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A DECADE OF SCM LITERATURE: PAST, PRESENT AND FUTURE IMPLICATIONS

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This study covers a decade of academic research in the Supply Chain Management (SCM) field, offering an in-depth analytical review focused on the existing trends and gaps in the supply chain literature. Nine academic journals were investigated and a subject categorization is developed for SCM research. A content analysis was then conducted on 405 articles, focusing on the categories covered within the SCM literature, various levels of the chain examined and sample populations and industries studied, as well as the research methods employed. Finally, a conceptual framework of the most highly researched categories in SCM indicates that there is a need for more research that seeks to understand the nature of multiple links in SCM chains and networks, as opposed to focusing on dyadic and inter-firm relationships.

Keywords: *supply chain management; supply management; literature review; alliances; strategy*

INTRODUCTION

Traditionally, supply chain management (SCM) has been a melting pot of various disciplines, with influences from logistics and transportation, operations management and materials and distribution management, marketing, as well as purchasing and information technology (IT). Ideally, the all-encompassing philosophy of SCM embraces each of these functions to produce an overall supply chain strategy that ultimately enhances firm performance (Croom, Romano and Giannakis 2000; Wisner and Tan 2000). In reality however, the literature is still very fragmented and although several studies purport to discuss supply chain issues, most of the existing research only examines one link of the chain, or more importantly only focuses on one ingredient in the supply chain performance mix.

Given the increasing focus on SCM in both academic and practitioner literature streams, a review of the concepts, topics, analysis methods and levels of analysis across nine academic journals was undertaken. This research investigates the history of the SCM literature looking at the various trends and developments in the field through a historical analysis covering the 10-year-period between 1997 and 2006. During this decade, SCM evolved into a more prominent area of research (Mentzer, DeWitt, Keebler, Min, Nix and Smith 2001). SCM research has included a number of literature reviews and historical studies published in the top scholarly journals in the fields of operations management, logistics, purchasing and SCM (Croom et al. 2000; Carter and Ellram 2003; Rungtusanatham, Choi, Hollingworth,

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Wu and Forza 2003). SCM literature reviews have also been performed in the past. However, for the most part these reviews have only been descriptive (offering basic frequencies for topics covered etc.) or normative (proposing an outline of how research should be approached).

The purpose of this article is threefold. First we intend to extend previous work by providing a comprehensive historical literature review that is greater in breadth and depth than previous literature reviews. Within this objective we intend to specifically focus on SCM literature, utilizing the comprehensive definition of SCM developed by Mentzer et al. (2001). Second, our goal is to analyze the existing literature as it pertains to past and current trends, identify existing gaps and offer analytical perspectives on where the field is heading. Finally, our last goal is to suggest possible research opportunities for researchers as we carry SCM literature into the next decade. It is our hope that by fulfilling these aforementioned goals this study will not only help SCM academics to clarify the boundaries defining our field, but also assist researchers from referent disciplines and those new to the field of SCM research to have a clear understanding as to where the field currently stands and the type of research that is needed to advance the SCM literature in future decades.

This current study extends previous work by covering a 10-year period by examining nine academic journals focused on SCM. It utilizes an investigative approach to examine (1) the existing literature, (2) subject categories covered, (3) various levels of the chain examined, (4) methods employed by researchers in their studies and (5) data analysis techniques utilized. Nine SCM peer-reviewed academic journals were selected for review based on their history of publishing research related to functions comprising the supply chain, as well as previous academic literature reviews. The nine journals are: (1) *Journal of Supply Chain Management* (JSCM), (2) *International Journal of Physical Distribution and Logistics Management* (IJPDLJM), (3) *Journal of Operations Management* (JOM), (4) *International Journal of Logistics Management*, (5) *Journal of Business Logistics*, (6) *International Journal of Operations and Production Management*, (7) *Industrial Marketing Management*, (8) *Management Science* and (9) *Decision Sciences* (Goh, Holsapple, Johnson and Tanner 1997; Soteriou, Hadjinicola and Patsia 1998; Carter and Ellram 2003; Rungtusanatham et al. 2003).

LITERATURE REVIEW

Defining SCM

Several researchers have argued that we are presently ushering in a new era where firm performance and competitive advantage will be linked to supply chain performance (Lambert, Cooper and Pagh 1998; Gunasekaran, Patel and Tirtiroglu 2001). Yet, in the same breath academics admit their inadequacy in providing suitable guidance via empirical studies, construct development and theory building in academic publications (Cooper, Lambert and Pagh 1997; Lambert, Cooper and Pagh 1998; Croom et al. 2000; Elmuti 2002). The concept of SCM was mentioned in business literature as early as Forrester (1961), who suggested that the success of industrial companies hinged on the "interactions between flows of information, materials, manpower and capital equipment." Nonetheless, despite his insightful conceptualization, the actual term supply chain management did not materialize until the early 1980s (Oliver and Webber 1982), and only a handful of articles mentioned the phrase "supply chain" between 1985 and 1997. In essence, the diffusion of the field did not take place until the late 1990s, with most of the theoretical and empirical investigation commencing in 1997 (Lambert, Cooper and Pagh 1998).

