



Supply chain management: a structured literature review and implications for future research

Supply chain
management

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Abstract

Purpose – The field of supply chain management (SCM) has historically been informed by knowledge from narrow functional areas. While some effort towards producing a broader organizational perspective has been made, nonetheless, SCM continues to be largely eclectic with little consensus on its conceptualization and research methodological bases. This paper seeks to clarify aspects of this emerging perspective.

Design/methodology/approach – A total of 100 randomly selected refereed journal articles were systematically analyzed.

Findings – A number of key findings emerged: the field is a relatively “new” one; several disciplines claim ownership of the field; consensus is lacking on the definition of the term; contextual focus is mostly on the manufacturing industry; predominantly “process” conceptual framing prevails; research methods employed are mostly analytical conceptual, empirical surveys or case studies; the positivist research paradigmatic stance is prevalent; and theories related to transaction cost economics and competitive advantage dominate.

Originality/value – This review identifies various conceptual and research methodological characteristics of SCM. From a philosophy of knowledge perspective, it is suggested that SCM be framed as a Lakatosian Research Program, for this has the best potential to assist in the development of SCM body of knowledge in a sustainable way into the future.

Keywords Supply chain management, Literature, Research

Paper type Literature review

Introduction

In recent years, the area of supply chain management (SCM) has become very popular. This is evidenced by marked increases in practitioner and academic publications, conferences, professional development programs and university courses in the area. While interest in SCM is immense, it is clear that much of the knowledge about SCM resides in narrow functional silos such as purchasing, logistics, IT and marketing. At least partly as a result of this, there appears to be little consensus on the conceptual and research methodological bases of SCM. This has contributed to the existence of a number of gaps in the knowledge base of the field. Firstly, from a conceptualization perspective, the definition of the term is unclear and the impact of theoretical diversity is such that it is doubtful SCM is based on a coherent theory. Secondly, from a research



methodology perspective, it is unclear how the research methods employed have shaped SCM concepts. Thirdly, from a meta-analytical perspective, the impact on consolidating knowledge gathered along narrow functional disciplines raises issues as to whether SCM has a coherent, overarching philosophy of knowledge framework.

We contend that in order to develop a better understanding of the above-mentioned issues, a systematic review of relevant literature is needed. While there have been several review articles published recently, these appear to only partially address conceptual issues and do not address research methodology issues at all. For example, Lummus *et al.* (2001) and Mentzer *et al.* (2001) focus specifically on the definition of SCM. Ho *et al.* (2002), Giannakis and Croom (2004) and Chen and Paulraj (2004) take a strategic management perspective to address theory development in the SCM area. Likewise, New (1997) provides a thematic overview of the SCM literature. Some of the reviews are narrowly based along functional lines; for example, Skjoett-Larsen's (1999) review is focused on the logistics discipline whilst Larson and Halldorsson's (2002) review is based on the purchasing literature. As yet, there does not appear to be a review that has considered the SCM area from a broader organizational perspective. As far as research methodological issues are concerned, none of the reviews appears to have systematically examined the range of methodological approaches employed. Also, the majority of reviews have used convenience samples of articles and the analysis is mostly thematic. There appear to be no structured and systematic reviews.

In this paper, the results of a structured review of SCM literature are presented. A systematic process was used to classify the literature along salient conceptual and research methodological dimensions. The results from this review were then used to generate a meta-analysis of the philosophy of knowledge that could be used to guide future SCM research.

For the term "supply chain management" there appears to be little consensus on its definition (New, 1997; Lummus *et al.*, 2001; Mentzer *et al.*, 2001; Kauffman, 2002). Kathawala and Abdou (2003, p. 141) conclude that SCM "has been poorly defined and there is a high degree of variability in people's minds about what is meant". Mentzer *et al.* (2001) attempted to overcome this state of affairs by proposing a definition that is broad, not confined to any specific discipline area and adequately reflecting the breadth of issues that are usually covered under this term. We decided to use this definition to guide our research:

Supply chain management is defined as the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole (Mentzer *et al.*, 2001, p. 18).

However, we have not dogmatically adhered to all the nuances expressed in this definition. Given that an important aspect of this review is to explore how SCM is conceptualized, we have used this term in a fairly "liberal" manner throughout the paper, hoping to ensure the scope of the research parameters was sufficiently broad to capture a wide range of definitions.

The sections which follow provide details of how the review was conducted. First, the methodological aspects of the literature review are presented. This is followed by the results section. Then, a discussion of conceptual and research methodological issues is presented. Leading from this discussion, future research possibilities and

developments are proposed. The paper concludes by summarizing the key findings of the review, highlighting the contributions this study makes to the body of SCM knowledge, and identifying the implications of the findings for practitioners and researchers.

Review methodology

Selection of articles

Journal articles were sourced from the ABI/Inform Global Proquest academic database. The aim of the review was to capture a snapshot of the diversity of research being conducted in the SCM field. Accordingly, all of ABI/Inform Global Proquest's journals were included in the search. An initial keyword search for articles containing any of the terms of the phrase "supply chain management" (limited to citations and abstracts of periodicals) revealed that there were more than 10,000 articles present in the database. The key word search was subsequently limited to the exact phrase, "supply chain management". This search revealed 3,511 articles (as of July 2003). Control over quality was achieved by limiting the search to peer-reviewed publications only. With this additional restriction, the number was reduced to 882. Prefaces, editorial notes, book reviews and interviews, in addition to any articles from magazines or industry publications, were excluded from this set, leaving 614 usable articles. A comprehensive approach would require that all 614 articles be reviewed. This was deemed inefficient. Instead, statistical methods were used to generate a representative random sample. To be ninety percent confident of being correct to within ± 0.1 of the true proportion of all articles, a minimum sample size of 61 articles was needed (Berenson and Levine, 1989, p. 327). This sample was increased to 100 to reduce the probability of Type II error. Full bibliographic details of the 100 articles selected for analysis are shown in the Appendix in order to make our research processes transparent, and allow independent assessment of our classification and analysis.

