The thematic landscape of literature on supply chain management in India: a systematic literature review

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Abstract

Purpose – To assess the state of supply chain management (SCM) research in India and to understand the research trends and methodologies used. The present study also aims to create a taxonomy of the subject areas researched in India.

Design/methodology/approach – The present study employed the systematic literature review methodology. Literature from 395 peer journal papers in 67 leading journals over a 20-year period (2000–2020 Quarter-1) was comprehensively reviewed and assessed.

Findings – SCM research in India started around the year 2000. The quantum of research was low (single digit) until 2010. There has been steady growth over the last decade, and over 50% of the total papers up until now has been published in the last four years. The present study created a three-tiered taxonomy of the subject areas and classified the papers as per it. The first tier (level-1) has seven categories (SCM strategy, network design, SCM processes and integration, IT systems, skills, performance measurement and others). A perusal of the newly created taxonomy revealed that, except for a few areas under level-1 categories (such as SCM processes and SCM strategy), the other level-1 categories have not seen much research. Similarly, there is little or no research in a large number of level-2 categories (such as outsourcing strategy, channel strategy, demand management, demand fulfillment, customer relationship management, integrated supply chain planning, new product development, returns, supply chain orientation, performance monitoring, performance improvement, SCM adoption process, SCM implementation issues and quantified benefits of SCM). Methodologically, the rigor of SCM research in India needs improvement.

Originality/value – A comprehensive taxonomy of SCM subject areas researched in India at three cascading levels was created for the first time in the present study. The taxonomy will help provide researchers with a clear understanding of the structure of the subject areas and help in identifying areas where research has been carried out and the subject areas where gaps exist for future research to proceed. The present study also provides an overview of the methodological rigor of SCM research in India and points out some of the limitations that researchers should avoid in future studies.

Keywords Supply chain management, Supply chain, SCM, India, Systematic literature review, Taxonomy, Methodology

Paper type Literature review

1. Introduction

Supply activities and supply chains have existed long before the term supply chain management (SCM) was coined by Oliver and Webber in 1982. Olden-day spice, silk routes and logistics planning for militaries involved supply chains. The concept of modern-day SCM can be traced to systems dynamics and analysis by Jay W. Forrester, who suggested that interaction between the flows of information, material, manpower, equipment and money will determine the success of industrial companies (Forrester, 1958). The modern-day SCM became popular in practice and academia since the mid-1990s (Mentzer *et al.*, 2001; Kotzab and Otto, 2004; Sweeney, 2011) in the developed economies.

In India, SCM was in a state of infancy in early 2000 (Sahay and Mohan, 2003) and is currently gaining momentum, especially over the last few years. However, it has a lot of catching up to do to be on par with the advanced economies. In terms of SCM research, too, India has been a laggard compared to the USA (Avittathur and Swamidass, 2007). Several

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other researchers have also observed that SCM research in India is limited (Saad and Patel, 2006; Park *et al.*, 2012; Gorane and Kant, 2015; Rogers *et al.*, 2016; Avittathur and Jayaram, 2016). The bulk of the empirical SCM research was carried out in developed economies such as North America and Europe. Developing countries contribute about 5% of SCM research (Soni and Kodali, 2011; Gorane and Kant, 2015). Scholars also note that multinational firms use developing and underdeveloped countries for sourcing raw materials and also as target markets. They have thus urged for more SCM research to be carried out in these countries to determine the performance of supply chains (Sachan and Datta, 2005; Soni and Kodali, 2011). With regard to emerging economies such as India, Avittathur and Jayaram (2016) have identified some gaps. These are: (1) there is very little research on SCM practices, (2) studies at the chain level are few and (3) research on the impact of national context factors such as cultural and infrastructural issues on the performance supply chains in comparison to developed economies is absent.

Systematic literature reviews (SLRs) are an essential building block for producing reliable scientific knowledge for the advancement of a discipline (Tranfield *et al.*, 2003; Burgess *et al.*, 2006; Durach *et al.*, 2017). Further, they are also a rich source of information as they provide interesting insights that are based on the synthesis from a large number of studies. SLRs abound in SCM literature. Durach *et al.* (2017) reviewed 133 SLRs related to SCM during the period 2010–2015. However, to the best of the knowledge of the authors of the present paper, there exists a solitary SLR related to SCM in India by Gurumurthy *et al.* (2013) until now. Moreover, it is based on 70 peer-reviewed papers over a 14-year period (1998–2012), which is quite small. The lack of a large number of SLRs and the low number of papers found by the Gurumurthy *et al.* (2013) SLR point to a low quantum of SCM research pertaining to India and corroborate the observations by other scholars such as Saad and Patel (2006), Park *et al.* (2012), Gorane and Kant (2015), Rogers *et al.* (2016), Avittathur and Jayaram (2016). Thus, it is evident that while there are numerous SLRs studies in the SCM discipline, but when it comes to SLRs studies related to SCM in India, there are not many. Thus, there exists a gap in the literature about SLRs that focus on SCM studies in India.

The other key reasons for the need of SLRs focusing on SCM on India are: (1) the size of the Indian economy. It is the third-largest economy of the world in terms of purchasing power parity (PPP) (World Bank, 2018); (2) a large market, with its 1.3bn population, India is home to one-sixth of the humanity; (3) is an outsourcing hub for global supply chains (Soni and Kodali, 2011; Udbye, 2014; Rogers *et al.*, 2016; Avittathur and Jayaram, 2016; Moradlou *et al.*, 2017); and (4) several key changes in the national context of India with respect to business models, technology and business environment in the past 3–4 years. There has been a spurt of new products and services being offered that are only possible through carefully designed and integrated supply chains. Few examples to illustrate are: e-commerce aggregators such as Flipkart and Amazon; taxi aggregators such as Uber and Ola; food delivery aggregators such as Swiggy and Zomato; hotel aggregators such as Oyo and Airbnb. The products and services offered by these firms are novel and are based on new business models. Further, mobile phones and Internet connectivity have become ubiquitous in India recently due to cheap mobile data rates. India has the most affordable mobile data in the world (PTI, 2019), which has been instrumental in making some of the new product and service offerings feasible. The business environment in India witnessed a quantum leap in the ease of doing business. India jumped 53 places, from 130 in 2017 to 77 in 2019, in the annual World Bank report that ranks 190 countries on the ease of doing business (World Bank, 2017, 2019).

To sum up the preceding discussions, it is important to undertake an SLR on SCM research in India due to: (1) the lack of SCM SLRs focused on India. Studies that provide comprehensive insights into SCM research in India with respect to content and methodology are absent – indicating a gap in the literature (established in the literature review section),

(2) India is a large developing economy – which has a large market, and is also an outsourcing hub for global supply chains, (3) researchers have identified a need to study SCM in emerging economies to understand the supply chain performance in the context of national factors. Thus, the objective of the present study is to comprehensively review the extant SCM literature in India with an aim to gain insights into how the subject areas and the methodologies used in SCM literature have evolved until now. This mapping will help researchers to identify the research trends and the areas that have not been explored yet or explored inadequately.

The structure of the present study is provided here. The current section (Section-1) sets the context of the study by providing an introduction and defining its purpose. Section-2 reviews the existing literature comprehensively and establishes the need for the present study. Section-3 describes the methodology used in the present study. It also discusses a novel schema created for categorizing the subject content. Section-4 presents the study results in terms of the quantum of SCM research in India, the subject areas researched and the methodologies used. A number of valuable insights have been presented in this section along with a discussion on how the results compare with past studies. Section-5 provides a discussion on the summary of the findings. It sheds light on the evolution of SCM research in India over the last 20 years and identifies the gaps in research with respect to subject areas and methodology. Section-6 provides the theoretical and practical implications, and the final section lists down the contributions, limitations and the direction for future research.

2. Literature review (SLRs related to SCM in India)

Based on an extensive search of the literature in Scopus, ProQuest, Web of Science (WOS) databases and other journals, 25 journal papers related to SLR studies pertaining to SCM in India were found. On scrutinizing them, it was found that eight of the papers (Sachan and Datta, 2005; Ansari and Kant, 2017; Datta, 2017; Chauhan and Singh, 2018; Das and Jharkharia, 2018; Roy *et al.*, 2018; Mishra *et al.*, 2018; Soni *et al.*, 2019) were not related to India. The remaining 17 papers related to multiple countries across the globe, including India. Only one of them (Gurumurthy *et al.*, 2013) has focused on India. A summary of these SLR studies, along with a brief description of the purpose and findings, has been provided in Table 1.

It is evident from Table 1, that except for the study of Gurumurthy *et al.* (2013), the country in which the SCM study has taken place is a mix of several countries. The percentage of studies from India in these papers ranges from 1.94 to 30%, with an average of 8%. The primary objective of these SLRs has been to classify the papers based on the (1) content, (2) methodologies used or (3) both content and methodology used. The major limitation of these 16 papers (from multiple countries) is that there is no classification of the content and methodology available country-wise. Thus, while these SLRs have included papers from India-related studies (which is a small percentage), no inference can be drawn from them about the research trends and methodology for India.

Furthermore, a majority of these SLRs (from multiple countries) have focused on a subset of SCM such as fresh produce supply chain management (FSCM) (Shukla and Jharkharia, 2013); green supply chain management (GSCM) (Malviya and Kant, 2015; Dubey *et al.*, 2017); empirical supply chain practices (Gorane and Kant, 2015); supply chain risk management (SCRM) (Prakash *et al.*, 2017); coordination and responsiveness of SCM in SMEs (Kumar and Singh, 2017); health care supply chain management (Mathur *et al.*, 2018); logistics/3PL (Roy and Sengupta, 2018; Mohammadreza, 2018); big data in SCM (Lamba and Singh, 2017); inventory models for perishable products (Chaudhary *et al.*, 2018); sustainable freight transportation for perishable food products (Vrat *et al.*, 2018); humanitarian operations and supply chain management (HSCM) (Behl and Dutta, 2018). Two of the papers (Soni and Kodali, 2011, 2012) have not limited their studies on content. However, they have limited their

Table 1.
SLRs related to SCM in India – (country of research, subject and summary of findings)

Authors, year	Time period	Source database, journals	# Of papers/ India papers	Country	Subject/content	Brief description of purpose/ findings
Soni and Kodali (2011)	1994–2008 (14 years)	Emerald, Taylor and Francis, ScienceDirect, and Wiley interscience	569/14	Global	All subjects	Classified empirical papers based on their content
Soni and Kodali (2012)	1994–2009 (15 years)	Emerald, Taylor and Francis, ScienceDirect and Wiley interscience	619/12	Global	All subjects	Classified empirical papers based on the methodology used
Shukla and Jharkharia (2013)	1991–2011 (20 years)	Emerald, Elsevier, Springer, Wiley and EBSCO	86/4	Global	Fresh produce supply chain management (FSCM)	Classified the papers based on (1) methodology used and (2) food product type
Gurumurthy *et al.* (2013)	1998–2012 (14 years)	Emerald, Elsevier, Springer, Wiley	70/70	India	All subjects	Classified the papers based on the (1) content and (2) methodology used
Gorane and Kant (2015)	1997–2012 (16 years)	Several Journals	382/11	Global	Empirical supply chain practices	Classified the papers based on the (1) content and (2) methodology used
Malviya and Kant (2015)	1998–2013 (15 years)	Elsevier, ScienceDirect, Emerald, Taylor and Francis, Wiley interscience, Springer and IGI Global Publication	177/7	Global	Green supply chain management (GSCM)	Classified the papers based on the (1) content and (2) methodology used
Lamba and Singh (2017)	2010–2016 (6 years)	Scopus	39/NA	Global	Big data	Reviewed the use of big data in operations and SCM, especially in the areas of manufacturing, procurement and logistics
Dubey *et al.* (2017)	1990–2016 (26 years)	ScienceDirect, Compendex, EBSCO, Emerald and Scopus	248/7	Global	Green supply chain management (GSCM)	Proposed a conceptual GSCM/ SSCM framework
Kumar and Singh (2017)	2000–2016 (16 years)	ScienceDirect, Emerald, Taylor and Francis, Sage and Inderscience	116/22	Global	Coordination and responsiveness of SCM in SMEs	Classified the papers based on content

(*continued*)

Table 1.

Authors, year	Time period	Source database, journals	# Of papers/ India papers	Country	Subject/content	Brief description of purpose/ findings
Prakash *et al.* (2017)	2004–2014 (11 years)	Emerald, Taylor and Francis, Sage, ScienceDirect, Wiley and JSTOR	343/13	Global	Supply chain risk management (SCRM)	Classified the papers based on risk management process (RMP)
Chaudhary *et al.* (2018)	1990–2016 (26 years)	Several Journals	418/99	Global	Inventory models for perishable products	Classified the papers based on (1) content and (2) methodology used
Mathur *et al.* (2018)	2000–2016 (16 years)	Emerald, Elsevier, Taylor and Francis, Springer, Inderscience	181/NA	Global	Health care supply chain management	Proposed a conceptual framework for SC practices, SC Performance (SCP) and organizational Performance (OP)
Prakash (2018)	1995–2017 (22 years)	Emerald, Springer, ScienceDirect, Taylor and Francis, Inderscience	99/30	United Kingdom and India	Food processing supply chains (FPSC)	Classified the papers based on (1) content and (2) methodology used
Vrat *et al.* (2018)	1985–2017 (22 years)	Scopus	94/5	Global	Sustainable cold chain for perishables	Reviewed the status and trends using bibliometric analytics and network analytics
Behl and Dutta (2018)	2011–2017 (6 Years)	Scopus, SCI, SSCI, Web of Science	362/56	Global	Humanitarian supply chain management (HSCM)	Classified the papers into nine thematic areas
Mohammadreza (2018)	1991–2016 (25 years)	Science direct, Emerald, Taylor and Francis, Wiley, Springer, JSTOR	263/20	Global	Logistics outsourcing	Reviewed the papers with respect to: (1) research design, research methods, data analysis techniques applied
Roy and Sengupta (2018)	2006–2016 (10 years)	Web of Science	95/12	Global	3PL	Created a classification based on: (1) subject category and (2) methodology used

studies to empirical research. As a result of a very narrow scope of review by these SLRs, a good understanding of the complete SCM research landscape in India with respect to content and methodology is not readily discernible.

