**
  - Bullwhip Effect (BE) FC = 3
  - Lack of Effective and Parallel Communication Structure (LEPCS) FC = 3
  - Operational Inefficiencies (OI) FC = 3
  - Redundant and Incompatible Business Processes (RIBP) FC = 2
  - Site Access Constraints (SAC) FC = 1
  - Different Distribution Activities (DDA) FC = 1
  - Customer Services Failing Market Requirements (CSFMR) FC = 1
  - Poor Responsiveness (PR) FC = 1
  - Lack of Data Exchange Standard (LDES) FC = 1
  - Insufficient SC Visibility (ISCV) FC = 1

- **Technological**
  - Lack of Unified IT Infrastructure (LUITI) FC = 10
  - Lack of Technical Resources, Skills and Knowledge on Integration (LRSKI) FC = 9
  - Incompatible IS (ISI) FC = 2
  - Lack of Alignment between Business Process and System (LABPS) FC = 2
  - Time to Implement SCI (TISCI) FC = 1

- **Financial**
  - Higher Initial Investment Costs (HIIC) FC = 7
  - Lack of Financial Resources (LFR) FC = 3

- **Environmental**
  - Environmental Uncertainty (EU) FC = 5
  - Hostile External Pressures (HEP) FC = 4
  - Risk of Security/Insecurity to Business and Information (RS/IBI) FC = 4
  - Increased Level of Global Competition (ILGC) FC = 3
  - Changing Competitive Environment (CCE) FC = 1
  - Competitive Pressures to Reduce Costs (CPRC) FC = 1

Driving Factors

- **Strategic**
  - Competitive Advantage (CA) FC = 32

- Developing Strategic Partnerships (DSP) FC = 21
- Joint Strategic Planning (JSP) FC = 3

- **Managerial**
  - Top Management Support & Commitment (TMSC) FC = 10
  - Improving Management/Workforce Performance (IMWP) FC = 3
  - Skilled Human Resource (SHR) FC = 3
  - Interactive Management Style (IMS) FC = 2
  - Reduction in Administrative Tasks Load (RATL) FC = 1

- **Organisational**
  - Improving Firm Performance (IFP) FC = 87
  - Effective Coordination & Communication (ECC) FC = 69
  - Efficient Customer Service & Responsiveness (ECSR) FC = 40
  - Improved Knowledge Exchange & Management (IKEM) FC = 18
  - Developing Trust (DT) FC = 16
  - Organisational Innovativeness and Competitiveness (OIC) FC = 15
  - Customer Satisfaction (CS) FC = 13
  - Efficiency and Sharing of Resources (ESR) FC = 9
  - Global Connectedness & Market Share (GCMS) FC = 8
  - Collective Operations & Responsibility (COR) FC = 6
  - Improved Collective Decision-Making (ICDM) FC = 6
  - Business Synchronisation & Collaboration (BSC) FC = 5
  - Interdependence (ID) FC = 5
  - Organisational Size (OS) FC = 1

- **Operational**
  - Facilitating Information Sharing (FIS) FC = 68
  - Operational Efficiency & Performance (OEP) FC = 55
  - Improved Product Quality, Management & Delivery (IPQMD) FC = 36
  - SC Agility, Flexibility & Visibility (SCAFV) FC = 35
  - Improved Information/Data Visibility, Management & Accuracy (IIDVMA) FC = 21
  - Effective Information Flow (EIF) FC = 20
  - Improving SC Effectiveness & Value (ISCEV) FC = 17
  - Reduced Inventory Levels (RIL) FC = 11
  - Collaborative Supply Networks & Operations (CSNO) FC = 8
  - Reduced Lead Times (RLT) FC = 7
  - Seamless Flow of Material (SFM) FC = 7
  - Cooperation with SC Partners (CSCP) FC = 4
  - Business Process Efficiency (BPE) FC = 3
  - Achieving Economies of Scale (AES) FC = 2

- **Technological**
  - Compatible IT Platform (CITP) FC = 11
  - Effective Implementation of Traceability (EIT) FC = 3
  - Reduced Operational & Logistics Costs (ROLC) FC = 2
  - Sharing Technological Resources (SRS) FC = 1

- **Financial**
  - Improved Financial Performance (IFP*) FC = 45
  - Higher Profitability (HP) FC = 15
  - Return on Investment (ROI) FC = 2
  - Collaborative Management of Costs (CMC) FC = 1

- **Environmental**
  - Global Competitiveness (GC) FC = 5
  - SC Sustainability (SCS) FC = 5
  - Reduced Uncertainty (RU) FC = 3
  - Improved Environmental Performance (IEP) FC = 1