However, the path leading to what can best be described as the more mature SCM research, as exemplified by Lambert et al. (2005), has been a short one. As seen in Table I, in the early 1990s, academics were trying to determine the definition of SCM. These early definitions focused on the supply chain as characterized by flow of goods, management of relationships and a concept that extended from supplier to the ultimate customer.

Based on the relatively recent development of the supply chain literature, it is not surprising that there has been much debate as to a specific SCM definition. For the purposes of this study we use the definition of SCM put forward by Mentzer, DeWitt, Keebler, Min, Nix, Smith and Zacharia (2001). They define SCM as the "systematic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within a supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole." Within this definition, a supply chain is defined as "a set of three or more entities (organization or individuals) directly involved in the upstream and downstream flows of products, services, finances and/or information from a source to a customer."

This purports that SCM activities should include integration behavior on the part of a firm, which would consist of a firm's customer and supplier base. Additionally, the firms involved in the supply chain should mutually share information, risks and rewards, as well as cooperate on activities performed within the chain. Furthermore, it suggests that effective SCM includes the same goals throughout the chain, along with a consistent customer focus and complete integration of processes. Finally, the contention is made that effective management of a supply chain involves active participation in the building and maintenance of long-term relationships within the chain, an often-pursued goal of effective supply chain managers.

While other attempts to define SCM have been made, they are not as all encompassing as the definition put

TABLE I

Early 1990's SCM Definitions

Novak & Simco (1991)	''The supply chain management covers the flow of goods from supplier through manufacturer and distributor to the end user (p. 14).''
Towil, Naim, and Wikner (1992)	''The supply chain is a system, the constituent parts of which include material suppliers, production facilities, distribution services, customers linked together via the feed forward flow of materials and the feedback flow of information (p. 3).''
Cavinato (1992)	''The supply chain concept consists of actively managed channels of procurement and distribution. It is the group of firms that add value along product flow from original raw materials to final customer. It concentrates on relational factors rather than transactional ones (p. 285).''
Scott & Westbrook (1991)	''. . . supply chain is used to refer to the chain linking each element of the production and supply process from raw materials through to the end customer (p. 23).''
Cooper & Ellram (1993)	''Supply chain management is an approach whereby the entire network — from suppliers through to the ultimate customers, is analyzed and managed in order to achieve the 'best' outcome for the whole system (p. 1).''

forth by Mentzer et al. (2001), which guides this research. They may be similar, but do not account for the entire supply chain in terms of all four levels of analysis we believe future research needs to address. For example, the Mentzer et al. (2001) definition takes into account both upstream and downstream flows within the supply chain, which involves SCM being viewed from a network perspective, across multiple firms. Many of the past attempts to define SCM, as highlighted in Table I, fail to grasp this upstream and downstream aspect of SCM. Instead, they focus on the downstream activities. Cooper and Ellram (1993) come close to capturing all the elements of SCM, but as Mentzer et al. (2001) points out, "authors have even conceptualized SCM differently within the same article: as a form of integrated system between vertical integration and separate identities on one hand, and as a management philosophy on the other hand (Cooper and Ellram 1993)."

Past Literature Reviews

Based on this conceptualization of SCM, we examined the existing literature, in an effort to identify the extent to which these underlying elements were present in SCM academic research to date. A review of previous literature studies, as highlighted in Table II, provides the basis for how this review extends our understanding of SCM research.

Burgess et al. (2006) review 100 randomly selected articles from 614 usable articles found in the ABI/Inform Database. Their study uses 19 years (1985–mid-2003) as its sampling period. SCM articles were classified into four groups: (1) Descriptive features of SCM, (2) Definition issues, (3) Theoretical concerns and (4) Research methodological issues. Findings indicated that SCM is a relatively young field with exponential growth in interest from researchers. Secondly, their sampling frames relied on manufacturing and consumer goods industries, while the research articles studied focused more on a narrowly defined operations management approach to SCM. The authors conclude that a broader view of SCM is needed in order to develop a wider consensus and resolve the present conceptual and research methodological confusion.

The specific value of this research in contrast to Burgess et al. (2006) is that instead of sampling 100 articles from a pool of 614 over a 5-year period, we examined 405 of 784 research based articles over 10 years. This not only makes for a more in-depth review, but provides a larger base from which to chart the maturation of the SCM field. It also helps to assess gaps in the literature and project future trends, thereby underscoring the importance and robustness of this study. Finally, Burgess et al., include books, manuscripts and conference proceedings while this research focuses solely on published articles in peer reviewed SCM journals.

Carter and Ellram (2003) examine 35 years of articles published in the JSCM covering 774 articles. This research reviews nine academic journals for a 10-year period and includes 405 research-based articles. Further, we review articles published after 1999. This is significant since it was found that more than 300 articles were published after 1999. The Institute for Supply Management™ (ISM) subject category used by Carter and Ellram is adopted for this study, with specific focus on the SCM literature. We also analyze articles in terms of research method, research design and data analysis techniques. Finally we develop a framework by examining the SCM literature in terms of a combination of level of analysis and research design. This framework allows future researchers to identify gaps in the methods and analyses across the top five SCM research categories.