On reviewing the Gurumurthy *et al.* (2013) study, the only SLR study that focused on SCM in India, it was found that it was based on 70 peer-reviewed journal papers spanning 14 years (1998–2012). It provided a categorization of the subject areas researched and the methodologies used. Eight subject categories were created to classify the papers. These were: collaboration management, comprehensive construct, information technology, integration, logistics management, manufacturing management, strategic management and supplier management. One of the major limitations of this SLR was that the categorization provided is a simple listing of the subject areas. SCM covers a vast array of themes involving multiple functional areas and business processes, both within and across organizational boundaries. Thus, a simple listing of subject areas, such as the one provided by the Gurumurthy *et al.* (2013) study, is not adequate. It is argued here that a classification of the subject areas into a taxonomy with cascading tiers will provide better insights. For example, a classification such as: SCM processes (at level-1) → Supplier Relationship Management (SRM) (at level-2) → (supplier selection, supplier evaluation, supplier development, power relationships, etc. at level-3) provides better understanding of the subject categories than simply assigning all the papers into a single category called supplier management as has been done in the Gurumurthy *et al.* (2013).

The other key limitation of the Gurumurthy *et al.* (2013) study was that the findings were based on a small number of papers (70 papers) available for review. Since then, there has been a sharp increase in the number of papers published between 2012 and 2020, as has been observed in the present study (refer Figure 2), necessitating a re-examination and revision of the subject categories.

The present study undertakes a more comprehensive SLR of SCM studies in India by (1) reviewing a large number of papers ($n = 395$) over 20 years, (2) creating a taxonomy of the content that has a tiered hierarchy rather than a simple listing of subject categories, (3) providing information about the theories used, (4) providing insights into sampling technique, sample sizes and response rates for survey papers and (5) providing trends about data analysis techniques used over the years.

3. Methodology

Durach *et al.* (2017) identified 133 SLRs in SCM between 2010 and 2015. There have been several other SLRs prior to 2010. It is neither the intent, nor is it possible to review all the SLRs in SCM in the present study. So, a brief review of some of the important SLR studies in SCM over the last two decades, such as the ones by Croom *et al.* (2000), Carter and Ellram (2003), Sachan and Datta (2005), Burgess *et al.* (2006), Giunipero *et al.* (2008), Soni and Kodali (2011), Durach *et al.* (2017) and Gunasekaran *et al.* (2017), has been carried out to gain critical insights about SCM SLRs with respect to the objectives/main findings and methodology used (refer Table 2).

Based on the insights gleaned from the review of SLR studies (in Tables 1 and 2), the present study used the SLR methodology by Durach *et al.* (2017). This methodology has been specifically created for the SCM domain and is based on four key publications (Mulrow, 1987; Tranfield *et al.*, 2003; Cochrane Collaboration, 2011; Campbell Collaboration, 2016). It comprises six steps: (1) define the research question(s); (2) determine the required characteristics of the papers; (3) retrieve a sample of potentially relevant literature (baseline sample); (4) select pertinent literature (synthesis sample); (5) synthesize literature; and (6) report the results.

Table 2. Review of key SCM SLRs

Authors, year	# Of papers/time period	Source data^	Result/outcome of the study
Croom *et al.* (2000)	84 papers/(time period not mentioned)	ProQuest, Searchbank, Anbar and BIDS (books, journal papers, and conference papers)	Classified the papers based on two broad criteria: (1) content-oriented and (2) methodology-oriented A new content classification framework (two-dimensional content analysis matrix) was created. The two dimensions were: level of analysis (dyadic, chain and network) and elements of exchange (asset, information, knowledge and relationship)
Carter and Ellram (2003)	774 papers/1965–1999 (35 years)	JSCM	Classified the papers along four areas: (1) the subject area; (2) the type of research; (3) research design; and (4) data analysis performed
Sachan and Datta (2005)	442 papers/1999–2003 (5 years)	JBL, IJPDLM, SCMIJ	Classified papers based on the methodologies used Provided insights about research design, research methods, data analysis techniques, unit of analysis and data sources
Burgess *et al.* (2006)	100 papers/1985–2003 (19 years)	ABI/Inform Global ProQuest	Categorized the papers along four groups involving 11 dimensions. These are: (1) descriptive features of SCM literature (time distribution of publications, journal names, industry sectors); (2) definitional issues (approaches to definitions, conceptual framing of SCM, constructs of SCM, discipline bases); (3) theoretical concerns (theoretical perspective, the purpose of theory); and (4) research methodological issues (paradigmatic stance, research methods)
Giunipero *et al.* (2008)	405 papers/1997–2006 (10 years)	DS, IJLM, IJOPM, IJPDLM, IMM, JBL, JOM, JSCM, MS	Reviewed the papers and categorized them along: (1) subject categories, (2) research method, (3) research design and (4) data analysis techniques. Created a framework for analysis based on the level of analysis and research design
Soni and Kodali (2011)	569 papers/1982–2008 (26 years)	Emerald, Taylor and Francis, ScienceDirect, and Wiley interscience	Reviewed empirical papers of SCM and classified them at two levels: (1) SCM construct and (2) issues studied within each construct

(*continued*)

Table 2.

Authors, year	# Of papers/time period	Source data^	Result/outcome of the study
Durach *et al.* (2017)	133 SLR papers/ 2010–2015 (5 years)	EBSCO and Web of Science	Categorized the 133 papers. About 60% of them were related to mapping research trends and methodological approaches in SCM Created a new approach to conduct SLR in the SCM domain, which reflects the ontological and epistemological idiosyncrasies of SCM research [(1) theoretical boundaries; (2) unit of analysis; (3) sources of data: units and level of data collection; (4) study context; (5) definitions and operationalization of constructs; (6) research methods]
Gunasekaran *et al.* (2017)	100 papers/2004–2014 (10 years)	EBSCO, Scopus, Springer link, Taylor and Francis online journals, Sage journals, Wiley online library and Emerald journal databases	Reviewed literature on the use of IT in logistics and supply chains for competitive advantage Categorized the content in the papers based on the triple A's classification scheme (adaptation, alignment, agility) by Lee (2004)

Note(s): ^DS – Decision Sciences; IJLM – International Journal of Logistics Management; IJOPM – International Journal of Operations and Production Management; IJPDLM – International Journal of Physical Distribution and Logistics Management; IMM – Industrial Marketing Management; JBL – Journal of Business Logistics; JOM – Journal of Operations Management; JSCM – The Journal of Supply Chain Management; MS – Management Science; SCMIJ – Supply Chain Management: An International Journal

3.1 Step-1: defining the research question(s)

The purposes of the majority of the SLRs in the SCM domain are (1) classification of content and methodology of past literature to gain insights into the issues, trends and so on; (2) developing theoretical models or frameworks. The objective of the present study is to categorize the content and methodology of SCM in India. Thus, the research questions of the present study are:

(1) What is the quantum of SCM research carried out in India?

(2) What SCM subject areas and issues are researched in India?

(3) What methodologies are used in SCM research in India?

3.2 Step-2: determining the required characteristics of the papers

This step requires the specification of the inclusion and exclusion criteria for the present study. The criteria for selection of papers in this study are: (1) the paper should pertain to SCM research in India, and (2) both empirical and theoretical papers are included.

3.3 Step-3: retrieving the sample of potentially relevant literature ("baseline sample")

For retrieving the sample of relevant literature, it is important to specify the selection criteria of the journals and papers, the time horizon of the studies and the classification scheme. The journal selection criteria, article selection criteria and time horizon are discussed in this section (step-3) while the article classification criteria are discussed in step-4.

3.3.1 Journal and article selection criteria. The present study employed three of the comprehensive research databases Scopus, ProQuest ABI/INFORM collection databases and WOS for searching the papers. This is in line with other SLRs in the field (Burgess *et al.*, 2006; Ansari and Kant, 2017; Durach *et al.*, 2017; Lamba and Singh, 2017; Behl and Dutta, 2018; Mishra *et al.*, 2018; Roy and Sengupta, 2018; Vrat *et al.*, 2018). Scopus, ProQuest and WOS are three of the largest repositories of peer-reviewed literature for scientific journals. Scopus has over 21,000 peer-reviewed journals. It is considered an excellent repository for peer-reviewed papers on SCM (Chicksand *et al.*, 2012). ProQuest ABI/INFORM collection databases have over 3,100 scholarly journals and a dissertation database with over a million dissertations. The WOS database comprises over 12,000 high-impact journals. The three databases combined together can be said to include papers from almost all leading publishing houses such as Elsevier, Emerald, Taylor and Francis, Springer, Sage Publications, John Wiley and Sons and so on.

The keywords used in the present study ("Supply chain management or supply chain or SCM" and "India") are similar to other SLRs in the field (Burgess *et al.*, 2006; Soni and Kodali, 2011; Gurumurthy *et al.*, 2013; Malviya and Kant, 2015; Prakash *et al.*, 2017; Durach *et al.*, 2017). The specific keyword search strings for the three databases are given in Table 3.

Database	Keywords	Date of search	# Of records retrieved
Scopus	TITLE-ABS-KEY ((("supply chain management") OR ("supply chain") OR ("SCM")) AND (India))	01-Apr-2020	1,893
ProQuest	(NOFT ("Supply chain management") OR NOFT ("supply chain") OR NOFT (SCM)) AND NOFT (India)	01-Apr-2020	1,239
Web Of Science	(TI = (India AND ("Supply Chain Management" OR "Supply Chain" OR SCM))) AND LANGUAGE: (English)	01-Apr-2020	46
Total			3,178

Table 3. Keywords searched

The queries were run on all the three databases on April 01, 2020. No time frame had been set for the queries. As a result, all the records present in the databases until the query run date were fetched. A total of 3,178 papers were retrieved from the three databases. Eight other relevant papers were added to form a "baseline sample" of 3,186 papers.

3.4 Step-4: selecting pertinent literature (synthesis sample)

The papers from the baseline sample were subjected to a filtration process. The title and abstract of these papers were read, and the nonrelevant papers were filtered out in several steps, as has been shown in Table 4. Finally, a database of 395 peer-reviewed papers remained for carrying out the literature review. This formed the "synthesis sample" (refer to Table 4).

Table 4. Arriving at the synthesis sample database for SLR: article filtering process

Step #	Filtering steps	# Of papers	# Of papers after filtering
1	Total papers	3,186	3,186
2	Duplicate in Scopus, ProQuest and Web of Science	392	2,794
3	Not journal article	785	2,009
4	Not SCM-related or not SCM-focused	1,171	838
5	SCM study: not India-related	102	736
6	Repeat-similar study	48	688
7	SCM study: indirect/periphery	261	427
8	Full article could not be accessed	32	395

3.5 Step-5: synthesize literature

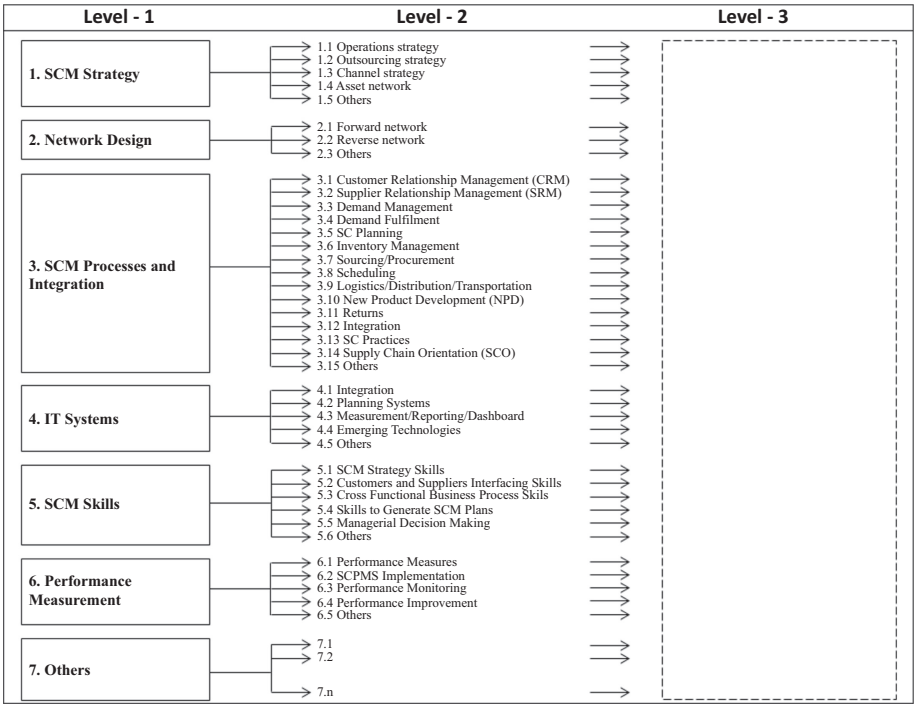
Synthesis refers to deriving meaningful insights and finding new knowledge from the information collected. Synthesis is carried out in two steps. In the first step, the papers are assigned codes as per a coding scheme (refer to Table A1 in Appendix) that helps in extracting the relevant information for synthesis. The second step involves summarizing, combing, comparing, contrasting, finding broad categories, trends and so on from the extracted information (obtained in the first step).