Review process and inter-rater reliability

Eleven key dimensions relating to SCM conceptualization and research methodological issues were defined, and all the articles were then classified within these dimensions. The three authors, who all have practical and academic experience in the area, acted as reviewers and classified allotted portions of the sample of articles. Measures were taken to ensure a high level of inter-rater reliability. Preliminary measures involved reviewers classifying several articles, and then comparing these to ensure consensus. After the classification process, the whole group discussed articles which individual reviewers were uncertain of, until agreement was reached.

Classification framework

The 11 dimensions along which the articles were analyzed were integrated into a framework which broke into four distinct, yet logically ordered, groupings commencing with the least complex concepts and progressively working through to more philosophically-advanced research issues. Table I summarizes the framework.

As Table I shows, the classification framework is structured to enable a holistic conceptual and research methodological analysis of the field. Specifically, grouping 1 provides an analysis of the sample of articles used and examines trends in the literature. Grouping 2 classifies the territory covered by SCM from a range of

Table I.
Literature review
classification framework

Grouping	Content covered	Rationale
1. Descriptive features of SCM literature	Time distribution of publications Journal names Industry sectors	Describe characteristics of sample of articles
2. Definitional issues	Approaches to definitions Conceptual framing of SCM Constructs of SCM Discipline bases	Explore consistency or variation in SCM definitions by researchers on a range of dimensions. Define the territory that researchers claim falls within SCM
3. Theoretical concerns	Theoretical perspective Purpose of theory	Determine the range of theories that are used to inform SCM and ends to which they are applied
4. Research methodological issues	Paradigmatic stance Research methods	Determine the methodological assumptions being made and the types of research methods that are used to explore SCM

perspectives using either purpose-built or existing classification schemes. Grouping 3 also classifies the literature, but deals with issues around theoretical bases. Finally, grouping 4 examines issues associated with research methodology. While any classification system can be challenged for levels of comprehensiveness, it was felt that the breadth of perspectives covered by the 11 dimensions was adequate to develop a sound understanding of SCM. Also, the classification categories for some of the 11 dimensions were a potential source of contention. To overcome this, where possible, existing conceptual and taxonomical frameworks that have been extensively used in similar research were used. For dimensions where no existing framework was available, we developed our own.

The 11 elements of the framework were designed to assist in establishing a clear “line of sight” from information sources to definitional matters, and then through to theoretical concerns and research approaches used. Together, these cover conceptual and research methodological concerns. The framework, therefore, provides a method to check for logical links and connections to verify consistency (or the lack thereof) amongst the various research activities within SCM. The data generated from examination of the relationships between the framework’s 11 elements then inform a meta-analysis on the philosophy of knowledge in the SCM area.

Results

Descriptive features of SCM literature (grouping 1)

Time distribution of publication of articles. An analysis of the years in which the 100 randomly selected articles were published show that the first articles appeared in 1985. Over the past 18 years, there was an exponential increase, with 77 out of the 100 articles published between 1999 and mid-2003.

Journal titles. The 100 articles were reviewed to identify the journals, as well as the number of articles published in each journal. This analysis showed that a total of 31 journals covering many discipline areas were captured in the review. Two journals, *Journal of Supply Chain Management* (21) and *Supply Chain Management* (27),

accounted for 48 percent of the publications. The remaining 52 percent of articles were “thinly” spread over the rest of the 29 journals.

Industry sectors. Anecdotally, the SCM literature appears to be concentrated in a handful of industry sectors. Examples to illustrate SCM concepts are mostly chosen from industries such as consumer goods retailing, computer assembling and automobile manufacturing. In order to improve our understanding of sectoral influences on SCM, the sample of articles were classified according to the industry sector in which they were primarily based. The Australia and New Zealand Standard Industry Classification (ANZSIC) code (Australian Bureau of Statistics, 1993) was used for this purpose. The results are shown in Table II.

Table II shows that 35 percent of the articles were based in the manufacturing industry sector. Closer examination showed that for the majority of articles classified as manufacturing, most dealt with selling of products in consumer markets. The second largest group of articles involved multiple industry sectors (16 percent). In this group, articles were based on surveys of large numbers of firms operating in diverse industry sectors. The remaining handful of articles was spread across a broad range of industry sectors.

Definitional issues (grouping 2)

Definition of supply chain management. As indicated in the Introduction section, there appears to be little consensus on the definition of the term “supply chain management”. In this review, while we were eager to capture a range of perspectives, we did not wish

Industry category title	Articles Reference numbers (see Appendix for bibliographic details)	Count
Agriculture, Forestry & Fishing	[1-7]	7
Mining	[8]	1
Manufacturing	[2, 8-45]	39
Electricity, gas & water supply		0
Construction	[8]	1
Wholesale trade	[46, 47]	2
Retail trade	[33, 34, 39, 48-52]	8
Accommodation, cafes & restaurants		0
Transportation & storage	[29, 53-55]	4
Communication services	[56-60]	5
Finance		0
Property & business services		0
Government, administration & defense	[8]	1
Education	[61]	1
Health & community services		0
Cultural & recreational services		0
Personal and other services	[9]	1
Multiple industry sectors	[37, 62-78]	18
None	[79-100]	22
Total		110 ^a

Note: ^a While 100 articles were reviewed, some articles were based in more than one industry sector and were, therefore, placed in multiple categories

Table II.
Industry sectors

to achieve this by imposing subjectively generated inference on our part. Therefore, a conservative approach was taken – a definition had to be explicitly stated, not merely implied, for it to be counted. Where definitions of SCM were apparent, they were further classified into existing, modified or original definitions. Table III summarizes the results of the definitional analysis.

In over half the articles (58 percent), no definitions were used. In most of these cases, it was found that either a broad view of SCM was taken where the main discussion was focused elsewhere and SCM was only partially relevant, or a very specific aspect of SCM was discussed. The next largest group used existing definitions (21 percent). Little consistency was found in the specific definitions used. Three of the 21 articles utilized the definition proposed by Handfield and Nichols Jr (1999) and none of the remaining 18 articles used the same definition. Those that fell under the category of “developed own definition” were often those that proposed a definition without making reference to other sources. Closer analysis of the similarities and differences revealed almost half of the articles tended to have embedded within the definitions, core concepts concerning the flow of goods and information across organizations.