TABLE II

SCM-Related Literature Reviews

	Methodology	Scope (Sampling Period; # of Journals)	Main Results
Burgess et al. (2006)	Reviewed randomly selected 100 articles from 614 usable articles found in ABI/Inform Global ProQuest Database. Analyzed those articles in terms of four dimensions: descriptive features of SCM literature, definition issues, theoretical concerns, and research methodological issues	Nineteen (19) years (1985–mid-2003); 31 random journals	The majority of the articles they reviewed were published between 1999 and mid-2003; consensus is lacking on an SCM definition; research methods employed are mostly analytical conceptual, empirical survey or case studies; SCM is framed as some form of process (chain of related activities); and theories are borrowed from other disciplines
Carter & Ellram (2003)	Reviewed 774 articles published in the Journal of Supply Chain Management over a 35-year period; performed a content analysis of article subject matter (ISM's subject categories) and research methodologies (overall types of research, type of design, and type of data analysis)	Thirty-five (35) years (1965–99); one journal	Defined each of ISM's subject categories; the most common article subject category was Inventory and Production Management. The most common type of research performed was Exploratory (Literature Review and Hypothesis Testing being the least common); the dominant type of research design employed was mail surveys; the most common type of data analysis was descriptive statistics, followed by means testing; more advanced data analysis techniques, such as factor analysis and regression analysis were also used
Rungtusanatham et al. (2003)	Reviewed 285 survey articles published in six operational management (OM) journals; analyzed those articles in terms of primary research focus, purpose of survey study sampling strategy, unit of analysis, and assessments of measurement quality	Twenty-one (21) years (1980–2000); six OM journals	SCM was only one of the five operations classification categories; the number of SCM-oriented articles increased significantly after first half of 1990's; few studies identified the unit of analysis and assessed measurement reliability and validity
Croom et al. (2000)	Reviewed 84 papers on SCM in terms of level of analysis and methodologies used; used ProQuest, Searchbank, Anbar and BIDS	Time period not mentioned; journals, books, and conference proceedings	Primary categories in supply chain management literature are defined, including Strategic Management, Logistics, Marketing, Relationships/ Partnerships, Best Practices, and organizational behaviors; SCM literature can be classified in terms of the level of analysis (Dyadic, Chain, and Network) and of the element of the exchange; SCM literature is dominated by descriptive empirical studies

Rungtusanatham et al. (2003) review 285 survey articles published in six operations management journals over a 21-year time period (1980–2000). SCM is only one of the five categories of operations research topics discussed in their research. This research examines a wider range of research methodologies (i.e., case studies, simulation, conceptual, etc.), delves into the level of analysis and data analysis techniques, focuses solely on SCM, and reviews a greater number of articles (285 vs. 405). Although Rungtusanatham et al. (2003) use a longer sampling period, their study suggests that most SCM-related articles are published after the mid-1990s. Initially this research examined a longer period, but focusing on the decade from the mid-1990s forward provided an analysis of a time period that witnessed significant growth in the SCM literature and was the major reason for choosing the ten-year sampling frame (1997–2006).

Croom et al. (2000) analyze 84 studies on SCM in terms of level of analysis and research methodologies, but the time period for their data collection is ambiguous. Their study represents an early attempt to categorize the SCM literature, but data were collected before the significant period of growth. Further, it includes books, conference proceedings and articles. Finally they describe and categorize the research methods into two dimensions: theoretical and empirical and do not provide the number of articles associated with each level of analysis.

This study extends Croom et al. (2000) by (1) reviewing a decade of significant SCM growth, (2) providing a much wider sampling frame, (3) focusing only on scholarly journals, (4) providing the number of papers associated with each level of analysis (dyadic, chain and network) and (5) describing and evaluating the research methods employed.

In summary, this research extends the previous literature reviews by:

- specifically focusing on SCM work in scholarly journals,
- reviewing the decade during which SCM based academic research significantly increased,
- analyzing a large sample of the SCM literature (n=405),
- providing a fine grained investigation of the research methods, data analysis and level of analysis, and
- using an established subject categorization scheme and reviewing publications by journal.

Increasing Importance of SCM

Research conducted in the early 1990s in the SCM field centered on minimizing transaction costs in the buyer/supplier interaction. Then companies changed their focus and their perspective to a more relationship-oriented approach to SCM (Tanner 1999). Companies are now stressing a value delivery network that is based on strong alliances alongside significant vertical and horizontal integration (McCutcheon and Stuart 2000; Corsten and Kumar 2005). Building dyadic and network-level relationships are now considered to be central.