A database was created using a spreadsheet. The database was populated with the 395 papers obtained in the previous step (Step-4: Synthesis Sample). The database contained the author's names, the title of article, abstract, journal name, year of publication, publisher name, source database name, unique id. For each of the papers, additional information was coded by the lead author. The fields coded were: subject classification (level-1, level-2, level-3), industry sector, size (large or SME), unit of analysis, the theoretical base used, empirical/nonempirical and research design comprising research method, sampling type, sample size and data analysis technique.

3.5.1 Classification scheme. A taxonomy of the subject areas can be carried out by (1) creating a structure first and then assigning the papers into this structure; (2) reviewing the papers and coming up with a structure. In the present study, the first option for creating a taxonomy has been used, as shown in Figure 1. The number of tiers (levels) in a taxonomy is dependent on the subject area and purpose of the study. A single layer is a list without any structure. In contrast, on the other extreme, a classification with numerous layers may provide an intricate structure, but may not be easy to comprehend. As a trade-off, a three-layered subject categorization has been adopted for the present study, which is deemed to provide sufficient understanding in terms of breadth and depth of the subject areas researched in SCM. A study by Roy *et al.* (2018), also employed a three-layered classification system for identifying the thematic development of sustainable supply chain management (SSCM). The top two levels (level-1 and level-2) of the proposed three-layered categorization are based on SCM definitions and constructs identified from earlier research in the discipline.

The first two levels provide the structure of the proposed taxonomy. The third-level categorization has been created based on the topics discovered in the papers reviewed. The description of the content included in the level-1 and level-2 categories of the proposed taxonomy has been provided further.

The major subject categories (level-1), in the proposed taxonomy, are based on established and recurrent themes identified from SCM definitions provided by serval scholars (Oliver and Webber, 1982; Houlihan, 1985; Jones and Riley, 1985; Stevens, 1989; Ellram, 1991; Scott and Westbrook, 1991; Towil *et al.*, 1992; Lambert and Cooper, 2000; Mentzer *et al.*, 2001; Bowersox *et al.*, 2002; Handfield and Nichols, 2002; CSCMP, 2007; Stock and Boyer, 2009; APICS, 2010; Christopher, 2011). The recurrent themes found are: one, SCM is about strategic, cooperative arrangement of relationships between interdependent entities (Mentzer *et al.*, 2001; Bowersox *et al.*, 2002; Stock and Boyer, 2009; Christopher, 2011). Two, SCM calls for coordination of information, material and money flows from initial source to the end customer (Oliver and Webber, 1982; Houlihan, 1985; Jones and Riley, 1985; Stevens, 1989; Scott and Westbrook, 1991; Towil *et al.*, 1992; Handfield and Nichols, 2002; CSCMP, 2007; Stock and Boyer, 2009). Three, SCM requires the integration of key business processes (Ellram, 1991; Scott and Westbrook, 1991; Towil *et al.*, 1992; Lambert and Cooper, 2000). Four, SCM tries to match the supply according to the demand (CSCMP, 2007; APICS, 2010). Five, the objective of SCM is to leverage the combined resources and strategic positioning of the firms in the network to create higher efficiency, competitive advantage, value addition, profits and customer satisfaction (Oliver and Webber, 1982; Stevens, 1989; Lambert and Cooper, 2000; Bowersox *et al.*, 2002; Stock and Boyer, 2009; APICS, 2010; Christopher, 2011).



Source(s): Author's own illustration

Figure 1.
Classification scheme

Based on the aforementioned definitions, six major subject areas (level-1 categories) were identified that relate to the major components required to implement and run SCM in a firm. These are (1) SCM strategy; (2) network design; (3) SCM processes and integration; (4) information technology (IT) systems; (5) skills, and (6) performance measurement. A seventh category, called "Others," has been created (at level-1) to accommodate the papers that cannot be classified in the first six subject categories.

The first level-1 subject category of the proposed taxonomy is "SCM strategy." An SCM strategy is a blueprint that specifies how the objectives of the supply chain will be achieved given its context (business strategy, products, resources, capabilities, internal structure, culture and environment) in alignment with the business strategy. SCM strategy guides five critical components. These are the operations strategy, the outsourcing strategy, the channel strategy, the customer service strategy and the asset network (Cohen and Roussel, 2005). These five are interlinked and together create the capability needed for providing products and services to the end customer. These five components form the level-2 categories of "SCM strategy." The "others" category has also been added at level-2.

The operations strategy determines the overall production focus (lean, agile, hybrid) based on product demand characteristics (Fisher, 1997), demand and supply uncertainties (Lee, 2002), and product type and product life cycle stage (Vonderembse *et al.*, 2006). The outsourcing strategy deals with the decision of make or buy. Outsourcing may also lead to offshoring to faraway global location(s). The channel strategy determines how the goods and services will be provided to the end customer. The decision required here is about determining whether to sell directly to end customers (like Dell's direct sales model) or use distributors or dealers/retailers (used by most automobile firms) or use a combination. The customer service strategy determines the service levels to be provided based on customer segmentation (by volume, profitability, etc.). This is done by studying the various service levels and the corresponding cost to serve. The asset network comprises the plants, production equipment, distribution centers and so on.

The second level-1 subject category is "network design." Network design refers to decisions related to setting up facilities of the firm and creating linkages with other supply chain actors. The decision about facilities setup includes the choice of location of plants and machinery, distribution structure and their capacities. The choice of location(s) for the facilities is influenced by a host of factors such as the presence of a supplier base, availability of land, the raw material(s), logistics infrastructure, skilled manpower, proximity to market, regulations and so on. Network design is one of the important decisions for a firm as it has a bearing on agility, flexibility, quality and unit costs. Network design requires a huge capital outlay, has a long gestation period (2–3 years or more) and is usually irreversible. Similarly, building relationships with suppliers and customers, developing mutual trust and commitment take years. Thus, network design is an essential component of SCM that requires careful considerations before it is set up. The level-2 categories of "network design" are forward network design, reverse logistics network design and others.

The third level-1 subject category is "SCM processes and integration." For a synchronized movement of material, information and money through the supply chain, all the processes involved in fulfilling a customer requirement need to be integrated both within a firm and across the firms in the chain. The supply chain operations reference (SCOR) framework has identified five SCM processes: plan, source, make, deliver and return (Supply-Chain Council, 2008). The Global Supply Chain Forum (GSCF) has identified eight SCM processes. These are customer relationship management, customer service management, demand management, order fulfillment, manufacturing flow management, procurement, product development and commercialization and returns (Lambert and Cooper, 2000). Process integration helps in the flow of information, plans, resources and activities for the conduct of business. Some of the means of achieving process integration are cross-functional teams, collaborative planning,

sales and operations planning (S&OP), vendor managed inventory (VMI), on-premise supplier personnel, third-party logistics (3PL), rolling plan with quantity commitment, joint process improvement initiatives, collaborative planning, forecasting and replenishment (CPFR). The level-2 categories of "SCM processes and integration" have been created largely based on the SCOR framework and SCM processes by GSCF. These are: customer relationship management (CRM), supplier relationship management (SRM), demand management (DM), demand fulfillment (DF), SC planning, inventory management, sourcing/procurement, scheduling, logistics/distribution/transportation, new product development (NPD), returns, integration (collaboration/cooperation/coordination/trust), supply chain practices and supply chain orientation (SCO).

The fourth level-1 subject category is "Information Technology (IT) systems." SCM IT systems, also known as advanced planning and scheduling (APS) systems, help in integrating the processes within a firm and across the chain. APS systems help in: evaluating network designs; communication and collaboration by providing real-time visibility of information (single version of the truth) throughout a firm and the supply chain; solving optimization problems (in network design, master planning, scheduling, distribution planning, transportation, etc.); creating simulations of various kinds of "what-if" scenarios quickly (in a matter of hours and minutes) for managerial decision-making; and performance measurement (plan vs actual and root cause analysis). The level-2 subject categories in IT systems are integration, planning systems, measurement/reporting/dashboard, emerging technologies (big data, Internet of things (IoTs), block chain, etc.) and others.

The fifth level-1 subject category is "SCM skills." A thorough understanding of SCM by people in a firm is essential to implement and run the SCM processes. The SCM skills required are for: creating and evaluating SCM strategy; setting up and evaluating supply chain networks; maintaining supply chain relationships with customers and suppliers; developing an understanding of business processes across functions (sales, production, logistics, procurement, R&D, finance); creating experienced planners who can run, analyze, troubleshoot and evaluate supply chain plans and create alternate scenarios; and managerial skills for taking business decisions. The level-2 subject categories in skill are SCM strategy skill, skills to maintain relationships with customers and suppliers, cross-functional business process skills, skills to generate SCM plans, managerial decision-making and others.

The sixth level-1 subject category is "performance measurement." An SCM performance measurement system (SCPMS) is required to measure how the supply chain strategy has been operationalized and whether it is performing as envisaged. An SCPMS monitors the actual performance of the supply chain against plans (strategic, tactical and operational) and is used for making managerial decisions. It also helps improve the performance of SCM measures in a firm over time (higher maturity level). The SCOR framework provides ten performance measures under the five performance categories of responsiveness, flexibility, costs and asset management efficiency (Supply-Chain Council, 2008). Determining the appropriate performance measures of an SCPMS and implementing an SCPMS (Gopal and Thakkar, 2012) are critical for SCM. The level-2 categories in performance measurement are performance measures, SCPMS implementation, performance monitoring, performance improvement and others.

The seventh level-1 subject category is "others." This a placeholder for papers that do not fit into the aforementioned six classifications, such as overviews, issues/challenges and so on.

3.6 Step-6: report the results

Based on the findings from the synthesis of the literature, the results are reported to answer the research questions. The reporting followed in the present study is in alignment with other

SLR studies in the domain (Croom *et al.*, 2000; Carter and Ellram, 2003; Giunipero *et al.*, 2008; Soni and Kodali, 2012; Gurumurthy *et al.*, 2013).

4. Study results

The findings of the present study have been presented in three subcategories to answer the research questions: (1) quantum of SCM research in India, (2) subject areas or themes of SCM research in India; and (3) methodologies used in SCM research in India.

4.1 Quantum of SCM research in India

A total of 395 peer-reviewed papers were assessed. The frequency of publication has been shown in Figure 2. It can be observed that SCM research in India prior to the year 2000 seems to be absent. The papers were published between the years 2000 and 2020 (until April 01, 2020). The 20-year period has been split into three phases: from the start (2000) to 2007 (Phase-1); 2008–2013 (Phase-2); and 2014–2020 (Phase-3) for comparison. SCM research was minuscule in phase-1, with an average publication of 3.43 per year. The average improved to 12.71 publications per year in phase-2. A spurt was noticed in phase-3, with an average publication of 40.29 papers per year. The average publication in the third phase will be higher than 40.29 as papers until Apr 01, 2020 have been considered for the year 2020.

The lower number of research publications found in phase-1 and phase-2 of the present study is in alignment with other studies (Sachan and Datta, 2005; Soni and Kodali, 2012; Gurumurthy *et al.*, 2013). The SLR related to SCM in India by Gurumurthy *et al.* (2013) found 18 papers (between 1998 and 2006) and 52 papers (between 2007 and 2012). SCM research in India seems to have taken off in phase-3 (2014 onwards). SCM research in developed countries has started about 15–20 years earlier (in the 1990s) than India (Giunipero *et al.*, 2008; Soni and Kodali, 2012).

4.1.1 Leading publishers. The 395 papers of the present study were published by 20 publishers. The top six publishers accounted for 93% of the papers. The list of the publishers (with at least ten publications) is given in Table 5.

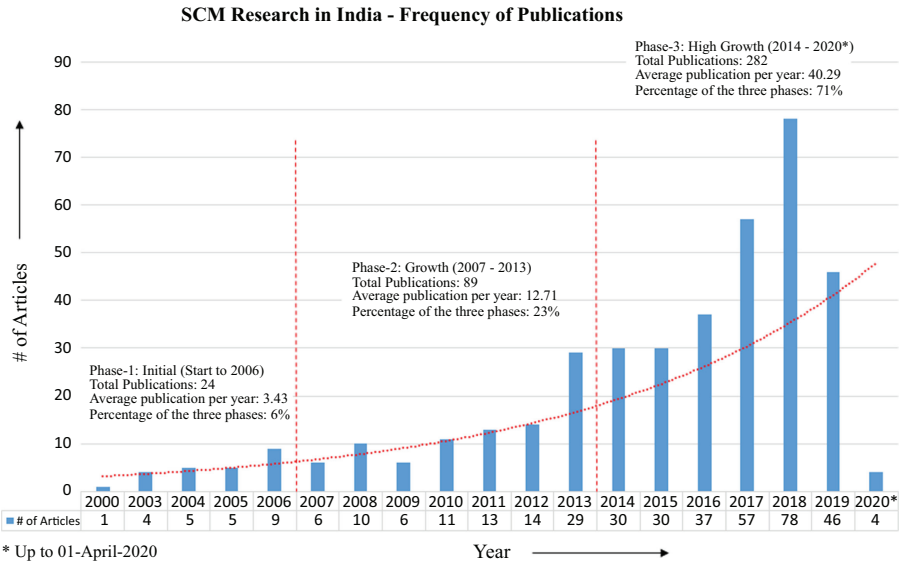


Figure 2.
SCM research in India: frequency of publications

Publisher	Phase-1 (2000–2006)	Phase-2 (2007–2013)	Phase-3 (2014–2020*)	Total	Percentage (%)
Emerald	14	31	120	164	42
Springer	2	8	52	62	16
Inderscience	1	25	21	47	12
Taylor and Francis	5	3	38	46	12
Elsevier		7	27	34	9
SAGE Publications	1	5	6	12	3
Others (14 publishers)	1	10	18	29	7
Total	24	89	282	395	100

Note(s): *Up to April 01, 2020

Table 5. Number of papers by publisher

4.1.2 Leading journals. A total of 67 journals published the 395 papers of the present study. The journals that published a minimum of five papers have been listed in Table 6. The top 20 journals published 77% of the total papers.