“*Framing*” of SCM. A scheme for classifying the manner in which SCM is conceptually framed was developed by the authors. This consisted of four categories: activity (including instances where SCM was described as an individual function in a process); process (chain of related activities); system (series of related processes; loosely connected collection of concepts; networks; frameworks); and other (a deeper level of analysis that dealt with, *inter alia*, sociological, psychological and philosophical concepts). These four categories could be viewed on a scale that ranged from “micro” to “macro” perspectives, and were chosen for the following reasons. Firstly, the conceptual framing used could assist in explaining the lack of consensus in definitions – how SCM is conceptually represented has a large bearing on the nature of the definition that is proposed. Secondly, the conceptual framing could explain expectations that organizations have of SCM. For example, treating SCM as an activity could lead to it being viewed as a minor operational function. On the other hand, a systems perspective would suggest SCM to be an all-embracing management framework. Finally, an understanding of conceptual framing that was used would assist in revealing the constructs that sit behind SCM. Table IV provides the results of the classifications. This shows that a majority (57 percent) of the articles framed SCM as some form of process, while about a quarter (24 percent) viewed SCM as a system. A smaller proportion (9 percent) saw SCM as a simple activity.

Approach to definition	Articles	
	Reference numbers (see Appendix for bibliographic details)	Count
Developed own definition	[4, 6, 14, 18, 38, 57, 62, 88, 92, 95, 99, 100]	12
Used existing definitions	[9, 13, 20, 27, 30, 32, 37, 48, 50, 61, 63, 64, 66, 69, 70, 81, 83, 86, 96-98]	21
Incrementally changed existing definitions	[17, 25, 39, 49, 56, 67, 89-91]	9
None used	[1-3, 5, 7, 8, 10-12, 15, 16, 19, 21-24, 26, 28, 29, 31, 33-36, 40-47, 51-55, 58-60, 65, 68, 71-80, 82, 84, 85, 87, 93, 94]	58
Total		100

Table III.
Approaches to definitions of supply chain management

Conceptual schema	Articles	
	Reference numbers (see Appendix for bibliographic details)	Count
Activity	[10, 33, 35, 44, 45, 50, 59, 62, 92, 94]	10
Process	[1-3, 5, 6, 13-22, 24, 26, 28-31, 34, 36, 39-41, 43, 46, 47, 49, 51, 55, 56, 60, 63-73, 75, 77, 78, 81, 83-85, 87, 89, 93, 95-97, 99]	59
System	[4, 7, 9, 23, 25, 27, 32, 37, 38, 42, 48, 52-54, 57, 58, 61, 67, 80, 82, 86, 88, 90, 98, 100]	25
Other	[67, 74, 89, 91]	4
None	[8, 11, 12, 76, 79]	5
Total		103 ^a

Note: ^a While 100 articles were reviewed, some articles involved more than one conceptual schema and were, therefore, placed in multiple categories

Table IV.
Conceptual framing of
SCM

Constructs of SCM. Owing to the nature of the field, a suitable way to present the SCM concepts is to logically group them into “constructs” – higher order abstract variables that are not directly measurable, but provide more rounded definition of the concepts (Nunnally, 1978). For the SCM field, agreement on a common set of constructs does not appear to exist. Some researchers use a single overarching construct to cover all aspects of SCM (Ho *et al.*, 2002), whilst others use a myriad collection of narrowly defined constructs (e.g. Chen and Paulraj (2004) define 18 constructs and Min and Mentzer (2004) describe 24 constructs). In the absence of consensus on a common set of SCM constructs, we decided to consolidate, to a reasonable list, the constructs proposed by researchers such as Chen and Paulraj (2004), Min and Mentzer (2004) and Tracey *et al.* (2004) by focusing on the commonalities amongst these lists. The final outcome was a set of seven constructs: “leadership” (capturing the strategic nature of SCM and the need for senior management team to be proactively involved); “intra- and inter-organizational relationships” (focusing on the nature and type of social and economic associations between stakeholders both within and between organizations); “logistics” (describing the issues associated with movement of materials within and between entities in a supply chain); “process improvement orientation” (processual arrangements that facilitate interactions within and between organizations, with a view to continually improving them); “information system” (covering aspects of communication both within and between organizations); and, “business results and outcomes” (capturing performance related outcomes that organizations accrue from adopting strong SCM orientation). Similar to other areas in management, the SCM constructs appear to generally fall into two broad groups: the “soft” people-focused constructs that deal with social relationships; and the “hard” system-dominated constructs that deal with technological and infrastructural issues (Croom, 2001; Power *et al.*, 2001; Keller *et al.*, 2002). Applying this schema to this study, the soft constructs are leadership, and intra- and inter-organizational relationships, and the hard constructs are logistics, process improvement orientation, information system, and business results and outcomes. While it could be argued that there is some overlap between these constructs, we felt that they had sufficiently distinctive features to be treated as exclusive constructs at the high level of analysis conducted in this section of the review. The classification of articles with respect to the seven constructs is shown in Table V.

Construct	Articles	
	Reference numbers (see Appendix for bibliographic details)	Count
Leadership	[13, 47]	2
Intra-organizational relationships	[4, 13, 42, 69]	4
Inter-organizational relationships	[2, 3, 5, 9, 13, 15-17, 20-22, 25, 27, 30-32, 37, 46, 47, 49, 52, 55, 58, 61, 68, 71, 74, 77, 78, 84, 89, 90, 96, 98, 100]	35
Logistics	[6, 9, 12, 38, 42, 43, 50, 53-55, 61, 65, 69, 70, 73, 76, 99]	17
Process improvement orientation	[3, 7, 8, 10-12, 14, 16, 18, 19, 21-26, 28-30, 32, 36, 39-41, 43, 45, 48, 51, 52, 55, 59, 60, 63, 66, 75, 77-79, 83, 84, 87, 89, 93-97, 99, 100]	49
Information systems	[1, 9, 17, 23, 50, 52, 56-58, 62, 64, 77, 80-82, 86, 92, 98]	18
Business results & outcomes	[15, 33-35, 38, 42, 44, 47, 48, 50, 72, 93]	12
Others	[67, 85, 88, 91]	4
Total		141 ^a

Table V.
Constructs of SCM

Note: ^a While 100 articles were reviewed, some articles involved more than one construct and were, therefore, placed in multiple categories

As can be seen from Table V, of the three soft constructs, the inter-organizational relationships construct has been the focus of strong research attention, with 35 out of the 41 articles involving this construct. Given our anecdotal assessment of emphasis in the literature on the importance of social factors, we had anticipated that this construct would capture the soft issues. However, the majority of articles classified under this construct were in fact about company-to-company relationships with little or no mention made of people-related issues. Leadership and intra-organizational constructs have been the subject of very few studies. In the case of hard constructs, the process improvement orientation construct has been strongly researched. The other hard constructs have received lesser research attention, but they have not been totally neglected.