Companies today are increasingly dealing with suppliers and buyers from all over the world. The products they design, manufacture and sell are shipped globally. As a result, SCM seems to have gained increasing importance with today's large multinational corporations (Lummus and Vokurka 1999; Lummus et al. 2001). In fact, some academics have suggested that the competitive battle is now between supply chain and supply chain rather than between firms (Lambert and Cooper 2000). This is because as much as a product or service itself is important to a firm, an effective SCM strategy can assist a company with an established and sustainable competitive advantage, if well executed (Martin 2000). With the onset of globalization, the value delivery network has increased its impact on corporate planning. Complex global supply chains must extend beyond value delivery to include traceability and safety due to numerous recalls of pet food, toys and drugs (Roth, Tsay, Pullman and Gray 2008). Many companies now consider SCM to be central to corporate strategy and we anticipated that these issues would have generated increased academic interest.

The growing importance of SCM has attracted increased attention from the academic community. Academics use various methods to answer research questions. We question if the research methods and designs used by SCM researchers are as diverse as those in related fields.

For example, Frankel et al.'s (2005) study of 108 logistics-related articles found that 51% used a survey as their primary method of research. Interestingly, there were a lack of case studies and content analysis methods used for analyzing logistics research. In addition, the marketing literature has gradually made greater use of more sophisticated techniques such as factor analysis, cluster analysis and structural equation modeling (SEM) (Neslin, Gupta, Kamakura, Lu and Mason 2006). Since SCM is still a relatively new field, and one that is growing in importance, we would expect a trend toward more complex causal techniques used in empirical SCM studies.

RESEARCH METHODOLOGY

Stages of Process

A three-stage process was used for the data collection and content analysis segments of this study. The first stage of the process involved data collection. In order to develop an extensive database of academic articles within the SCM field, several citation identification methods were employed. First, a basic search was carried out in ABI/Inform, using search criteria based on the (1) presence of the phrases "supply chain management" and/or "supply chain" in the abstract and/or title, in order to capture articles focusing on the broader supply chain concept, and; (2)

publication in one of the nine previously listed academic journals. The journal selection was developed after investigating those that had been examined in previously published articles. For example, the JSCM was studied by Carter and Ellram (2003), while Rungtusanatham et al. (2003) examine *Decision Sciences*, *Management Science*, the *Journal of Operations Management* and the *International Journal of Operations and Production Management*. Other academic journals, such as the *Journal of Business Logistics, Industrial Marketing Management* and the *International Journal of Logistics Management* were selected based on the volume of SCM-oriented articles published in each outlet, as well as their rankings by Baumgartner and Pieters (2003) and Kumar and Kwon (2004).

Other journals were examined, using the same search criteria, but not all were reported on. For example, *MIS Quarterly* (MISQ) and *Information Systems Research* (ISR), ranked one and two among peer-reviewed IS journals, respectively, were examined (Lowry et al. 2004; Rainer and Miller 2005). Across the 10-year period examined, both journals reflected a total of seven articles focusing on "supply chain management." Likewise, a search of the *Strategic Management Journal* (SMJ) only reported three SCM articles during the 10-year period, based on the search criteria.

SCM articles from these nine previously listed journals were then identified. This initial search yielded a preliminary count of 784 articles from 1997 to 2006. From this initial output, a second data reduction process was conducted, where articles having a pure marketing, logistics, or operations focus were eliminated from the analysis. As stated previously, SCM involves the coordination of multiple business functions and entities. Thus, articles focusing only on one function were deleted from the analysis. The data reduction eliminated articles that, for example, may have contained the phrase "supply chain management," as well as "logistics," "marketing," or "operations" but had a marketing, operations, or logistics focus. Accomplishing this reduction involved a detailed reading and evaluation of the original pool of 784 articles. Thus, the final count of 405 empirical and non-empirical articles focus primarily on the broader SCM concept.

During stage two, a content analysis methodology was employed to both code and categorize the selected articles into one of the 13 categories adapted from Carter and Ellram (2003) and displayed in Table III. The 13 categories used in this study are (1) SCM Strategy; (2) SCM Frameworks, Trends and Challenges; (3) Alliances/Relationships; (4) E-Commerce/World Wide Web; (5) Time-Based Strategies; (6) Information Technology; (7) Quality; (8) Supplier Development/Selection and Management; (9) Environmental/Social Responsibility; (10) Outsourcing; (11) Human Resource Management; (12) Buyer Behavior and (13) International/Global supply chain concepts. These particular categories were selected because they are based on a classification summary provided by the ISM, as seen in Carter and Ellram (2003). The research goal was to systematically capture trends, gaps and the future direction for the SCM field as depicted in the SCM literature and covered by a wide cross-section of nine peer-reviewed journals. This undertaking is designed to help formulate our thinking on the SCM literature, and serve as a basis for future research.

Descriptions for each topic category were then assigned appropriately. These categorical descriptions and the issues covered are expanded upon in Table IV. This table provides a useful categorization for future researchers in examining the various elements of the supply chain.