4.1.3 Papers by industry sector. Table 7 shows the number of SCM papers by industry sector.

About one-fifth of the papers have just mentioned "manufacturing" without specifying the specific sector, while several papers (14%) have not mentioned any sector/industry. Among the papers that have specifically mentioned the industry sector, the automobile and auto ancillary industry is the largest (13%). The other top sectors are agri-business/food (6.8%), followed by retail (6.1%), textile/apparel/garments (3%), electronics/computer/semiconductor (3%). There were nine papers in the services sector (comprising construction, tourism, health care and telecom), representing about 2.3% of the total papers. Most of the services sector–related papers are from phase-3. The amount of research on SCM in the services sector in India is virtually nonexistent. Possibly future studies can explore this sector to get a better understanding.

Other SLR studies have also pointed out that the manufacturing sector contributed to the majority of studies. Burgess *et al.* (2006) found that the top industries were manufacturing (35%) and multiple industries (16%). Soni and Kodali (2012) also found manufacturing to be the predominant sector with 42% of studies.

4.1.4 Researcher productivity. The number of papers contributed by the researches is listed in Table 8.

A total of 659 researchers contributed to the 395 papers. The majority of the researchers (n = 488) have provided a single paper. The maximum, minimum and weighted average paper contribution per researcher are 16, 1 and 1.67, respectively. The collaboration effort in writing the papers is: single author (8%), two authors (35%), three authors (38%), four authors (12%) and five or more authors (7%). The names of authors who have contributed five or more papers are listed in Table 9.

4.2 SCM subject areas researched in India – a taxonomy

The 395 papers were classified based on the classification scheme created in the present study (refer Figure 1). Table 10 provides a summary of the number of papers in each of the subject categories.

There are several papers that can be categorized in more than one subject category. However, in this study, all papers have been classified only once, along with the significant dominant subject category. The subject classifications for level-2 and level-3 categories have been provided in Table 11.

Journal name	Phase-1 (2000–2006)	Phase-2 (2007–2013)	Phase-3 (2014–2020*)	Total	Percentage (%)
Benchmarking: An International Journal	1	3	54	58	14.7
International Journal of Production Research	2	2	25	29	7.4
Annals of Operations Research			23	23	5.8
OPSEARCH	1	4	17	22	5.6
Journal of Modelling in Management		2	16	18	4.6
International Journal of Productivity and Performance Management	3	2	12	17	4.3
Production Planning and Control	3	1	12	16	4.1
Journal of Advances in Management Research		3	11	14	3.6
Journal of Cleaner Production		1	12	13	3.3
Journal of Manufacturing Technology Management		5	8	13	3.3
International Journal of Logistics Systems and Management	1	4	8	13	3.3
Global Business Review		3	9	12	3.0
International Journal of Production Economics		2	7	9	2.3
Global Journal of Flexible Systems Management		4	4	8	2.0
International Journal of Business Performance and Supply Chain Modelling		4	3	7	1.8
International Journal of Systems Assurance Engineering and Management			6	6	1.5
Business Process Management Journal		3	3	6	1.5
International Journal of Procurement Management		3	3	6	1.5
Operational Research			5	5	1.3
International Journal of Advanced Manufacturing Technology	1	4		5	1.3
International Journal of Logistics Management			5	5	1.3
International Journal of Business Excellence		3	2	5	1.3
Others (45 Journals)	12	36	37	85	21.5
Total	24	89	282	395	100

Note(s): *Up to April 01, 2020

Table 6.
Number of papers by journal

The essence of the research issues in the papers reviewed has been discussed further under the seven categories.

4.2.1 SCM strategy. The number of papers on the SCM strategy is 34 (9%). Over half of the papers relate to operations strategy. The subject areas of interest are the type of strategy

Industry sector	Phase-1 (2000–2006)	Phase-2 (2007–2013)	Phase-3 (2014–2020*)	Total	Percentage (%)
Manufacturing	2	24	56	82	20.8
Automobile/auto ancillary	4	15	33	52	13.2
Agri-business/food	1	8	18	27	6.8
Retail/FMCG	2	9	13	24	6.1
Textile/apparel/garment		3	9	12	3.0
Electronics/computer/ semiconductor	1		11	12	3.0
3PL/transportation		2	8	10	2.5
Pharmaceutical	1	1	7	9	2.3
Perishable/deteriorating items		1	5	6	1.5
Dairy			5	5	1.3
Metal, mining and mineral, lighting, chemical/paint, rubber/ tire industry, distillery, plastic, oil and gas, engineering, jewellery, footwear	3	5	11	19	4.8
Services (construction, tourism, healthcare, telecom)		1	8	9	2.3
Multiple industry sectors	7	7	22	36	9.1
Not applicable (NA)		7	29	36	9.1
Not mentioned	3	6	47	56	14.2
Total	24	89	282	395	100

Note(s): *Up to April 01, 2020

Table 7.
Number of papers by industry sector

Number of papers	1	2	3	4	5	6	7	8	9	10	11	13	16	Total
Researchers	488	90	24	18	10	10	3	5	4	3	2	1	1	659

Table 8.
Research productivity

Author name	# Of papers	Author name	# Of papers
Shankar, Ravi	16	Datta, Saurav	6
Haq, A. Noorul	13	Deshmukh, S.G.	6
Singh, Rajesh Kumar	11	Jha, P.C.	6
Soni, Gunjan	11	Kamble, Sachin S.	6
Govindan, Kannan	10	Kannan, Devika	6
Luthra, Sunil	10	Kumar, Pravin	6
Tiwari, Manoj Kumar	10	Rathore, Ajay PalSingh	6
Gunasekaran, Angappa	9	Sharma, Satyendra Kumar	6
Mangla, Sachin Kumar	9	Thakkar, Jitesh J.	6
Mathiyazhagan, K.	9	Agarwal, Vernika	5
Raut, Rakesh D.	9	Gardas, Bhaskar B.	5
Dubey, Rameshwar	8	Jain, Vipul	5
Kannan, Govindan	8	Jakhar, Suresh Kumar	5
Kant, Ravi	8	Jharkharia, Sanjay	5
Kumar, Sanjeev	8	Kodali, Rambabu	5
Mahapatra, SibaSankar	8	Kumar, Sri Krishna	5
Kumar, Darshan	7	Prakash, Surya	5
Routroy, Srikanta	7	Singh, Surya Prakash	5
Sahay, Bidya Shanker	7	Uthayakumar, R.	5
Darbari, Jyoti Dhingra	6		

Table 9.
Leading researchers

Table 10.
SCM research in India – major subject categories

Subject categories (Level-1)	Phase-1 (2000–2006)	Phase-2 (2007–2013)	Phase-3 (2014–2020*)	Total	Percentage (%)
1. SCM strategy	3	10	21	34	9
2. Network design		6	17	23	6
3. SCM processes and integration	6	40	117	163	41
4. Information technology (IT) systems	1	3	14	18	5
5. Skills		1	3	4	1
6. Performance measurement		5	20	25	6
7. Others	14	24	90	128	32
Total	24	89	282	395	100

Note(s): *Up to April 01, 2020

(responsive, agile, flexible, or efficiet), push–pull boundary and postponement-related decisions, alignment of supply chain strategy and business strategy and trade-off decisions. A few papers were related to the outsourcing strategy. The issues researched are about outsourcing and offshoring decisions. A few papers are also found on the channel strategy involving structural arrangements, reverse logistics. A quarter of the papers also discuss SC design factors, SC flexibility, SC reconfigurability and SCM strategy evaluation. Of late, few papers are also emerging related to green/sustainability such as closed-loop supply chain (CLSC) design and strategy selection for sustainability.

4.2.2 Network design. The level-2 and level-3 themes under network designs relate to decisions regarding plant and facilities locations to ensure smooth production and flow of product and service (inbound and outbound) in accordance with the SCM strategy. Subjects such as reverse logistics network design, network design, contract farming, location decision, CLSC design, cross-docking location center (CDC), facility location–allocation problem and network design for supply chain resilience (SCRES) to disasters have been studied by researchers.

4.2.3 SCM processes and integration. SCM processes and integration are the most popular subject category with 163 papers (41%). SRM is the most popular level-2 subject area followed by integration, logistics, distribution and transportation, inventory management and supply chain practices. The topics researched under SRM include supplier selection, development and evaluation. In the SC integration area, the topics researched are coordination/collaboration, information sharing, supply chain cell, joint economic lot size (JELS), power relationships, trust and learning. In the logistics, distribution and transportation area, the topics where researchers have focused attention include 3PL selection, reverse logistics and logistics. Most of the papers in inventory management are theoretical studies related to integrated inventory models, inventory policies, trade credit and so on. The topics (level-3) researched under SC practices are VMI, e-commerce, SC practices in retail, efficient consumer response (ECR), sustainable supply chain processes (SSCPs) and impact of SC practices on customer relationship, SC performance, firm performance and competitiveness.

Some of the areas are under researched. These include DM, DF, CRM, sourcing/procurement, NPD, returns, SCO and supply chain planning. It is surprising to note that DM, which is the trigger point of all activities upstream of the supply chain, has not caught the attention of researchers. Sahay and Mohan (2003) had indicated a lack of DM applications. Even after 15 years, research studies on DM are still low. Similarly, DF, which leads to higher

Table 11. SCM themes in India – detailed levels (L1, L2, L3)

Level-1	Level-2	Level-3	# Of studies
1. SCM strategy			*34*
	1.1 Operations strategy	Agile/flexible/responsive/leagile, push–pull boundary/postponement decisions, strategic fit between competitive strategy and supply chain strategy, trade-off decisions	19
	1.2 Outsourcing strategy	Business process offshoring, joint offshoring and outsourcing decisions, outsourcing IT-enabled SCM functions	3
	1.3 Channel strategy	Green design, product recovery, reverse logistics, logistics/distribution/transportation, structural arrangement	3
	1.4 Asset network	Closed loop supply chain (CLSC) design considering economic and environmental factors	1
	1.5 Others	Influence of SC strategy on supplier practices, SC design factors, SC flexibility assessment, SC flexibility under sales promotion schemes, SC re-configurability enablers, SCM strategy evaluation, sustainable strategy selection	8
2. Network design			*23*
	2.1 Forward network design	Closed-loop supply chain (CLSC) design, contract farming, cross-docking location center (CDC), facility location–allocation, network design, supply chain network redesign, supply chain resilience (SCRES) to disaster	13
	2.2 Reverse logistics network design	Consumer selling behavior, facility location–allocation, multistage reverse supply chain, reverse logistics, reverse supply chain	10
	2.3 Others		0
3. SCM processes and integration			*163*
	3.1 Customer relationship management (CRM)	Customer integration, demand management, the impact of SC relationships and integration on innovative capabilities (process and product), overview, service quality	5
	3.2 Supplier relationship management (SRM)	Bargaining power in SC coordination, flexible contract, negotiation, power relationships, preferred supplier status (PSS), pricing policy, supplier and carrier selection, supplier classification, supplier development, supplier evaluation, supplier relationship, supplier satisfaction, supplier selection, supplier service quality, sustainable supplier selection	48
	3.3 Demand management	Bullwhip/uncertainty, the effect of buyback price, forecasting	5
	3.4 Demand fulfillment	Optimal order allocation	1
	3.5 SC planning	Decentralized production-distribution planning, optimal production-distribution planning	2
	3.6 Inventory management	Consignment stock policy, coordination with quantity discount, demand aggregation approach for inventory control, integrated inventory model, inventory policy, inventory policy for deteriorating items, price setting of clearance sale inventory, trade credit policy, trade credit and freight rate discount policy	21
	3.7 Sourcing/procurement	Centralized vs decentralized sourcing, control system design for SC networks experiencing supplier disruption, the impact of sustainability orientation (SO) and integration on sustainable procurement, integrated multisourcing closed-loop supply chain configuration (CLSCC) optimization model, a model for food grain procurement in India, ordering policy, procurement, sourcing strategy, supply uncertainty	10
	3.8 Scheduling		0
	3.9 Logistics/distribution/ transportation	3PL Selection, 3PL selection under sustainability, bullwhip/uncertainty, collusive behavior, consignment stock policy, distribution, facility location and vehicle routing for disaster resilience, logistics, outbound logistics for retail, outsourcing success, reverse logistics, reverse logistics in pharmaceuticals industry, systematic literature review (SLR) logistics, supply chain resilience (SCRES), sustainable food grain distribution system, transportation, transportation models, transporter performance measurement, vehicle routing, warehouse performance improvement	32
	3.10 New product development (NPD)	Impact of inventory and procurement strategies on green product design	1
	3.11 Returns		0
	3.12 Integration	collaborative assets, communication, coordination/collaboration, coordination in the humanitarian supply chain, customs clearance, issues/challenges, joint economic lot size (JELS), power relationships, SC relationships, supply chain cell, trust and learning	22
	3.13 SC practices	Competitiveness, customer relationship, e-commerce, efficient consumer response (ECR), food processing, the impact of supply chain practices on SC performance, the effect on SC performance and firm performance, Indian vs Japanese SCs, issues/challenges, SC performance, SC practices in retail, the status of SC practices, sustainable supply chain processes, vendor managed inventory (VMI)	14

(*continued*)

Table 11.