Discipline bases of SCM literature. The term “discipline” is related to doctrine, has religious connotations and is contentious (Shepherd, 1993). For the purpose of this review, we took a discipline to be a body of practice that is well supported by occupational groupings that identify with a defined territory of activity. Disciplines are supported by infrastructure designed to transfer and create knowledge within a defined field of endeavor. Such infrastructure includes professional associations, various publications and training institutions. A discipline may also be supported by competing and complementary theories. We classified the articles into discipline categories which, in our opinion, appear most relevant to SCM. They include marketing/services, logistics, purchasing, strategy, psychology/sociology, finance/economic, information/communication, operations management (defined as activities involved in transforming raw materials into goods and services but excluding logistics and purchasing functions), and an “others” category. The results of these classifications are shown in Table VI.

The classifications in Table VI show that the largest grouping of articles was based in the operations management discipline area (19 percent). This was closely followed by the strategy (16 percent) and purchasing (15 percent) areas. Very few articles have focused on psycho-sociological issues such as power differentials, trust, cooperation,

Discipline	Articles Reference numbers (see Appendix for bibliographic details)	Count
Marketing/services	[3, 43, 47, 50, 83, 85, 91]	7
Logistics	[5, 38, 42, 49, 51, 53-55, 65, 66, 72, 73, 76, 87, 96]	15
Purchasing	[8, 16, 20, 26, 28, 31, 34, 35, 40, 44-46, 48, 58, 60, 68, 73, 75, 84, 95, 96]	21
Strategy	[4, 6, 10, 12, 13, 15, 19, 20, 24-26, 31, 33, 37-39, 41, 55, 64, 66, 77, 90]	22
Psychology/sociology	[2, 13, 22, 37, 47, 55, 59, 80, 90, 100]	10
Finance/economics	[19, 25, 29, 38, 45, 55, 63, 79, 82, 90, 97]	11
Information/ communication	[1, 9, 17, 23, 45, 50, 52, 56-58, 62, 64, 80, 81, 86, 92, 94, 98]	18
Operations management	[7, 11, 14, 16, 18, 19, 21-23, 27, 30, 32, 36, 38-41, 43, 48, 70, 71, 73, 77, 78, 84, 96]	26
Others	[61, 67, 69, 74, 87-89, 93, 99]	9
Total		139 ^a

Note: ^a While 100 articles were reviewed, some articles were based in more than one discipline and were, therefore, placed in multiple categories

Table VI.
Discipline bases

confidence and quality of relationships. Also, there was some evidence, albeit not particularly strong, that multi-disciplinary perspectives were being taken, with 30 out of the 100 articles classified into two or more disciplines.

Theoretical concerns (grouping 3)

Theoretical perspective. It is generally accepted that theory development is an essential requirement for the proper development of any field (Popper, 1961; Kuhn, 1970; Wacker, 1998). However, the theory-building process is contentious. Some researchers suggest that theories should be built upon existing ones (Pfeffer, 1995). Others believe that, in the spirit of plurality, new innovative theories should be encouraged (Van Maanen, 1995). For the field of SCM, the extent to which theories have been developed appears to be slight. The development of SCM appears to have been largely practitioner-led, with theory following (Voss *et al.*, 2002). To develop a better understanding, the articles were analyzed to determine, in the first instance, if a theoretical perspective was apparent. Those articles that seemed to reflect theoretical perspectives were further analyzed to ascertain if the theories were existing or new ones. Where existing theories were being used, we decided to use an expanded version of theories suggested by Amundson (1998) because this offered a suitably comprehensive list. These consisted of theories in economics (transaction cost, others that included agency), strategic management (resource based view of firm, competitive advantage), and psychology and sociology (organizational learning, inter-organizational networks). The results of classifying the articles according to theoretical stance are summarized in Table VII.

As can be seen from Table VII, a significant proportion (20 percent) of the articles had no discernable theory present. Of all the articles that adopted theoretical perspectives, none proposed an original SCM theory. Instead, they were all grounded in existing theories. Closer examination of specific theories that were adopted showed that the transaction cost economics theory and the strategic management theory related to competitive advantage were most popular (29 and 24 percent, respectively).

Table VII.
Theoretical perspective

Theory	Articles	Reference numbers (see Appendix for bibliographic details)	Count
No discernable theories		[1, 3, 7-10, 12, 14-16, 18, 27, 53, 56, 57, 62, 64, 65, 76, 83, 85-88]	24
New SCM-specific theories		[5, 6, 23, 25, 28, 29, 31, 33, 34, 36, 38, 40, 41, 43, 44, 50, 51, 55, 58, 59, 63, 70-73, 80, 81, 90, 92, 94, 95, 97-99]	0
Economic	Transaction cost	[11, 17, 21, 24, 35, 37, 45, 50, 79, 80, 82]	34
	Other economic incl. agency	[49, 68, 90]	11
	Resource based view of firm	[4, 13, 17, 19, 20, 23, 25, 26, 29, 30, 32, 38, 39, 42, 43, 47, 48, 54, 55, 64, 66, 67, 77-79, 81, 84, 97]	3
	Competitive advantage	[2, 4, 22, 23, 60, 61, 69, 75, 82]	28
	Organizational learning	[46, 52, 96, 98, 100]	9
	Inter-organizational networks	[89, 91]	5
Psychological/Sociological		[74, 93]	2
Multiple			2
Other			2
Total			118 ^a

Note: ^a While 100 articles were reviewed, some articles addressed more than one theory and were, therefore, placed in multiple categories

Other economic (e.g. agency) and strategic management (e.g. resource-based view) theories were not so popular (9 and 3 percent, respectively). Also, articles grounded in psycho-sociological theories such as organizational learning (8 percent) and inter-organizational networks (4 percent) were under-represented. Very few articles (1 percent) attempted multi-theory grounding.