TABLE III

Previous Subject Categories Identified in the Supply Chain Literature

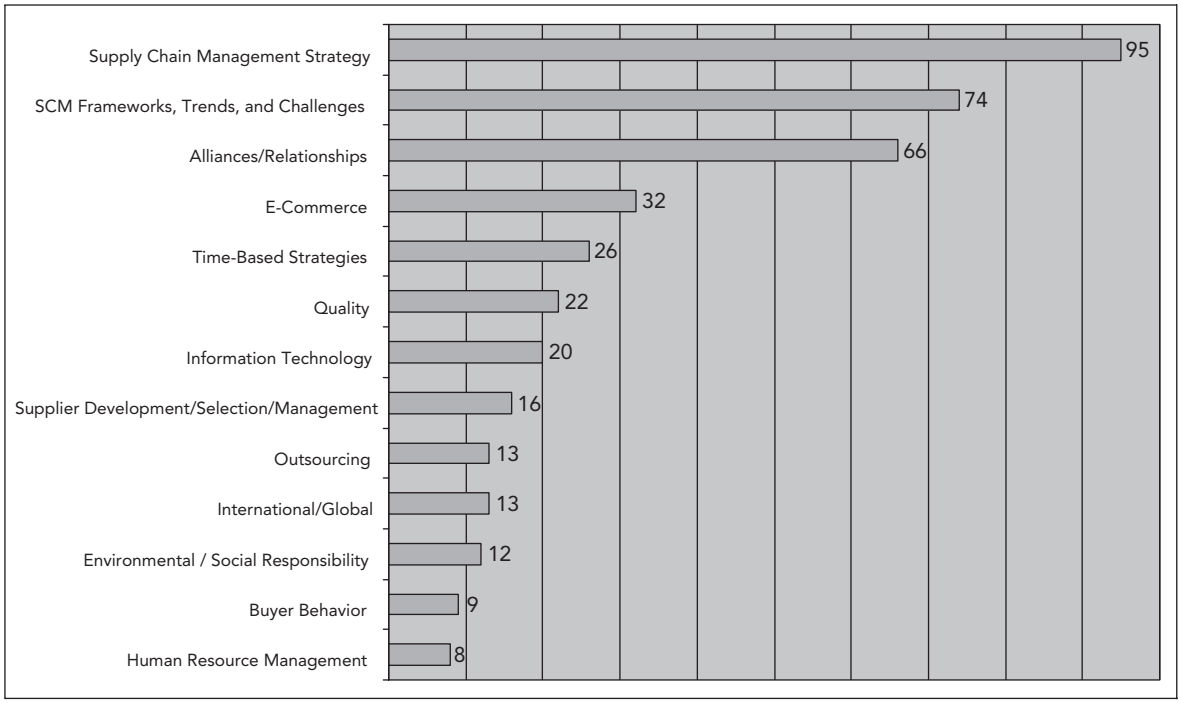
Carter and Ellram (2003)	Croom et al. (2000) Partial Listing	Rungtusanatham et al. (2003)
SCM Strategy	Strategic Management	Management of Technology
SCM Frameworks, Trends, and Challenges	Logistics	Operations Strategy
Alliances/Relationships	Marketing	Quality Management
WWW-E-Commerce	Relationship/Partnering	Supply Chain Management
Time-Based Strategies	Best Practices	Just-in-Time
Information Technology	Organizational Behavior	
Quality		
Supplier Development/Selection and Management		
Environmental/Social Responsibility		
Outsourcing		
HR Management		
Buyer Behavior		
International/Global		

TABLE IV

Category Description

Category	Description and Topics Covered
SCM Strategy	Strategic alignment between the SC and the focal firm. *Includes: Competitive Advantage, Resource Based View, Agency Theory and Risk Management.*
SCM Frameworks, Trends, and Challenges	Categorization of SCM Frameworks, Trends, and Challenges. *Includes: Future Trends, Supply Chain Definitions, Historical Reviews, and problems/benefits of SCM.*
Alliances/Relationships	The relationship between the focal firm and its business partners or between various suppliers to the focal firm. *Includes: Trust, Commitment, Conflict, Power, Intra and Inter-firm Relationship Building, Partnerships, Vertical and Horizontal Cooperation, TCA and Communications.*
EC/WWW	The effect of E-Commerce and the Internet on the supply chain *Includes: E-integration, E-procurement and Website Content.*
Time-Based Strategies	Managing supply chain inventories and building flexibility into supply chains to meet demand. *Includes: Just-in-time, Inventory Management, Supply Chain Agility and Flexibility, Cycle time, Postponement and Supplier Managed Inventory.*
Information Technology	The use of information technology or systems in the supply chain. It involves both internal (decision support systems) and external (EDI) IT tools, ranging from networking with supply chain partners to strategic alignment of the IT function. *Includes: How IT Supports the Organization and Virtual Supply Chain, EDI, Network Systems in Supply Chain and the Strategic Alignment of IT.*
Quality	Product and service quality output of the supply chain. *Includes: ISO and Quality Management Practices.*
Supplier Development/ Selection and Management	Supplier Development, Selection, and Management. *Includes: Supplier Selection Criteria, Supplier Training and Improvement Supplier Monitoring, Management, and Assessment.*
Environmental/Social Responsibility	Ethical, environmental and social responsibility concerns faced by organizations managing the supply chain. *Includes: Recovery, Scrap and Surplus, Environmental Policies, Government Regulations, Diversity Policies and Practices, Human Rights.*
Outsourcing	Outsourcing the Supply Chain processes. *Includes: Third-Party Logistics and Contract Manufacturing.*
HR Management	The process of establishing necessary reporting relationships between and among firms, as well as HR issues that affect the day-to-day performance of supply chain personnel. *Includes: Organizational Change, Virtual Organizations, Organizational Effectiveness, Responsiveness vs. Anticipatory Management styles, Organization Learning Skills, Tacit Knowledge, Job Roles, Role Conflict, and Purchasing Skills.*
Buyer Behavior	Inter-firm behaviors and activities. *Includes: Virtual Teams, Negotiations, New Product Development, Internal Integration, Information Flows, and Organizational Decision Processes.*
International/Global	Globalization of the supply chain. *Includes: Global Logistics, Cultural Issues, International Logistics, Distribution, International Trade, Global Supply and Demand, and Worldwide Sourcing.*