Level-1	Level-2	Level-3	# Of studies
	3.14 Supply chain orientation (SCO)	SCOs influence on performance, SCO's impact on the relationship between SCM practices and performance	2
	3.15 Others		0
4. Information technology/systems			*18*
	4.1 Integration	Decision support system (DSS), e-applications, the impact of cloud computation integration and external integration on performance, impact of IT and collaboration on financial performance, internet usage, IT as an enabler to SCM performance, the linkage between IT system, SCM and operational performance, RFID adoption, usage of ICT in humanitarian SCM	9
	4.2 Planning systems	IT implementation in retail SC, KPIs for implementation of supply chain information system, reverse logistics, SCM IT implementation challenges	5
	4.3 Measurement/reporting/dashboard		0
	4.4 Emerging technologies	Big data, systematic literature review (SLR) on big data in SCM, blockchain	4
	4.5 Others		0
5. SCM skills			*4*
	5.1 SCM strategy skills		0
	5.2 Customers and suppliers interfacing skills	Skill, globalization, regulation	1
	5.3 Cross-functional business process skills	Supply chain learning, worker experience under learning and forgetting	2
	5.4 Skills to generate SCM plans		0
	5.5 Managerial decision making		0
	5.6 Others	SC skill development framework	1
6. Performance measurement			*25*
	6.1 Performance measures	3PL, agility performance evaluation, balanced score card (BSC), design issues, framework for textile industry, measurement framework, measures and metrics, performance evaluation, performance evaluation of sustainable freight transportation	11
	6.2 SCPMS implementation	Enablers/factors	2
	6.3 Performance monitoring		0
	6.4 Performance improvement	Factors impacting supply chain performance, the influence of SC knowledge flow on SC performances	2
	6.5 Others	Classification of supply chains based on business and supply chain performance, GSCM performance indicators, the impact of dynamic capability (DC) on performance, the impact of GSCM implementation on performance, impact of SC agility and SC resilience on performance under the effect of organizational culture, impact of sustainable SCM practices on performance, methods to measure performance, performance comparison of green alternatives in SCM, the relationship of SCM practices and SCM performance	10
7. Others			*128*
	7.1 Overview/description/review/ analysis/viewpoint	3PL practices, auction and supply chain contracting, coordination and responsiveness, dairy supply chain, eco-labelling, flexibility, GSCM implementation/ adoption, GSCM performance indicators, GSCM status in India, impact of SC disruptions on stockholder worth, logistics network, profile of rural supply chain, review of sustainable supply chain management (SSCM), SCM capability of family business, SCM context in India, SCM practices: sectoral dissimilarities, Six Sigma SCM implementation, SLR-cold-chain for perishable food product (CfPFP), SLR-Food Processing Supply Chains (FPSC), SLR-fresh produce supply chain management (FSCM), SLR-green supply chain management (GSCM), SLR-GSCM Framework, SLR-health care supply chain management, SLR-humanitarian supply chain management (HSCM), SLR-inventory models for perishables, SLR-need for 3PL, SLR-SCM research-subject content, SLR-SCM research methodology, SLR-SCM research on India, SLR-supply chain practices, SLR-supply chain risk management (SCRM), suitability of existing lean supply chain management (LSCM) frameworks in India, supply chain complexity index, supply chain issues of temperature control items, sustainability measurement, sustainable supply chain management (SSCM) practices, tourism supply chain (TSC)	39

(*continued*)

Table 11.

Level-1	Level-2	Level-3	# Of studies
	7.2 Quantified benefits	Inventory reduction, cost reduction, transportation cost reduction, sales increase, lead time reduction, service level improvement, customer satisfaction improvement	6
	7.3 Adoption	SCM practices and IT usage, SCM software packages adoption, SCM status	3
	7.4 Drivers/enablers/critical success factor (CSF)	Efficient agri-supply chain, enablers of IT in a supply chain, frugal innovation for supply chain sustainability in SMEs, green manufacturing framework, green supply chain management (GSCM), green supply chain management (GSCM) practices, GSCM implementation/adoption, humanitarian supply chain management (HSCM), humanitarian supply chain resilience, logistics management implementation, SCM implementation, service quality, vaccine delivery improvement, supply chain resilience (SCRES), supply chain resilience (SCRES) to disaster, supply chain sustainability performance, sustainability measurement, sustainable supply chain management performance	40
	7.5 Barriers	Ambidextrous supply chains, circular supply chain (CSC) adoption, green supply chain management (GSCM), green, lean and Six Sigma (GLS) product development, humanitarian-disaster relief (HDR) coordination, IT enablement of a supply chain, performance measurement barriers, post-harvesting losses (PHLs) in transportation, reverse supply chain (RSC) implementation, supply chain performance measurement, sustainable consumption and production (SCP), sustainable supply chain management implementation, sustainable textile and apparel supply chains in India, vendor managed inventory (VMI)	17
	7.6 Issues/challenges	Distribution system issues, GSCM implementation/adoption, humanitarian disaster relief, the impact of sustainable SCM practices on SC risk, retail channel management, risks of GSCM adoption, SC finance-related challenges, SC issue in SMEs, SC risk propagation, service SCM inhibitors, supply chain risk management (SCRM), supply chain sustainability, value stream mapping	20
	7.7 Others	SCM model for blood banks in India, tea leaves supply chain, unethical behaviors in the supply chain	3

customer service levels and customer satisfaction, is not a popular topic among researchers as there was no paper found on DF. Integrated supply chain planning is also not a hot topic for researchers. The concept of SCO, put forward by Mentzer *et al.* (2001), as a precursor to SCM, is a relatively unknown area of research in India with a couple of studies featuring it.

4.2.4 Information technology (IT) systems. The quantum of research in the IT systems category is low (18 papers, 5%). Most of these studies have been carried out in phase-3. About half of the papers in IT are related to integration. These relate to RFID adoption, e-applications, Internet usage, Cloud computation integration, ICT usage and linkage between IT system, SCM and operational performance and decision support systems (DSSs). A few papers were found on IT planning systems. These pertained to IT implementation in retail SC, SCM IT implementation challenges, KPIs for implementation of supply chain information system (SCIS). Few papers were also found on big data and block chain. There were no papers related to the IT dashboard, analytics.

Bahli and Goyal (2005) posited that IT, which was once viewed as noncore, and a support function to SCM business processes, has now become an integral part of SCM. While this assertion may be true in developed economies, SCM-related IT is yet to percolate down in India. Future research about various facets of IT in SCM, such as breadth and depth of usage, benefits, barriers, issues and challenges, will be useful. Several new technological innovations (such as robotics, artificial intelligence (AI), IoTs, big data, 3D printing, distributed ledger technology (DLT), block chains, data visualization) have come to the fore in the last five years with Industry 4.0. Future research should also examine the feasibility and benefits of such new technological innovations on SCM from an Indian context.

4.2.5 SCM skills. This is one of the most ignored areas (four papers, 1%). This theme can be said to be one of the untouched areas of SCM research in India. There is an empty canvas out there, and researchers are urged to venture into this area in the future. Skills related to how to design a supply chain network, how to create good buyer–supplier relationships, skills to generate tactical master plans, scenario planning for changes in the market, environment, process audits are fertile areas for research to proceed.

4.2.6 Performance measurement. The quantum of research in the performance measurement category is low (25 papers, 6%). About half of the papers in this category are related to performance measures. These are related to measures and metrics, performance evaluation, agility performance evaluation. A few papers have tried to study the impact of an intervention on performance, such as dynamic capability (DC) on performance, GSCM implementation on performance, SC agility and SC resilience on performance, sustainable SCM practices on performance and so on. A couple of papers each were also found on SCMPS implementation and performance improvement. There was no paper on performance monitoring, process audits, evaluation of organizational KPIs. These are areas where there is scope for more research.

4.2.7 Others. The number of papers under the Others category was 128 (32%). These papers were classified under seven subject areas at level-2 based on the topics present in them. These are: (1) overview/description/review/analysis/viewpoint, (2) quantified benefits, (3) adoption, (4) drivers/enablers/critical success factors (CSF), (5) barriers, (6) issues, challenges, risks and (7) others.

The overview/description/review/analysis/viewpoint (level-2) subject category contained a diverse range of topics such as the profile of rural supply chain, need for 3PL, SCM capability of family businesses and many reviews of the literature (SLRs).

The quantified benefits (level-2) subject category is based on six papers from diverse industries (cement, automobile, jewelry and paints industries) that have reported unlocking of unprecedented value due to SCM that caused significant turnarounds. The benefits reported were: inventory reduction (Mohanty and Deshmukh, 2000; Sehgal *et al.*, 2006;

Choudhury *et al.*, 2004); lead time reduction (Mohanty and Deshmukh, 2000; Choudhury *et al.*, 2004); cost reduction (Choudhury *et al.*, 2004; Kapoor and Ellinger, 2004; Raghuram, 2004; Sehgal *et al.*, 2006); sales increase (Kapoor and Ellinger, 2004; Kannabiran and Bhaumik, 2005); service-level improvement (Raghuram, 2004; Sehgal *et al.*, 2006) and customer satisfaction improvement (Kapoor and Ellinger, 2004). These benefits are in alignment with the quantified benefits reported by Sahu and Rao (2015).

There were three papers related to the adoption subject category. These pertained to SCM status, SCM practices and IT usage and SCM software packages adoption. The drivers/enablers/CSF subject category predominantly contained GSCM adoption/implementation-related papers. The other papers in these categories were diverse. These included service quality, SCM implementation, GSCM practices, SCRES, sustainability measurement, green manufacturing framework and reverse supply chain (RSC) of e-waste.

The barriers subject category contained topics such as barriers to GSCM, RSC implementation, humanitarian-disaster relief (HDR) coordination, sustainable consumption and production (SCP), circular supply chain (CSC) adoption, green, lean and Six Sigma (GLS) product development, supply chain performance measurement, VMI and performance measurement barriers.

The issues/challenges/risks subject category contained a handful of papers on SCRM topics such as risk assessment, source and impact of risk factors, uncertainty, risk drivers and risk propagation, risk mitigation strategies and risk assessment methodology. Other topics that discussed issues and challenges were related to supply chain sustainability, SC issue in SMEs, agricultural commodity marketing, distribution system issues, service SCM inhibitors, GSCM implementation, value stream mapping, retail channel management and SC finance-related challenges.

The "Others" subject category had three papers. These are the SCM model for blood banks in India, tea leaves supply chain and unethical behaviors in the supply chain.

4.3 Methodologies used in SCM research in India

This section provides insights into the methodologies used in SCM studies in India. The papers were reviewed for: the unit of analysis, size of unit/organization under study, the theoretical base used, study type, research methods used and data analysis technique (DAT) employed.

4.3.1 Unit of analysis. The unit of analysis used in the papers of the present study is shown in Table 12. The most common unit of analysis was "firm." Over half of the studies (56%) used it. The next two major units of analyses were "dyad" (18%), and "chain" (9%). About 7% of

Unit of analysis	Phase-1 (2000–2006)	Phase-2 (2007–2013)	Phase-3 (2014–2020*)	Total	Percentage (%)
1. Function		2	3	5	1.3
2. Firm	18	57	148	223	56.5
3. Dyad	3	10	59	72	18.2
4. Chain	2	3	31	36	9.1
5. Network		1		1	0.3
6. Others: individual		1		1	0.3
Not applicable (papers, country, events)		7	22	29	7.3
Not mentioned	1	8	19	28	7.1
Total	24	89	282	395	100

Note(s): *Up to April 01, 2020

Table 12. Unit of analysis found in SCM studies in India

the studies have been classified as not applicable (NA) as these pertained to literature reviews, events (HDR, the impact of SC disruption on stockholder wealth, etc.) and country-level study. About 7% of the studies did not report the unit of analysis.

There were several studies that have employed the survey method, where the unit of analysis was at "firm" level, but data collection had been done at an individual level (more than one response per firm). Some of the examples are Saad and Patel (2006), Prakash (2011), Sharma and Bhat (2013), Tripathy *et al.* (2016), Kumar (2017), Gandhi *et al.* (2017), Babu *et al.* (2018). This is inappropriate as a phenomenon at the firm level requires data about firms and not multiple responses from the same firm. There may be more studies where this kind of issue may be present but has not been reported, unlike the study of Prakash (2011).

The low number of studies at the chain level was identified as a gap by Avittathur and Jayaram (2016). The present study finds that the gap persists still as the number of studies at the chain level continues to be low (about one-tenth).

4.3.2 Size of the organization/unit under study. Table 13 shows the size of the organization/unit under study. About 60% of the papers did not mention the size of the organization/unit under study, while 31% mentioned the size, and for 8% of papers, it was not applicable (NA). The number of papers on small and medium enterprises (SMEs) was 14%, followed by large firms (8%) and mix of small, medium and large firms (6%).

4.3.3 Theoretical base. A theoretical framework provides the necessary conceptual basis for a study. Thus, it is vital to have an understanding of what theoretical lenses have been used to examine the phenomenon under study. Table 14 provides the details of the theoretical bases mentioned in the papers of the present study. A vast majority of papers (80%) did not explicitly mention the theoretical base used. Many papers did review certain theories in their studies; however, they did not explicitly mention the theoretical lens used. About 14.7% of the

Table 13.
Size of the organization/unit under study

Size	Phase-1 (2000–2006)	Phase-2 (2007–2013)	Phase-3 (2014–2020*)	Total	Percentage (%)
Large	10	10	11	31	7.8
Medium		1	5	6	1.5
Small and medium enterprise (SME)	2	17	34	53	13.4
Small and large		3	1	4	1.0
Medium and large	1		3	4	1.0
Small, medium and large	2	8	15	25	6.3
Not applicable (NA)		8	26	34	8.6
Not mentioned	9	42	187	238	60.3
Total	24	89	282	395	100

Note(s): *Up to April 01, 2020

Table 14.
Theoretical base usage in SCM studies in India

Theoretical base	Phase-1 (2000–2006)	Phase-2 (2007–2013)	Phase-3 (2014–2020*)	Total	Percentage (%)
Mentioned	2	10	46	58	14.7
Not mentioned	22	72	222	316	80.0
Not applicable (NA)		7	14	21	5.3
Total	24	89	282	395	100

Note(s): *Up to April 01, 2020

papers explicitly mentioned the theoretical lenses used. The mentioning of theory has improved in phase-3.