Purpose of theory-related activities. Further insight into the theoretical developments of a field can be gained through an analysis of the purpose of theory-related activities. A field at an early stage of its theoretical development is likely to have most activities focused on discovery and description. On the other hand, a maturing field would have a greater proportion of the activities focused on theory validation, extension and refinement activities (Handfield and Melnyk, 1998). In this study, the set of articles identified in the previous section as being grounded in theory was analyzed to establish the type of activities involved. Handfield and Melnyk's categories were used for this purpose. This analysis framework suggests six types of theory-related activities: discovery; description; mapping; relationship building; theory validation; and theory extension/refinement. The results of the analysis are summarized in Table VIII. This shows that of the 76 articles involving theory-related activities, 40 percent were theoretical descriptions of some sort. Articles falling into other research strategy categories were all closely distributed, ranging between 5 and 10 percent.

Research approaches (grouping 4)

Research method paradigmatic stance. Theories can be tested using a variety of methods. The specific research method paradigmatic stance adopted by researchers has a strong influence on the shape and form of the subsequent knowledge that is generated. Philosophy of knowledge researchers have identified several paradigms. At one end of the spectrum is positivism, which assumes the unity of scientific method, searches for causal relationships, believes in empiricism, assumes that science (and its process) is values-free, and views the foundation of science as being based on logic and mathematics. At the other end of the spectrum is a raft of paradigms such as phenomenism, post-modernism and interpretivism, all of which reject the assumptions of positivism and entail a more normative approach to knowledge generation. For this study, the framework developed by Burrell and Morgan (1979) was used to classify the articles. This framework consists of four groups: functionalism, intepretivism, radical humanism and radical structuralism. The functionalist paradigm is aligned with positivism. The remaining three paradigms are

Research strategy	Articles Reference numbers (see Appendix for bibliographic details)	Count
Discovery	[4, 37, 69, 71, 77]	5
Description	[5, 6, 11, 13, 17, 19, 23, 26, 28, 31, 33-35, 38-41, 45, 50-52, 55, 61, 63, 67, 72, 79-81, 84, 89-92, 94-99]	40
Mapping	[2, 22, 29, 43, 58, 78, 100]	7
Relationship building	[21, 30, 32, 46-48, 54, 60, 68, 75]	10
Theory validation	[20, 42, 49, 59, 66]	5
Theory Extension/refinement	[24, 25, 36, 44, 70, 73, 74, 82, 93]	9
Not applicable	[1, 3, 7-10, 12, 14-16, 18, 27, 53, 56, 57, 62, 64, 65, 76, 83, 85-88]	24
Total		100

Table VIII.
Purpose of theory-related activities

anti-positivist in nature. While Burrell and Morgan originally developed their framework for the field of sociology, it has been applied in other fields (Chua, 1986; Goles and Hirschheim, 2000), and was therefore, deemed useful for this study as well. In terms of the criteria used for classifying articles, we first looked for an explicit statement on the research method paradigmatic stance of the article. If this was not present, then we made a summative assessment of the orientation of the articles based on the criteria provided by Burrell and Morgan. The result of classifying the literature set using Burrell and Morgan’s framework is shown in Table IX.

Table IX demonstrates that there is a very strong usage of the functionalist paradigm with 97 percent of the articles based on this paradigmatic stance. Only a small proportion of articles used the interpretivist and radical structuralist paradigms (1 and 2 percent, respectively). None of the articles used multiple research method paradigms.

Research methods. Greater epistemological insight into the field can be gained by examining the specific research methodologies that are used. Researchers have a wide range of options, depending on the nature of knowledge and the certainty with which it is presented. Classification of such a range is, therefore, important in order to detect potential systematic patterns in the research literature. For this research, Wacker’s (1998) classification scheme was used. Wacker suggests that research methods can be broadly divided into two groups: analytical and empirical. Analytical methods are further categorized as conceptual, mathematical or statistical, and empirical methods include experimental design, statistical sampling or case studies. Results of classifying the articles according to research methods adopted are shown in Table X.

Table IX.
Paradigmatic stance

Paradigm	Articles	
	Reference numbers (see Appendix for bibliographic details)	Count
Functionalist	[1, 3-73, 75-79, 81-100]	97
Interpretivist	[2]	1
Radical humanist		0
Radical structuralist	[74, 80]	2
Total		100

Table X.
Research methods

Research strategy	Articles	
	Reference numbers (see Appendix for bibliographic details)	Count
<i>Analytical</i>		
Conceptual	[3-6, 10, 19, 34, 38, 51, 53, 54, 56, 60, 61, 63, 67, 70, 73, 75, 76, 79-81, 83-91, 93-98, 100]	39
Mathematical	[21, 24, 43, 71, 82, 92, 99]	7
Statistical		0
<i>Empirical</i>		
Experimental design		0
Statistical sampling	[12, 13, 15, 18, 20, 30, 31, 32, 36, 39, 42, 45, 47, 48, 59, 62, 64-66, 68, 69, 77, 78]	23
Case studies	[1, 2, 7-9, 11, 14, 16, 17, 22, 23, 25-29, 33, 35, 37, 40, 41, 44, 46, 49, 50, 52, 55, 57, 58, 72, 74]	31
Total		100

As can be seen from Table X, most of the articles were classified as analytical conceptual, empirical case studies or empirical statistical sampling (39, 32 and 22 percent, respectively). Only a handful of articles used analytical mathematical methods (7 percent). None of the articles used either analytical statistical or empirical experimental design. Also, none of the articles cited used mixed methods.