FIGURE 1
Supply Chain Management Subject Category Frequencies, 1997–2006



For example, articles in the SCM strategy area focused on the strategic aspects within the chain studying theories such as the resource based view, agency theory and risk management. Category discrepancies were handled via additional coders and discussions. No article appeared in more than one category.

In order to ensure reliability, two researchers (coders) were used for this classification process. The inter-coder agreement rate was calculated as the proportion of total pair wise agreements between coders and was based on criteria outlined in Carter and Ellram (2003). The first coder used keywords in the abstract and/or a keywords breakdown of each article for placement within specific categories. A second independent coder then mirrored this process. If a disagreement between the two coders occurred, the final categorization was resolved via discussions between them and/or the inclusion of a third and fourth coder, when necessary.

Following this initial categorization, the software tool, *Microsoft Access*, was used to develop an extensive database for capturing these articles. Data concerning the author(s), year, title, journal, abstract, independent and dependent variables, key findings and subject classification and keywords were first collected. "Article Type" classified the article as empirical, theoretical, or normative. "Level of Analysis" outlined the specific levels within the total supply chain network examined in the study (Croom et al. 2000). There were four possible levels of analysis including: (1) firm level – involving a single organization; (2) dyadic level – involving the two party relationship between focal firm and a single supplier or customer; (3) chain level – involving a set of dyadic relationships including either first and second tier suppliers and the focal firm, or the focal firm distributors and final customers and (4) network level – involving a network of operations within the supply chain either from an upstream or downstream perspective.

"Sample/Unit" of analysis classified an article based on the sample surveyed or interviewed. It usually indicated the hierarchical level of corporate personnel interviewed or surveyed — i.e., purchasing managers, CEOs, etc., as well as whether the study was a cross industry or single industry investigation. "Study Design" outlined the type of study design utilized by the researchers, and encompassed surveys, interviews, content analysis, experiments, simulations and different case study varieties. "Analysis Conducted" classified the articles based on the type of analysis conducted. The general trends in subject categories etc., literature gaps, as well as suggestions for future research are outlined for each subject area in the results section with special attention being paid to the top three most researched topics in the SCM literature.

RESULTS

Subject Category Frequencies — A 10-Year Review

The three categories of SCM Strategy (n=95), SCM Frameworks, Trends and Challenges (n=74), and Alliances/Relationships (n=66) shown in Figure 1 dominate the SCM research, accounting for 58% of the articles. A

TABLE V

Subject Category Publication Frequencies by Year

Subject category	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total	Percentage
SCM strategy	0	2	6	7	10	6	8	17	8	31	95	23%
SCM frameworks, trends and challenges	0	3	5	9	11	8	6	5	13	14	74	18%
Alliances/Relationships	1	4	1	4	8	4	9	11	11	13	66	16%
EC/WWW	0	0	1	3	2	4	3	13	4	2	32	8%
Time-based strategies	1	0	3	0	1	0	1	2	9	9	26	6%
Quality	2	2	3	0	3	3	2	0	0	7	22	5%
Information technology	0	1	2	2	1	1	0	2	5	6	20	5%
Supplier development/ selection/management	1	0	2	2	2	1	0	5	1	2	16	4%
Outsourcing	0	1	4	0	2	2	0	0	0	4	13	3%
Environmental/social responsibility	0	2	1	2	2	0	0	3	1	1	12	3%
International/global	0	0	0	1	0	1	3	0	0	7	12	3%
Buyer behavior	0	0	2	0	0	1	1	0	1	4	9	2%
HR management	0	0	1	0	0	1	0	1	5	0	8	2%
Total	5	15	31	30	42	32	33	59	58	100	405	100%

second group of categories consisting of E-Commerce (n=32), Time-Based strategies (n=26), Supplier Development/Selection (n=16), Quality (n=22) and IT (n=20) accounted for 29%. The final five subject categories of Environmental/Social Responsibility (n=12), Outsourcing (n=13), HR Management (n=8), International/Global (n=12) and Buyer Behavior (n=9) combined only represented 13% of all the articles analyzed in our database. While alliances did not dominate as expected, it was ranked third out of the 13 categories.