Comparing with studies involving SLRs on SCM from other countries, Burgess *et al.* (2006) found that 20% of the studies did not report any theory. Defee *et al.* (2010) found no theory in 47% of the studies. Chicksand *et al.* (2012) found that the theory was being used in 38% of the papers. Based on these comparisons, it can be said that the percentage of usage or reporting of theory in SCM studies in India is lower.

A total of 44 unique theories were found to have been used in SCM research in India. Among the papers that mentioned the theoretical underpinning, a majority of them (28 papers) used a single theory, 13 papers used two theories and five papers used three or more theories. The top theories are given in Table 15. Resource-based view (RBV), institutional theory, stakeholder theory, system dynamics and transaction cost economics (TCEs) are the top five theories used in the studies.

The top theories reported in other SCM studies are TCEs, RBV, Porter's framework, contingency theory, resource dependence, Bullwhip effect (BWE), theory of constraints (TOCs) and systems theory (ST) (Defee *et al.*, 2010; Liao-Troth *et al.*, 2012). It can be seen from Table 15 that researchers in India have also used theories along similar lines as reported by Defee *et al.* (2010); Liao-Troth *et al.* (2012).

The present study also found a number of theories that have been reported once. These are: BWE, dyadic exchange theory (DET), efficient market theory (EMT), grounded theory, high reliability theory (HRT), human agency theory, information processing theory (IPT), network theory, resource dependency theory (RDT), social capital theory, social exchange theory (SET), swift trust (ST), technology acceptance model (TAM), the political economy theory, the relational view and TOCs.

4.3.4 Study type (empirical/theoretical). Over half of the papers (53%) were found to be empirical, while the remaining (47%) were theoretical (refer to Table 16).

Top theories	Number of times used
Resource-based view (RBV)	10
Institutional theory	5
Stakeholder theory	4
System dynamics (SD)	4
Transaction cost economics (TCE)	4
Dynamic capability	3
Systems theory	3
Agency theory	2
Commitment-trust theory (CTT)	2
Contingency theory	2
Knowledge-based view (KBV)	2
Theory of planned behavior (TPB)	2

Table 15.
Top theories used in SCM research in India

Study type: empirical/theoretical	Phase-1 (2000–2006)	Phase-2 (2007–2013)	Phase-3 (2014–2020*)	Total	Percentage (%)
Empirical	16	58	135	209	52.9
Theoretical	8	31	148	186	47.1
Total	24	89	282	395	100

Note(s): *Up to April 01, 2020

Table 16.
Study type found in SCM studies in India

The empirical papers consisted of surveys (105), case studies (33), conceptual models (14), mathematical models (39), SLRs (17) and archival study (1). The conceptual and mathematical models that have empirically verified their models have been considered empirical. The nonempirical (theoretical) studies consisted of pure conceptual models (122), pure mathematical models (54), literature reviews (4) and archival studies (6). A vast majority of the pure conceptual models (117 of the 122 papers) found in this study used multicriteria decision-making (MCDM) methods such as interpretative structural modeling (ISM), analytical hierarchical process (AHPs) and analytic network process (ANPs) or their variants using fuzzy logic and so on. These studies typically hypothesized a relational model based on factors identified from the literature. They created a structural hierarchy of the relationship among these factors based on expert judgment. These conceptual models have not been subsequently validated empirically in most cases. The limitation of using such an approach are: (1) the expert opinion is based on experts understanding and may not reflect the reality; (2) more often than not, these models are not empirically validated (Mathiyazhagan *et al.*, 2013; Balon *et al.*, 2016; Mangla *et al.*, 2018).

Compared to other SLRs, the relative percentage of theoretical papers in India is high. Croom *et al.* (2000), in their SLR spanning multiple countries, reported 83% of the papers to be empirical, while 17% were nonempirical. The SLR by Giunipero *et al.* (2008) from multiple countries found that 70% of the papers were empirical and 30% were nonempirical.

The research methods employed in the papers of the present study are shown in Table 17. Conceptual models were used in over one-third (34%) of the papers followed by survey method (27%), mathematical model (24%), case studies (8%), literature review (5%) and archival/secondary data analysis in 2% of the papers. A closer look at the trend of research method used in India over the past 20 years shows a steady increase in the use of theoretical models and mathematical models (38% in phase-1, 44% in phase-2, 64% in phase-3).

4.3.5 Research methods. Comparing the findings of Table 17 with the research methods used in other SLRs, it is found that survey has been the most preferred research method followed by case studies (Carter and Ellram, 2003; Burgess *et al.*, 2006; Giunipero *et al.*, 2008; Soni and Kodali, 2012; Mohammadreza, 2018). Carter and Ellram (2003), based on 35 years (1965–1999), found that survey (60%), case studies (18%) and interviews (12%) were the primary research methods used. Burgess *et al.* (2006) found surveys as the major research method followed by and case studies. Giunipero *et al.* (2008) also found that the top two preferred research methods employed were survey (61%) and case study (11%). These were followed by simulation/model (9%) and conceptual (9%). Soni and Kodali (2012) also reported the top two research methods to be survey (51%) and case studies (43%). Mohammadreza's (2018) study found the use of survey (42%), case study (19%), conceptual model (14%) and

Table 17.
Research method found in SCM studies in India

Research method	Phase-1 (2000–2006)	Phase-2 (2007–2013)	Phase-3 (2014–2020*)	Total	Percentage (%)
1. Survey	9	28	68	105	27
2. Case study	6	13	14	33	8
3. Theoretical/ conceptual model	7	29	100	136	34
4. Mathematical model	2	10	81	93	24
5. Literature review		6	15	21	5
6. Archival/secondary data		3	4	7	2
Total	24	89	282	395	100

Note(s): *Up to April 01, 2020

mathematical model (12%) as the major research methods. In this present study, survey is one of the top two research methods (27%). However, conceptual and mathematical models seem to dominate with over half the papers (56%). The case study method is at number four (8%).

4.3.5.1 Surveys (sampling type, sample size and response rates). Of the 105 papers that employed survey as the research method, 68% of the papers were used for hypothesis testing. The rest of the papers (32%) were descriptive or developed measurement scales. Scale reliability was reported in about 79% of the papers, while validity was reported in 60% of the papers. Sampling type used was reported in 41% of the papers (refer Table 18, while the remaining 59% did not mention the type of sampling used. Convenience sampling was used in 14% of the surveys, followed by simple random sampling (8%), purposive/judgment sampling (7%), snowball sampling (4%), entire population (4%) and combination of sampling types (5%).

Table 19 provides the details of sample sizes used in SCM studies in India. It was found that 7% of studies have a sample size of less than 50, over a quarter of the studies (27%) have sample size lower than 100, close to half of the studies (47%) have a sample size below 150, 68% of the studies have a sample size below 200 and 80% have a sample size of 250 or less.

The sample size in SCM studies in India has been on the lower side. The prevalence of small sample sizes in SCM studies was also highlighted by Soni and Kodali (2012), who found that 34.5% of the surveys reported a sample size of less than 100. Apart from the small sample size, the present study also found that a majority of the papers have not provided justification

Sampling	Phase-1 (2000–2006)	Phase-2 (2007–2013)	Phase-3 (2014–2020*)	Total	Percentage (%)
1. Simple random		4	4	8	8
2. Purposive/judgment	1		6	7	7
3. Convenience	2	3	10	15	14
4. Snowball	1	1	2	4	4
5. Convenience and judgement	1			1	1
6. Convenience and snowball			1	1	1
7. Cluster, stratified, judgemental			1	1	1
8. Multistage		1	1	2	2
9. Entire population	2	1	1	4	4
Not mentioned	2	18	42	62	59
Total	9	28	68	105	100

Note(s): *Up to April 01, 2020

Table 18. Sampling type found in SCM studies in India

Sample size	# Of studies	Percentage (%)	Cumulative percentage (%)
Less than 50	7	7	7
50–100	21	20	27
100–150	21	20	47
150–200	22	21	68
200–250	13	12	80
250–300	10	10	90
Greater than 300	11	10	100
Total	105	100	

Table 19. Sample sizes found in SCM studies in India

Table 20.
Response rate found in SCM studies in India

Response rate	# Of studies	Percentage (%)	Cumulative percentage (%)
5–10%	4	4	4
10–15%	5	5	9
15–20%	7	7	15
20–25%	13	12	28
25–30%	6	6	33
30–40%	10	10	43
40–50%	7	7	50
50–60%	8	8	57
60–70%	10	10	67
Greater than 70%	8	8	74
Not mentioned	27	26	100
Total	105	100	

for the sample size based on the significance level (α) and the statistical power (β) used. Few of the studies have tried to justify the sample size by referring to rules of thumb (five times rule, minimum 50 required for factor analysis, etc.).

Table 20 provides the details of response rates found in SCM studies in India. It was found that 74% of the papers reported a response rate, while 26% did not. A response rate of less than 10% was reported by 4% of the papers. Response rates between 10 and 30% range were reported by 30% of papers. Response rates between 30 and 50% were reported by 16% of the papers. Response rates between 50 and 70% were reported by 18% of the papers. Response rate greater than 70% was reported by 8% of the papers.

Here it must be mentioned that the sample size and response rates must also be viewed in conjunction with the sampling design to get a better understanding. It was noticed that about 89% of the surveys either did not mention the sampling type (59%) or were nonprobabilistic (convenience, purposive/judgment, snowball) in nature (30%). About 8% of the papers employed probabilistic sampling (simple random sampling), and another 4% of the papers used the full population. Table 21 provides the sample sizes and response rates for 9% of the papers (12 papers) whose sampling design included a probabilistic sample (eight papers) or the full population (four papers).

Given the understanding gained about sample sizes, and response rates from Tables 19–21, it is difficult to generalize the prevailing sample sizes or response rates for SCM studies in India due to the fact that justifications for sampling type used have not been provided in a majority of the papers. About 89% of the papers have used nonrandom sampling. Sample size justification has also not been provided by the majority of the papers. There are also instances of mismatch in the unit of analysis and the level of data collection. Further, only 60% of the papers have reported reliability and validity of the measuring instrument.

Table 21.
Sample size and response rates (for probabilistic sample or full population)

Sample size	Response rate Not mentioned	10–20%	20–30%	30–40%	>40%	Total	Percent (%)
Less than 50				1		1	8
50–100			1		2	3	25
100–150		2	2			4	33
150–200	1				1	2	17
200–250						0	0
250–300				1	1	2	17
Total							100

Data analysis technique	Details	# Of studies	Percent (%)
Multicriterion decision-making (MCDM) methods	AHP, AHP-COPRAS, AHP-PGP (pre-emptive goal programming), AHP-TOPSIS, AHP–PROMETHEE–TOPSIS, ANP, ANP-MOORA, Balanced Score Card (BSC), Complex Proportional Assessment (COPRAS-G), DEA, Delphi, Delphi study, DEMATEL, FMLMCDM, Fuzzy Analytical Hierarchy Process (FAHP), Fuzzy ANP, Fuzzy BSC, Fuzzy c-Means (FCM) Algorithm, Fuzzy Delphi, Fuzzy DELPHI , Fuzzy DEMATEL, Fuzzy DEMATEL-ANP, Fuzzy ELECTRE, Fuzzy Goal programming (FGP), Fuzzy ISM, Fuzzy Logic, Fuzzy MAHP, Fuzzy MICMAC, Fuzzy Mixed-Integer Linear Programming (Fuzzy MILP), Fuzzy Numbers, Fuzzy Set Theory, Fuzzy SMART, Fuzzy TOPSIS, Fuzzy VIKOR, Fuzzy-AHP, Fuzzy-MOORA, Fuzzy-TOPSIS, Generalized trapezoidal fuzzy numbers, Genetic algorithm, GRA, Graph Theoretic Approach (GTA), Green DEA (GDEA), Grey Approach, Grey Relation Analysis (GRA), Grey-DEMATEL, Interval 2-tuple linguistic TOPSIS(ITL-TOPSIS), Intuitionistic-GRA, Intuitionistic-MOORA, Intuitionistic-TOPSIS, ISM, ISM-ANP-ELECTRE II, ISM-ANP-VIKOR, IVFRN based FARE and MABAC, MICMAC, Mixed-Integer Linear Programming (MILP), Mixed-Integer Non Linear Programming (MINLP), MOORA, Pareto, SAW, *t*-test, TOPSIS, Total Interpretive Structural Modeling (TISM), Trapezoidal fuzzy numbers set, ViseKriterijumskaOptimizacija I KompromisnoResenje (VIKOR)	128	32
Optimization models	AHP, TOPSIS, Interpretive Ranking Process (IRP), Weighted IRP (W-IRP), Borda–Kendall (BAK), Integer linear program (ILP), AHP, TSP, Fuzzy multiobjective programming (FMOP), ANOVA, Bacterial Foraging Algorithm (BFA), Bargaining Game, Bayesian Network, Chance constrained programming, Generalized Reduced Gradient (GRG) technique, Consignment stock policy, Cutting plane based solution algorithm, DEMATEL, DMAIC, Efficiency Analysis Technique with Output Satisficing (EATWOS), Factor analysis, Forecasting, Artificial Intelligence, Discrete Wavelet Transformation (DWT), Fuzzy AHP, Fuzzy Mixed integer linear programming (Fuzzy MILP), Fuzzy Triangular Numbers, Goal programming (GP) and Weighted Sum Aggregate objective function (AOF), Intuitionistic fuzzy *T*-sets based optimization technique, Joint Total Expected Cost (JTEC), *K*-means clustering algorithm, Kohonen Self-Organizing Map (KSOM), Mixed-Integer Linear Programming (MILP), Mixed-Integer Nonlinear Programming (MINLP), Mixed-Integer Programming (MIP), Multi Factor Dependent Optimization, Multigene Genetic Programming (MGGP), ARIMA, Multiobjective Particle Swarm Optimization (MOPSO), Non-Dominated Sorting Genetic Algorithm II (NSGA-II), Sensitivity analysis, Multiregional Input–Output (MRIO)	75	19