Discussion

Based on the findings of this review, it is possible to address a number of contentious issues, such as how best to conceptualize the field and assess the impact of the distinct trends in literature on the development of the field. These issues are discussed with close reference to the four groupings and 11 dimensions of the analysis framework described in Table I.

Descriptive features of SCM literature (grouping 1)

The paucity of articles prior to 1985, followed by rapid growth in the late 1990s, demonstrates that the field is a relatively new one. In terms of journal titles, while two journals dominate, there is a large range of journals that publish articles in the SCM area. This indicates that SCM is of interest to researchers from a vast array of backgrounds. If the combined results of year of publication and journal title analyses are extrapolated into the future, then it is possible that the dominance of the two journals could weaken as SCM continues to be explored in more depth by an increasing variety of researchers. In relation to industry sector (Table II), the ANZSIC classification scheme did not prove to be useful, as most supply chains exist across several industries. Despite the weakness of the ANZSIC classification scheme, Table II suggests that SCM development is being informed primarily from a manufacturing perspective with the consumer market as the primary concern. Based on the sample of articles reviewed in this paper, many other industry sectors, such as industrial markets, do not yet appear to have been researched as comprehensively.

Definitional issues (grouping 2)

Approaches to definitions of SCM. A good indication of the maturity level of a field is provided by the attitude of researchers to the definition of key concepts. Table III shows a relatively high proportion of researchers proposing new definitions or modifications of existing definitions. This suggests that definitional consensus does not exist, a point specifically acknowledged by some authors (New, 1997; Cox *et al.*, 2001; Kauffman, 2002; Quayle, 2003). In a mature field, most researchers would be inclined to use existing standard definitions. In our case, only a quarter of the authors used existing definitions, and within this subgroup there was no clear convergence on a single definition (although most were based on themes associated with operations research). This suggests that SCM is still in the developmental mode, and has not yet reached maturity. It can, therefore, be expected that more new or modified definitions will be proposed. As Mentzer *et al.* (2001) have highlighted, the lack of clear definition will inhibit SCM theoretical development.

Framing of SCM. The review shows that most researchers tend to describe SCM in terms of processes, and more specifically, as chains of activities (Table IV). This could be a reflection of SCM's historical development. It has been linked to several management philosophies and techniques that were popular in the 1980s and the

1990s, such as Japanese management methods and, more notably, total quality management, business process reengineering, lean manufacturing and just-in-time management. These philosophies and techniques predominantly take a process view of operations. If, as has been suggested, SCM emerged from these operations management approaches, then the predominance of the process view of SCM is understandable. The second most popular conceptualisation is “systems”. Closer examination showed that most researchers were using the metaphor of chain rather loosely, with many using it to describe several supply chains, which interacted. A more realistic representation of the complexities inherent in SCM would be to use the term “network” rather than chain. Another significant finding is that little attempt has been made to describe and analyze SCM in philosophical terms. This could well be preventing deeper and more critical perspectives on SCM from emerging.

Constructs of SCM. Leadership and intra-organizational constructs have been the subject of very few studies, and analysis of inter-organizational relationships reveal that the “soft” people-centred aspects have generally not been investigated in any depth (Table V). In the case of “hard” systems-based constructs, the process improvement orientation construct has been strongly researched, while the other constructs – logistics, information system and business results and outcomes – have been under researched, but not totally neglected. The emphasis on process improvement in a hard sense combined with a shallow amount of research on soft issues (even in the categories designed to capture such information), highlight that the social aspects of SCM have been neglected both in the breadth and depth of research. This finding was not anticipated given the importance many writers (Handfield and Bechtel, 2002; Dyer and Chun, 2001) have placed on the need to develop trust and collaboration within supply chains.

Discipline bases. The dominance of the operations management/logistics/purchasing disciplines reflects the historical origins of the field and was expected (Table VI). However, the low representation of articles focusing on psycho-sociological research was unexpected. Since, SCM involves engagement of people from different backgrounds, occupational groupings, geographical locations and cultures, one would expect stronger coverage of social issues than appears to be the case in Table VI. A possible explanation for this is the journals in which SCM research is published. Almost 50 percent of the research is reported in journals, which, despite the title of SCM, are in the narrow operations management domain. These journals usually prefer “technical” papers, ahead of those based on social perspectives. Another notable point is the dominance of single-discipline research. This is despite SCM being an inherently multi-disciplinary area. This may be due to the dominant disciplinary groups having reached a critical mass and, not feeling the need to reach out to other disciplines. Conversely, the other disciplines may be lacking a critical mass around the theme of SCM and do not have the resources or the credibility to engage with the dominant disciplines in a meaningful and on-going manner. The data in Table VI initially suggest that the SCM field is fragmented along narrow discipline areas. However, some researchers include purchasing and logistics under operations management. Under this broader category, logistics/purchasing/operations management is overwhelmingly the dominant discipline in SCM. Despite such dominance, there is little evidence of a move towards the emergence of an integrated approach to the field. Rather, as suggested in the diversity of journals publishing articles in the area, it appears

the dominant disciplines which previously informed SCM may now have to give way to an ever-increasing range of other disciplines which are seeking to also contribute to SCM knowledge.

Theoretical concerns (grouping 3)

Theoretical perspective. From the distribution patterns in Table VII, it is clear that most researchers do not think SCM body of knowledge requires “original” theories. Rather, by basing their ideas of SCM on multiple existing theories from other bodies of knowledge, researchers are suggesting that SCM can be described through an extension of existing ideas. More specifically, since more than one theory is being used in the field, it seems there is a strong suggestion that a single existing theory could not adequately explain all that is embraced under SCM. Also, some theories are more popular than others, the two most popular being transaction cost economics and competitive advantage theories. This suggests that there is a preference for certain “types” of theories. Also noticeable is the relative paucity of strong multi-theoretic approaches. These trends combine to contribute to a situation where the theoretical development in the field has become heavily skewed. If theory development was more evenly spread, then one would expect to see a wider representation of existing theories and less domination by a few, some original theories proposed, and multi-theoretic approaches used. It is possible that the current state of theory development in the field could be preventing its evolution towards a more mature status. To overcome this, as a start, it may be necessary for researchers to acknowledge that the current pre-occupation with a few existing theories (in their singular form) may not be sufficient to describe the field completely.