Subject Category Frequencies — An Introspective Review

There were several notable trends that developed concerning SCM publications during the time period covered by this 10-year literature review. This section is designed to briefly highlight the topics considered to be front-runners in our most current publications. An analysis of these trends should help to clarify the most in-demand topics for researchers. Table V categorizes SCM research across the entire 10-year time period. It illustrates the increased publication activity in SCM during the past 5 years. Within the 1997–2006 decade, 70% of the articles concerning SCM have been published in the past 5 years. The top three areas consisting of SC Strategy, SCM Frameworks, Trends and Challenges, and Alliances/Relationships showed a threefold increase in terms of published articles in the past 5 years (see Table V). This analysis shows that SCM is gaining in importance in the academic literature.

The number of articles written about SCM Frameworks, Trends and Challenges peaked in the 5 years between 2002 and 2006. Thirty-one percent of the articles published in 2006 fell into this category. Given the relative recency of SCM for researchers, as well as how it continues to evolve, SCM Frameworks, Trends and Challenges should remain an important topic going forward. This category may even grow through a pairing with research areas such as IT and e-commerce. In other words, at some point in the future, the lines between categories such as these may become blurred as IT and e-commerce are continually integrated into the frameworks and strategies of supply chains and their managers.

SCM strategy is another popular topic in recent years. Between 2002 and 2006, 70 articles from this category were published. One of the more intriguing and developing strategic trends is the increased focus on the participation of customers in the design of products they purchase. Tan and Tracey (2007) discuss the importance of an integrated approach to new product development that involves the customer, as well as the manufacturers and suppliers. This builds upon earlier discussions of integration in SCM which involve interactions between departments and organizations striving to achieve shared supply chain goals (Cooper and Tracey 2005). Customer involvement has impacted supply chains vertically, horizontally and geographically, in addition to making them more agile (Choi and Hong 2002; Ismail and Sharifi 2006).

As previously mentioned, alliances have received increased attention in the literature as well. Between 2002 and 2006, 48 new articles have been published in this

category. This is likely due to the aforementioned refocus on relational partnerships within the supply chain, as opposed to transaction-based purchasing relationships. For instance, Teng and Jaramillo (2005) emphasized the importance of strategic alliances with global suppliers as a way of reducing costs and increasing competitiveness in the global textile and apparel industry.

Researchers have explored issues involved with facilitating efficient information exchanges in the past few years. This is evident by an increase in time-based issues (e.g., lean techniques, supplier managed inventory, etc.) and the increase in IT-related research. Articles on e-commerce peaked in 2004 and have dropped to lower levels the past 2 years. There is no doubt that with the rapidity with which IT evolves, that these categories will increase in terms of their value to SCM researchers and managers in the coming years. The continuous information flows, necessary for a successfully integrated supply chain, are supported by IT efforts.

Meanwhile, traditional areas such as quality, supplier development and social responsibility/environmental topics remained fairly stable. In the future, less frequently published areas may prove more popular as areas of study. For instance, there was very little discussion on the global supply chain between 1997 and 2005. However, there were seven new articles published in 2006. This area should continue to see increased activity given the increased emphasis on global issues. Research regarding social responsibility and the environment appears to be a specialty area with an average of a little over one article per year. It will be interesting to see if the increased practitioner literature focusing on "green" and the "carbon footprint" translates into more academic SCM research in this area.

Four articles regarding outsourcing were published in 2006. This is an area that undoubtedly deserves more attention from researchers given the increase in outsourcing activity within industry. While there are many articles in the academic area on outsourcing, most deal with the strategies, economic criteria and methods, and less with the impacts on the supply chain. All of these areas represent opportunities to fill gaps in the SCM literature as SCM continues to evolve.

An In-depth Review of the Top Three SCM Publication Categories

This section provides an in-depth analysis of the top three subject categories in SCM research among the journals reviewed, providing insight into how each topic area has been studied during the 10-year period from 1997 to 2006. The top three subject categories represent approximately 58% of all the articles reviewed.

SCM Strategy

The most discussed area in the literature is that of Supply Chain Strategy. Several researchers have pointed to the growing need to integrate supply chain strategy into the overall firm strategy in an effort to maximize profitability (Tan, Kannan and Handfield 1998). As such, we have recently witnessed an increasing number of firms across various industries that have adopted integrated strategic approaches to purchasing and SCM (Tan, Lyman and Wisner 2002). This refocusing on the part of supply chain managers has also generated excitement in the literature as 23% of the articles included in our literature review were categorized as dealing with supply chain strategy. Analyses indicated that there are several strategic issues researched in the supply chain literature, including the development of an overall supply chain strategy, strategic alliances (Sandelands 1994; Carr and Pearson 1999), strategic performance measures (Tan, Kannan and Handfield 1998; Gunasekaran, Patel and Tirtiroglu 2001) and even supply chain forecasting (McCarthy and Golicic 2002).