(*continued*)

Table 22. Data analysis technique (DAT) found in SCM studies in India

Data analysis technique	Details	# Of studies	Percent (%)
	framework, Newsvendor problem, NK Hybrid Genetic Algorithm (NKHGA), Non Linear Programming (NLP), Nondominated sorting chemical reaction optimization (NCRO), Paired comparison, Particle Swarm Optimization (PSO), Sensitivity Analysis, Social Network Analysis, Triangular Fuzzy Numbers		
Structural equation modeling (SEM)	SEM: Covariance Based (AMOS, LISREL); SEM: Partial Least Square (PLS) (SmartPLS, WarpPLS)	48	12
Descriptive statistics	Averages, Weighted Average, Correlation, Count, Crosstab, Frequency, Mean, Percentage, Ratings, SD, *t*-test	34	8.6
Regression analysis	Multinomial Logistic Regression (MLR), Multiple Regression, Regression	30	7.6
Mixed-integer programming	Mixed-Integer Linear Programming (MILP), Mixed Integer Programming (MIP), Mixed-Integer Nonlinear Programming (MINLP)	8	2
Factor analysis	Exploratory Factor Analysis (EFA), Factor Analysis, Cluster Analysis	6	1.5
ANOVA	ANOVA	6	1.5
Discriminant analysis	Discriminant analysis, perception map	2	0.5
Cluster analysis	Cluster analysis	2	0.5
Conjoint analysis	Conjoint analysis	1	0.3
Others	Artificial Intelligence, Automatic Pipeline Variable Inventory and Order-Based Production Control System (APVIOBPCS), Behavior-Over-Time (BOT) chart, Bibliometric analysis, Case Summary, within case and cross-case analysis, Content Analysis, Description, Failure Mode and Effect Analysis (FMEA), Forecasting, Grounded Theory, Group model building, Importance Performance Analysis (IPA), Life Cycle Assessment (LCA), Monte Carlo Simulation, Multiagent Systems (MAS), Network analysis, Pareto, Qualitative Analysis, Qualitative content analysis, SAP-LAP, Simulation model, Stakeholder Analysis, System Dynamics, Thematic Network Analysis, Value Stream Mapping	39	10
Not applicable (NA)	Not applicable (NA)	12	3
Not mentioned	Not mentioned	4	1
Total		395	100

Table 22.

4.3.6 Data analysis techniques. The details regarding the DAT used in the papers of the present study have been provided in Table 22.

Many of the studies have used multiple DATs. In such cases, the present study reports the major DAT used. For example, in papers where both structural equation modeling (SEM) and descriptive statistics have been used, the present study reports the DAT used as SEM. If a paper has used only descriptive statistics, then the DAT used is reported as descriptive statistics.

The top two DATs account for over half of the studies. These are: (1) MCDM methods (32%) and (2) optimization models (19%). MCDM methods were used in the conceptual model, case studies and mathematical models. Optimization models were used in mathematical models, case studies and conceptual models. Other important DATs are SEM (12%), descriptive statistics (8.4%) and regression analysis (7.6%). DATs in the "others" category have been used in 10% of the papers.

Comparing the present study findings of DATs usage with past SLR studies, it is found that the study by Carter and Ellram (2003), reported usage of descriptive statistics (30%), followed by means testing (9%) and anecdotal evidence (6%). The use of multivariate data analysis techniques was low. Giunipero *et al.*'s (2008) study reports that the majority of the papers (42%) used basic data analysis techniques (such as descriptive, means, correlation, etc.), followed by regression (16%), factor analysis (14%) and SEM (10%). With the passage of time, there is a gradual shift into the usage of more multivariate DATs.

4.4 Subject area and research method used

Table 23 provides the information about the research methods employed while studying the various SCM subject categories in India.

The most commonly used research methods for SCM strategy and SCM process and integration were survey, conceptual model and mathematical model.

4.5 Overview of SCM in India

The present study is an attempt to fill the gaps identified by Avittathur and Jayaram (2016) for more research on supply chain practices and supply chain performance in the context of an emerging economy. The present study reviewed the SCM literature on India and provides a summary of the prevailing status of SCM in India in this section with respect to: (1) the SCM adoption status; (2) logistics infrastructure and challenges; (3) comparison of SCM practices in India with those of developed economies; and (4) the quantified benefits of adopting SCM.

4.5.1 SCM adoption status. There is no authoritative study in the extant literature that has quantified the number of firms that have adopted SCM in India. A couple of studies have reported a quantitative assessment, while a qualitatively understanding on status could also be found from a few studies. In the quantitative studies, SCM adoption rate has been reported as 17% (Sahay and Mohan, 2003) and 22% (Singh *et al.*, 2010). Since these studies were not representative of the all the firms in India, these numbers cannot be considered as conclusive. Ramaa *et al.* (2013) found that, two-third of the medium-sized manufacturing firms in India do not have an information system such as ERP, SCM and CRM. Singh *et al.* (2010) point out that APSs and SCM practices such as VMI, CPFR and so on are in a state of infancy in India.

There are several studies that have qualitatively pointed to the low adoption of SCM by firms in India. SCM being in a nascent stage has been pointed out in the automotive sector (Saad and Patel, 2006); 3PL sector (Sahay and Mohan, 2006); in SMEs (Thakkar *et al.*, 2012); in small and medium family-run business (Jayaram *et al.*, 2014); GSCM (Mitra and Datta, 2014; Soda *et al.*, 2015); and in food supply chains (Dharni and Sharma, 2015).

Subject category (L1)	Survey	Case study	Conceptual model	Mathematical model	Literature review	Archival study	Total
SCM strategy	10	3	13	7	1		34
Network design	1	1	9	12			23
SCM processes and integration	39	10	45	65	1	3	163
IT systems	11	1	3	2	1		18
SCM skills	2	1		1			4
Performance measurement	7	1	15	1	1		25
Others	35	16	51	5	17	4	128
Total	105	33	136	93	21	7	395

Table 23. Research methods used in subject areas

The low SCM adoption in India has also been attributed to poor logistics infrastructure issues, such as electricity shortages, inadequate roads, traffic snarls, labor difficulties, a slow legal system and a rigid bureaucracy (Saldanha *et al.*, 2015; Moradlou *et al.*, 2017; Sharma and Kushwaha, 2017; Arvis *et al.*, 2018).

4.5.2 Logistics infrastructure, issues and challenges. India's logistics cost is about 13% of its GDP. In comparison, developed economies spend about 9% (Sharma and Kushwaha, 2017). The estimated annual loss in India due to the inefficient supply chain is $65bn (Chakraborty and Mandal, 2014). The poor logistics infrastructure in India is found along four dimensions: (1) transportation network – road, rail, water, air modes; (2) warehousing network; (3) information and communications technology (ICT) network; and (4) institutional framework (Sharma and Kushwaha, 2017). In each of the four aspects, issues and inefficiencies were noticed. Primarily, the critical issue was the nonavailability of infrastructure. The capacity of transportation networks (all modes) was found to be inadequate. Similarly, the warehousing network capacities were also found to be insufficient for meeting the volume of industrial and agricultural production. Fewer warehouses coupled with other issues, such as lack of skilled labor, lack of standardization, inefficient material handling equipment and inadequate storage facilities, lead to wastage of about 30–40% of fruits and vegetables produced in India every year (Sharma and Kushwaha, 2017). A study has pointed out that most villages and rural areas in India are like self-contained islands and observed that their national integration has the potential to raise productivity by 60% from current levels (Chang-Tai and Klenow, 2009). Another study on organized retailing in India by Dabas *et al.* (2012) concluded that Government regulations sway supply chain structure in India. Issues of poor planning and collaboration due to the unavailability of point-of-sale (POS) data were highlighted by Kumar *et al.* (2015). Poor responsiveness by Indian firms due to inadequate logistics and transportation infrastructure, electricity shortage, excessive paperwork and working attitude has been attributed to the reshoring of jobs back to the United Kingdom (Moradlou *et al.*, 2017).

4.5.3 SCM practices in India as compared to developed economies. Indian firms fare lower in the usage of SCM practices when compared to firms in developed economies. Chang-Tai and Klenow (2009) posited that the supply chain networks in India are inefficient and are not as advanced as compared to developed countries. Kumar (2008) carried out a study to find out the similarities and differences of the supermarket industry in developed and developing economies (USA, Canada, United Kingdom, Germany, France, Denmark, Japan and India). It was found that the average stock-outs in Indian supermarkets were estimated at around 30–35%. For the US and UK supermarkets, the average stock-out is less than 1%. The study found that disjointed systems and inadequate infrastructure were the key challenges in India for employing ECR. In another study, Park *et al.* (2012) pointed out that in global supply chain management, Japanese firms were more sophisticated than their India counterparts. Their study found strong support of national culture influencing SCM practices in a country. The study also found that supplier selection practices for Indian and Japanese firms differ. Another study by Kumar *et al.* (2015), about supply chain disruptions on stockholder's wealth in India, based on 301 disruptions spread over a decade (2003–2012), revealed that supply chain disruptions in Indian companies resulted in the erosion of stockholder's wealth on an average by 2.88%. The study also found that wealth erosion was higher in India compared to US firms. The average loss of stockholder's wealth in the US firms was 1.13% (Kumar *et al.*, 2015). Supply chain mitigation and risk management in India are lower than in developed economies (Kumar *et al.*, 2015).

4.5.4 Quantified benefits of SCM adoption. Despite the challenges and issues reported by several scholars, a few studies have reported the quantified benefits due to SCM adoption in India. The benefits reported related to inventory reduction, lead time reduction, cost reduction, sales increase, service-level improvement and customer satisfaction improvement.

Mohanty and Deshmukh (2000) reported the SCM transformation in a large cement manufacturer in India, which led to a reduction of lead times, enhanced customer service and optimized operations. Reduction in inventory was by 27% (from Rs. 250 million to Rs. 180 million), and material procurement lead time reduced by 45% (from 171 days to 94 days). In another study, SCM implementation in a leading motorcycle manufacturer resulted in the improvement of customer satisfaction level by 23% and reduction in production cost by 27%. These benefits were attributed to the new collaborative supply chain process (Kapoor and Ellinger, 2004). A tractor manufacturing company that adopted SCM reported improved service levels and cost savings (Rs. 22 million per year) through an improved distribution structure (Raghuram, 2004). An SCM transformation in a paint company in India between the years 2002 and 2004 led to improvement of service level by over 20% from the earlier level of 50–60%. The other benefits that resulted were inventory reduction by 18% (Rs 90 million) and distribution cost reduction by Rs 10 million. Further, due to improved information flow, the purchasing team was able to negotiate a 5% reduction in raw material purchase price (Sehgal *et al.*, 2006). In yet another study, an SCM transformation initiative was undertaken in a leading jewelry manufacturer that was fighting for its survival. The firm aligned its supply chain strategy with business strategy, carried out the integration of internal and external linkages, undertook systemic changes with supply chain partners, made organizational structure related changes, created cross-functional teams, made use of IT systems. As a result, sales increased by 28% compound annual growth rate (CAGR), and the return on capital employed (ROCE) improved to 25% (Kannabiran and Bhaumik, 2005).

5. Discussion

This section discusses the result of the study. Several aspects of SCM research in India are discussed in this section, related to: the quantum of SCM literature published; the SCM themes researched, including the evolution of SCM research, a taxonomy of the topics researched and overview of SCM adoption status; the methodologies used; and the research gaps noticed in the subject areas and the methodology.

5.1 Quantum of SCM literature

SCM research and usage in the developed economies picked up momentum in the 1990s (Mentzer *et al.*, 2001; Kotzab and Otto, 2004; Sweeney, 2011). SCM research in India started around the year 2000. The average publications per year in India were low (in single digit) till the year 2012. From 2013 onward, there has been an increase in the number of publications. The quantum of research in the developed economies is higher than that of India. The leading publishers that publish over 90% of SCM research related to India are Emerald, Springer, Inderscience, Taylor and Francis, Elsevier and SAGE Publications. The top five industry sectors where SCM research was carried out in India were: manufacturing, automobile/auto ancillary, agri-business/food, retail and electronics/semiconductor.

5.2 SCM themes researched in India

5.2.1 Evolution of SCM research in India. The evolution of SCM research in India has been summarized in three phases (phase-1: 2000–2006; phase-2: 2007–2013; phase-3: 2014–2020 Q1). The initial years (phase-1 and 2) saw a few papers published each year. A substantial increase was noticed in phase-3. With the increase in the number of publications, the diversity of SCM issues studied also increased over the phases. The total number of SCM issues studied over the 20-year period was 241 (phase-1: 23 issues; phase-2: 61 issues; and phase-3: 178 issues).

The issues studied in phase-1 (23 issues, 24 papers) were related to SCM strategy (three papers), SCM processes and integration (supplier selection, customs clearance, inventory model) – six papers and quantified SCM benefits (six papers). The benefits were on account of inventory reduction, cost reduction, lead time reduction, sales increase and improved customer satisfaction. The remaining papers were of different topics.