Purpose of theory. A strong emphasis on descriptive types of theoretical contributions by researchers has meant that theory development so far has been at a relatively simple and unsophisticated level. Conversely, the relative lack of emphasis on contributions such as theory validation, extension and refinement appears to be preventing the emergence of higher-order and more mature theories in the field. This suggests that theory development is at an early stage and that further work remains to be done if more advanced theories are to emerge. Researchers need to address other categories in Table VIII if the rate of theoretical development of the field is to be hastened.

Research methodological issues (grouping 4)

Paradigmatic stance. Results show that there is very strong usage of the positivist research paradigm (Table IX). This dominance has meant that knowledge is being conceptualized as a rational function and investigated as a “science”. The relative absence of non-positivist research has prevented a more reflective style of writing. This in turn has the potential to restrict the field of SCM to a single paradigm, hence preventing its wider development and acceptance. The pattern of distribution is similar to the findings of researchers in other fields. For example, Goles and Hirschheim (2000) found the vast majority of information systems research was positivistic. They argue that such a pattern has developed due to the strong positivist leanings of business schools where the bulk of this type of research is conducted. Another impact of the positivist dominance is on the theory-development status in the field of SCM. It was shown earlier that theory-development in the area is rather “weak”. The theoretical

development of SCM may progress faster if there is greater plurality of research paradigmatic stances employed. This would require wider engagement with non-positivist methods. This suggestion is supported by a number of researchers (New, 1997; Naslund, 2002; Voss *et al.*, 2002). Table IX also shows that there were no articles that reflected the use of mixed paradigms. Multi-paradigmatic approaches can provide triangulation to idea development in the area. Their absence could be due to practical difficulties in developing such methods, given the diametrically opposed assumptions that are made (“paradigm incommensurability” (Burrell and Morgan, 1979)), the silos that operate within SCM, and the observations about research practices that Goles and Hirschheim (2000) make above.

Research methods. The skewed distribution pattern of research methods (as a result of the absence of analytical statistical or empirical experimental design) is similar to that found in other studies (Table X). For example, Wacker (1998) found a similar pattern in the operations management literature. The absence of experimental design initially appears to contradict the strong positivist leaning. Such an absence is possibly explicable on two grounds: the multidisciplinary nature of SCM makes it difficult to distinguish, let alone control, all variables, particularly the social and cultural ones; and SCM usually forms part of large, expensive, mission-critical activities upon which organizations are reluctant to conduct experiments due to the high risk of adverse consequences. Overall, as far as research methodology is concerned, the focus is only on a narrow range. Another issue of concern is the relative lack of mixed methods being used. To achieve triangulation, it is generally recommended that a number of methods be used to address research questions (Gable, 1994; Wacker, 1998). The lack of mixed-methods could have an adverse impact on the development of the field.

Proposed future research directions

SCM meta-analysis based on analysis framework

If SCM were well developed in conceptual and research methodological terms, it would be reasonable to anticipate a “clear line of sight” from definitions all the way through to theory and research methods. Overall, such a pattern was not found in the literature reviewed. In fact the opposite could be claimed for the descriptive features of SCM literature and definitional issues groupings, where great diversity was found. However, the diversity narrowed with respect to theoretical perspectives and shrank even more when it came to research methods. Such shrinkage may be explained in terms of the dominance of the positivist approach and positivism’s ability to censure by not publishing articles outside its own framework. Even allowing for such practices, the breadth of views expressed in Tables II–VIII would suggest that a wider range of theories and research methods should have been supported.

The lack of diversity in research methodology is explained by the fact that a sizable minority of the articles had a clear line of sight from the definition through to the theoretical stance taken and research method employed. This clear line of sight is most likely due to the dominance of the operations management discipline, which in turn is focused toward a process view, manufacturing industry, economic theory and positivist research methodologies. Researchers outside of the operations management field have only recently started to lay claims to the SCM territory. The challenge for operations management researchers is to demonstrate why continuation of such a limited range of research methods is most useful in light of the changing nature of SCM.

Based on the overall findings of the various tables within the research framework, two immediate options emerge on how to progress SCM research. The first option is to view SCM as part of operations management, logistics and purchasing, and contain it within that body of knowledge. The obvious benefit is that this body of knowledge is the only one that appears to dominate in representation across all tables. There is considerable infrastructure in place by way of journals and research institutions which *prima facie* could manage and advance the body of knowledge to which they have already laid strong claims.

The alternative view is that operations management provides a narrow functional perspective and is not particularly well suited to dealing with the emergent issues covered under SCM, such as the psycho-social issues of power and trust. This view argues that SCM is quite different in form from those approaches which have gone before and that it requires a different viewing perspective. The bulk of the data presented would suggest that this view has considerable substance – for example, the exponential growth in SCM articles across various journals and disciplines. However, as shown in Tables VII and VIII, suitable theories are yet to emerge in comprehensible form and the focus on certain research methodologies shown in Tables IX and X may well be inhibiting the development of such theories.

The framework used to analyze the data would suggest SCM will become increasingly multidisciplinary in its nature. As such, it will have to break from the dominance of single disciplines such as operations management, logistics and purchasing. This has conceptualization and research methodology related implications for the progression of SCM.

Meta-theory of SCM

In terms of a theory for SCM, the evidence from this study shows that researchers have used a multitude of existing theories from other fields to explain aspects of the SCM field. As a consequence, the theoretical foundations of the field could best be described through a meta-theory, i.e. a “theory of theories” (Tsoukas, 1993). Meta-theories are suited to areas where single theories are not feasible, and where there is high level of diversity in ontological and epistemological bases. According to Tsoukas, a meta-theory articulates a set of ontological and epistemological principles that clarifies the nature of the field and possible knowledge in it. It also helps bring together, in a logically consistent manner, a number of perspectives on a field by specifying their individual domains of application. In this way, the relationships between various perspectives are clarified and, ideally, the scope of application of these perspectives is specified. Researchers have drawn meta-theories in a number of areas, for example, Tsoukas’s meta-theory of management, and Poole and Van de Ven’s (1989) meta-theory of innovation. For the field of SCM, no such attempts at drawing meta-theory have yet been made.