In phase-2 (61 issues, 89 papers), researchers extended work to new categories. The new categories were: network design, performance measurement and IT systems. The areas from phase-1, SCM strategy and SCM processes and integration, were also expanded. Research on GSCM also started to take shape in this phase, with ten papers getting published.

In phase-3 (178 issues, 283 papers), the subject areas of the earlier phases were further expanded, especially the SCM processes and integration area. The SCM processes and integration area had 117 papers, which is more than the total papers of phase-1 and phase-2. There were a large number of papers on SRM (supplier selection, development, evaluation), logistics/distribution/transportation area (3PL selection, reverse logistics, etc.), integration (coordination and collaboration), inventory management (integrated inventory models and inventory policies). Supply chain strategy saw a handful of papers (21 papers), with the bulk of them related to the operations strategy of lean, agile and leagile. The performance measurement area saw 20 papers published. The network design area also saw a few papers (17 papers). These were related to the design of CLSC, facility location–allocation and multistage RSC. The IT systems area saw 14 papers. Few papers on big data, blockchain and cloud computing also emerged. The SCM skill area received three papers. One-third of the papers in this phase (90 papers) was about several topics such as overviews, issues, challenges, risks, drivers/enablers/ CSF and barriers for regular SCM (38 papers) and Green SCM (52 papers).

The papers have focused on SCM strategy, supplier relationship and quantified benefits of SCM in the initial phase, while in the second phase, network design, performance measurement and IT system issues emphasized. Research on GSCM also started taking shape in the second phase. In the third phase, the major research motivation has been the SCM process and integration area and GSCM.

5.2.2 Taxonomy. In the absence of any taxonomy on the subject theme in the previous literature in the context of India, a new taxonomy of SCM subject themes has been created in the present study. The taxonomy provides three cascading levels of subthemes. The taxonomy revealed that some of the areas have received research attention. These are SRM (supplier selection, development, evaluation and relationship), integration (coordination and collaboration), logistics/distribution/transportation (3PL selection, reverse logistics), supply chain practices (such as VMI, ECR, e-commerce, SC resilience, etc.) and inventory management (integrated inventory models and inventory policies).

The level-2 themes related to CRM, sourcing/procurement, DM, DF, supply chain planning and SCO have not garnered much attention of researchers. For the SCM strategy (level-1) theme, the major level-2 themes were: operations strategy related (flexibility and responsive), and a few studies related to supply chain design-related themes. Areas in outsourcing strategy, channel strategy and asset network have not been explored. For the performance measurement (level-1) theme, the major level-2 area researched was performance measures. SCPMS implementation, performance monitoring, performance improvement-related areas have not been explored much. For the others (level-1 category), the level-2 areas researched were: overview/description/review/ analysis/viewpoint on various SCM themes, quantified benefits due to SCM, adoption-related, drivers/enablers/CSFs, barriers, issues/challenges and others.

A review of the taxonomy created in present study reveals that, in general, there is scope for more research in India along all the major level-1 themes. However, the level-1 themes, related to IT/systems, SCM skills, and some of the level-2 themes such as outsourcing

strategy, channel strategy, asset network, DM, DF, CRM, integrated supply chain planning, NPD, returns, SCO, SCPMS implementation, performance monitoring, performance improvement, SCM IT/systems, SCM skills, SCM adoption process/decision-making, barriers to SCM adoption, SCM implementation issues and quantified benefits of SCM are areas where there are large opportunities for research to explore.

5.2.3 Overview of SCM status in India. A comprehensive picture of SCM adoption in India did not emerge from the present study due to the lack of studies researching it. Indirect evidence suggests that the adoption of SCM in India has not yet taken place on a large scale, and SCM adoption continues to be in a nascent state in automotive sector, 3PL, SMEs, family-run business and GSCM. The indirect evidence of low adoption was in the form of poor logistics infrastructure in the country, tardy legal system, bureaucracy, fragmented supplier base and retail channels, complex regulations, nonavailability of POS data, excess inventory, higher stock-outs, low collaboration index, lack of information sharing culture, lack of SCM skills, SCM practices in India lagging behind as compared to developed economies, high cost of logistics as percentage of GDP and the losses caused due to inefficient supply chains. A few studies reported quantified benefits due to SCM adoption in the areas of inventory reduction, lead time reduction, cost reduction, sales increase, service-level improvement and customer satisfaction improvement.

Insights about SCM diffusion in India (number of SCM adoptions over time), the reasons for SCM adoption, the return on investment (ROI), payback period, comparison of process capabilities of SCM adopters and nonadopters and so on also could not be found. Future studies may consider to research on these aspects.

5.3 Methodology

The research methods found in previous SCM studies in India were conceptual model (34%), survey method (27%), mathematical model (24%), case studies (8%), literature review (5%) and archival/secondary data analysis (2%). The quantum of empirical papers was 53%, and that of theoretical papers was 47%.

The most common unit of analysis was "firm," followed by "dyad" and "chain." Some of the papers did not mention the unit of analysis. A majority of the studies (three-fifth) did not mention the size of the unit/organization under study. About four-fifth of the papers did not explicitly mention the theoretical base used.

For papers employing the survey method, the reliability and validity of the measuring instrument have been established in majority (three-fifth) of the studies. The sample size in SCM surveys in India has been on the lower side, with about a quarter of the studies having a sample size of lower than 100. It has also been noted that sampling design justification has not been provided in the majority of the studies, with about nine-tenth of the papers using nonrandom sampling designs. Additionally, sample size justification has also not been provided in the majority of the studies. Instances of mismatch between the unit of analysis and data collected for surveys were also noticed. The prevalent DATs found were: MCDM methods, optimization models followed by SEM, regression analysis and descriptive statistics.

5.4 Specific gaps

The present study has found specific gaps in the literature about SCM research in India with respect to subject areas and methodologies used. This section summarizes these gaps.

5.4.1 Gaps in subject areas of research. The subject areas where research is limited or nonexistent include CRM, DM, DF, integrated S&OP, APSs, use of emerging technologies (IoT, big data, AI, data visualization) in SCM planning, SCO, NPD, SCM strategy, SCM risk, SCM performance measurements, HDR, integrated sustainability (comprising of economic,

environment and social sustainability), SCM in services sectors, SCM skills, SCM adoption decisions, SCM implementation, routinization and maturity levels in organizations, barrier studies and quantified benefits. Studies in these areas will be useful for the advancement of SCM in India.

5.4.2 Gaps in methodology. The gaps in methodology found can be summarized along: theoretical base, unit of analysis and research methods. Future research should address these shortcomings in their studies to improve the methodological rigor.

5.4.2.1 Theoretical base. A large proportion of the papers have reviewed theories related to their studies. However, only a small proportion of the studies (one-fifth) have explicitly stated the theory that underpinned their study. Future research should take a note of this and clearly articulate the theoretical basis for their studies.

5.4.2.2 Unit of analysis. Most studies do not explicitly mention the unit of analysis, the entity of analysis, the element of exchange, industry/sector, size of the firm, SCM context and so on. In some cases, the unit of analysis and the level of data collection are different. The absence of such information poses challenge to the generalizability of the study findings and its real-life application.

The number of studies at the chain level is low in India. The real value of a supply chain is realized when the intra- and interorganizational processes of all the participating firms are synchronized and optimized. Thus, future research in India should strive to study at the chain level. The findings of such studies will provide critical insights about the performance of the supply chains in the Indian context.

5.4.2.3 Research methods. For most of the studies using the survey method, the rationale of the sampling design used and sample size justification has not been provided. Further, reliability and validity of measurement scales are also not mentioned in many studies. In some cases, the level of data collection does not match with the unit of analysis. These aspects need attention in future studies.

Most of the studies (conceptual model/mathematical models) do not provide a case study illustrating the quantification of the benefits of their proposed model/algorithm.

Most of the studies that use mathematical model for simulation/optimization do not provide information about the software used, algorithm, hardware specifications, data volume and run times.

The conceptual models involving MCDM techniques (such as AHP, ANP, ISM, DEMATEL, etc.) employ qualitative/subjective judgmental inputs from experts. Majority of the studies do not elaborate the basis on which the experts were selected, the process of eliciting expert opinion and the steps taken to minimize biases creeping into their models.

6. Implications

There are several implications of the present study, both theoretical and practical. On the theoretical front, it provides a novel taxonomy for the classification of the subject areas researched in SCM in India. As this taxonomy is based on the recurrent themes of SCM definitions, it can also be used by SCM researchers while undertaking other SCM SLR studies in India and other countries.

The practical implications of the study are, one, the study has identified the subject areas where future SCM research in India may be carried out (refer Section 5.4.1). Two, it provides an overview of evolution of SCM research in India over the last 20 years. This also presents a picture of the latest topics and areas that have caught the attention of researchers. Three, it sheds light on the methodological aspects of SCM studies in India and provides recommendations for future researchers on theoretical underpinnings, unit of analysis and research methods (refer Section 5.4.2). Four, it provides a comprehensive understanding of the status of SCM adoption in India, the issues and challenges. Policymakers may provide

support to overcome infrastructural issues, bureaucracy and slow judicial system. Five, the quantified benefits of SCM found in the present study will be useful for practitioners in their decision to adopt SCM in their organizations.

7. Contribution, limitations and future research direction

7.1 Contributions of the study

This study has contributed to the existing knowledge by providing insights into (1) the quantum of SCM research in India; (2) creating a taxonomy of SCM themes researched; (3) providing the methodologies used in research; (4) identifying gaps in literature with respect to subject areas researched and methodological shortcomings; (5) providing an overview of the SCM adoption status in India.

7.2 Limitation

There are some limitations to the present study. One, the papers included in the study are based on the search of the terms ("supply chain," "supply chain management," "SCM") and "India" in title, abstract and keywords of Scopus, ProQuest and WOS databases. It is possible that some papers could have been excluded due to this. Two, the full text of 32 potential papers could not be accessed, and these have been excluded. Three, the papers have been coded by the lead author. While the lead author has substantial academic and industry experience in SCM, there is still a possibility of errors during the classification of the papers.

7.3 Future research

The gaps identified in the present study with respect to to the subject areas and methodology in Section 5.4 can be further explored. Some of the interesting areas for future SCM research in India are: e-retailing, omnichannel, drone delivery, overcoming infrastructural bottlenecks, agri-food wastage, e-waste reverse logistics, integrated sustainability (green, economic and social), green product design, humanitarian and disaster relief supply chain, quantified benefits of SCM by industry segment, issues related to SCM adoption decisions, SCM implementation issues, SCM skills, organization structure and culture to facilitate SCM implementation, unethical behaviors in the supply chain, SCM for SMEs and use of new technology under industry 4.0 in SCM.

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Appendix

Sl #	Coding	Criteria used
1	Size	The size of the focal firm. The categories are: (1) Large; (2) Medium; (3) SME; (4) Small and Large; (5) Medium and Large; (6) Small, Medium and Large; (7) Not Applicable (NA); (8) Not Mentioned
2	Unit of analysis	The categories are: (1) Function; (2) Firm; (3) Dyad; (4) Chain; (5) Network; (6) Others: Individual; (7) NA (Papers, Country, Event); (8) Not Mentioned
3	Theoretical lens	If the study is based on some theoretical base, such as transaction cost economics, upper echelon theory, resource-based view, etc., and these have been explicitly mentioned
4	Theories used	Lists down the name of the theory(ies) used that have been explicitly mentioned
5	Empirical	By definition, empirical means, knowledge that can be verified by experience or observation. Papers are classified as empirical if they used: surveys, case studies, interviews, laboratory experiments, conceptual theory building and systematic literature reviews for collection and analysis of primary or secondary data. Papers that are classified as nonempirical are: desk research, historical records analysis, anecdotal evidence, opinions and pure mathematical modeling. Models that use MCDM approaches such as ISM, AHP, ANP, etc., for creating conceptual models have also been considered as nonempirical in nature
6	Subject classification	A three-layered taxonomy is used. The top level (L1) consists of seven categories: (1) SCM strategy; (2) network design; (3) SCM processes; (4) information technology (IT)/systems; (5) skill/competency/training; (6) performance measurement; and (7) others When more than one subject theme is present, the paper is classified under level one (L1) of the dominant theme
7	Industry sector	The industry sector the focal firm belongs to
8	Research method	The research methods categories are: (1) Survey, (2) Case Study, (3) Conceptual Model, (4) Mathematical Model, (5) Literature Review and (6) Archival Study
9	Sampling	The categories are: (1) Simple Random, (2) Purposive/Judgment, (3) Convenience, (4) Snowball, (5) Convenience and Judgment, (6) Convenience and Snowball, (7) Cluster, Stratified, Judgmental, (8) Multistage, (9) Entire Population, (10) Not Applicable (NA) and (11) Not Mentioned
10	Sample size	In case of survey, the number of respondents based on the unit of analysis
11	Response rate	The ratio of number of response to the number of respondents reached out to
12	Data analysis technique (DAT)	The type of data analysis technique used is mentioned. These are: (1) ANOVA, (2) Cluster Analysis, (3) Conjoint Analysis, (4) Correlation Analysis, (5) Descriptive Statistics, (6) Discriminant Analysis, (7) Factor Analysis, (8) Logistic Regression, (9) Mixed-Integer Programming, (10) Multicriterion Decision-Making (MCDM) Methods, (11) Optimization Models, (12) Regression Analysis, (13) Structural Equation Modeling (SEM), (14) Others, (15) Not Applicable (NA), (16) Not Mentioned. When more than one type of technique is used, the most important one has been mentioned

Table A1.
Coding scheme

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