How should research be “organized” in SCM?

In terms of conceptualizing SCM such that research can continue in an organized and orderly fashion, we are strongly supportive of the argument advanced by Skjoett-Larsen (1999). He suggests that SCM should be conceived as a Lakatosian (Lakatos, 1974) “research program” ahead of a “theory” in the Popperian (Popper, 1961) tradition, or a “paradigm” in the Kuhnian (Kuhn, 1970) form. According to Lakatos, the

Popperian tradition of theory development through falsification and the Kuhnian concept of revolutionary paradigm change provide rather limited and constrained explanations for scientific change and knowledge growth.

Lakatos contended that researchers study a phenomenon using many different theories and proposed that these theories operate within what he called a “research program”. Within the research program there is a “hard core” of theories which are positively appraised because they supply predictive gratification about a phenomenon. Beyond the hard core, there are other theories located in what Lakatos called the “protection belt” that produce novel shifts in knowledge. Lakatos’s model thus distinguishes between a hard core and a protection belt. The research program guides researchers as to which paths to research. This approach ensures that researchers are aware of where their research is being directed, the protection belt or the hard core.

In the case of SCM, the evidence from the review in this paper suggests that the hard core is based in the “operations management – manufacturing – process – positivist” nexus, while numerous other activities are starting to coalesce increasingly within the protection belt. Further, while the hard core is well defined, this is not the case for the protection belt. SCM needs to be more informed about the protection belt if it is to develop a sound body of knowledge. This would require researchers to recognize and engage with themes in the protection belt identified in this research such as the psycho-social dimensions of SCM and multi-theoretical perspectives. There is also a need to move beyond positivist methods of research and employ more multi-method research techniques.

The Lakatosian model provides a rational and organized view of how knowledge grows. Given the nature of SCM as described in this study (i.e. a multi-disciplinary, meta-theoretic research area that is still largely in a pre-paradigmatic state), the Lakatosian research program aptly describes how research presently appears to be conducted in the area. The extra advantage in adopting the Lakatosian approach is that it provides a logical framework to conduct research in the manner in which it presently appears to be evolving, thereby helping reduce the shortcomings in research identified previously in a non-revolutionary manner. The Lakatosian approach provides a way of staying connected with the historical core of SCM in both content and research methodology while also engaging with new content areas and new research methodologies. It thus provides a way of potentially overcoming existing barriers and assisting the speed of development of the SCM body of knowledge by encouraging and fostering new approaches, enabling discussion and exchange with a wider community of researchers and practitioners whose views may be presently marginalized and generally widening up the methods and area of research.

Conclusions

This paper, through a systematic and structured review of literature, provides insights into the conceptualization and research methodological bases of the SCM field. The review enables us to succinctly describe SCM, suggest how it should be described from a philosophy of knowledge perspective, and chart an agenda for future research.

The review shows that the SCM is a relatively “young” field with exponential growth in interest from researchers. However, a set of dominant characteristics was found. Most notably there is: a reliance on the manufacturing and consumer goods

industries for empirical as well as analytical illustration; a conceptual framing of SCM mostly as a process; a predomination of transaction cost economics and strategy-based competitive advantage theoretical grounding; the presence of mostly descriptive-type theories; strong positivist paradigmatic stances in the research methods employed; and, the utilization of analytical conceptual, as well as empirical statistical sampling and case study methods. These dominant characteristics appear to have prevented plurality of ideas in terms of how the area is conceptualized, theoretically described and researched, making the development of the field a narrowly concentrated one. This, in turn, has prevented wider dissemination and greater acceptance of ideas outside the functional areas that SCM has traditionally been associated with. As a consequence, the soundness and robustness of the ideas underpinning SCM have not been fully tested. If this pattern continues, then there is a risk that SCM will get confined to a narrow intellectual base. This could lead to SCM being considered unworthy of serious scholarship by the broader academic community.

How can a more encompassing approach be achieved in developing the field? The answer to this, at least partially, is provided by the meta-analysis presented earlier. From the philosophy of knowledge perspective, the Lakatosian research program may be the best way to conceptualize the SCM body of knowledge as it could assist in overcoming the “operations management – manufacturing – process – positivist” dominance while also being able to integrate research designs that are outside of these focal points.

If the present trend continues, then one implication is that doing more of the same type of research will most likely produce more of the same order of results. Given that SCM appears to be “struggling” to develop a coherent body of knowledge, such an approach seems both illogical and wasteful of scarce resources. SCM needs to rapidly expand the methods of inquiry if it wishes to speed up its rate of knowledge development. As it is, SCM stands at the crossroads. The choices are either to retreat to the narrowly defined operations management approach, or to expand the research framework to embrace the rapidly emerging protection belt. The former is not a feasible option if the area is to develop broad appeal. The Lakatosian approach provides a viable way forward for SCM which can both embrace the emerging challenges of SCM, and assist in resolving the present conceptual and research methodological confusion.

While we feel that the discussions presented in this paper provide useful insights into SCM body of knowledge, we feel that even greater insights are possible. One possible avenue for achieving this is through the further development and improvement of the analysis framework presented in this paper. This could be in the form of including additional disciplines, intellectual traditions, theoretical perspectives, practitioner activities and historical trends associated with SCM. Another possibility is through further inquiries into SCM in the form of content analysis and cross-tabulations of data reported in this paper. Finally, the accuracy of the findings reported in the paper can be confirmed by other researchers who can independently classify the set of articles, choose larger samples, use databases other than ABI/Inform Global Proquest and include articles that are not limited to the English language. These inquiries will need to test the findings of this study and thus facilitate the development of knowledge in a manner by which researchers might better adjudicate the different claims of those seeking to cover SCM. Accelerated knowledge

development should also follow such endeavors which in turn will assist industry to determine if SCM is a serious subject which warrants on-going investment or if it is a fad which should cease to be supported by scarce resources that can be more effectively used elsewhere.

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Appendix

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