Additionally, most of these articles only investigated strategy alignment between the firm and one key supplier rather than a chain investigation. More importantly, there is room for further investigation from the viewpoint of non-purchasing management within the top management teams of organizations to establish whether these suggested strategic alliances and streamlining have come to fruition or are still only ideas in the minds of ambitious supply chain managers. The idea of a supply chain organization has been presented (Ketchen and Giunipero 2004), but this has yet to be systematically investigated. Additionally, there is still considerable work yet to be done in terms of merging existing strategic management literature with theoretical work being conducted in the SCM field. Thus, despite the increase in the last 7 years of a greater focus on the strategic importance of alignment between supply chain and the parent firm, there is considerable work left to be done.

SCM Frameworks, Trends and Challenges

SCM Frameworks, Trends and Challenges represent the second largest area of recent growth within the supply chain field. As shown in Figure 1, 74 of the 405 total articles, or approximately 18%, fall into this category. Of those 74 articles, 62% ($n=46$) were published after 2001. While we have shown that SCM has, in some form or other, existed for several decades, it has not been until more recently that the true value of SCM research has been realized. Due to SCM's relative infancy, both in terms of the supply chain literature and its newly found importance in business, it is no surprise that such a large number of SCM Frameworks, Trends and Challenges papers have been published between 2001 and 2006.

Many of the articles that fall within this domain have focused on constructing frameworks for the development and mechanics of supply chains. Blackhurst et al. (2005) examines how supply chain complexity can make the

modeling of the chain such a multifaceted task. Other authors then contribute to the overall understanding of SCM by explaining various components of the chain itself. Min et al. (2005) help to establish frameworks for understanding collaboration and performance within supply chains. Several articles discuss the approach to management of various efficiencies within the chain, including product efficiencies related to design and manufacturing, as well as buyer–seller network frameworks (Fine et al. 2005; Huang et al. 2005; Lovell et al. 2005). This category also includes several definitions and frameworks which were developed for SCM (Lambert, Cooper and Pagh 1998; Mentzer et al. 2001). Based on our analysis, and the maturation of SCM, we see this area in a steady or decreasing state, as researchers appear to be examining other areas relevant to SCM. We believe that contributions provided by such studies were important for building the foundations of SCM.

Supplier Alliances/Relationships

The transaction cost analysis (TCA) framework has often been used to compare various governance structures. TCA posits that buyers are subject to opportunistic seller behavior, resulting in strict governance mechanisms being used to regulate important relationships where investments are high for each party. However, in instances where these mechanisms are lacking, for example in low-risk environments with relatively little investment, buyers can easily dissolve their relationships with suppliers if they fail to meet necessary requirements (John 1996; Dyer and Singh 1998). This arms-length approach was used as the basic platform to explain buyer–supplier governance mechanisms and practices (Hoyt and Huq 2000). As a result, few articles focused on buyer–supplier relationship issues such as trust and collaboration, as these considerations are less important in the traditional transaction cost theory framework. Only 13 articles in our sample focused on any form of buyer–supplier relationship issues before 2001.

The resurgence of publications in this area over the past 5 years (48 articles of 66 total, or 73% between 2002 and 2006, as compared with 1997–2001) is surely a result of a general trend within industries of moving away from simple transaction and contractual-based relationships, and toward more long-term relational forms of collaboration between parties involved in supply chain activities. The development of these long-term, strategic relationships between buyers and sellers within the supply chain has been previously shown to offer opportunities to create considerable competitive advantage (Tanner 1999). This new emphasis on relationships is not unique to the SCM literature, since it has been discussed under the moniker of relationship marketing during the 1990s (e.g., Crosby, Evans and Cowles 1990; Morgan and Hunt 1994; Kalwani and Narayandas 1995). What is interesting is that SCM appears to have piggybacked on this relationship theme. The strong increase in the publication of relationship-oriented SCM articles lends credibility to the idea that SCM is affected by marketing efforts.

As for SCM itself, Hoyt and Huq (2000) comment that the late 1990s ushered in a new era where researchers proposed several new paradigms as alternatives to the previously popular transaction cost theory. In essence entities were now taking a different perspective on the buyer–supplier relationships and many firms were moving away from traditional adversarial approaches toward greater interests in establishing long-term relationships (Kalawani and Narayandas 1995). Issues such as trust, effective communication, as well as information and asset sharing (Dyer and Singh 1998; Handfield and Nichols 1999) became popular in academic research. This led to SCM developing more effective strategies for creating competitive advantage and improving the buyer–supplier relationship in connection with supply chain performance.

Perhaps this trend in the literature can be first seen in the study performed by Ghosal and Moran (1996), who suggested that the basic premise behind TCA was opportunism, and as a result, buyers and suppliers practicing this level of interaction would eventually experience a type of self-fulfilling prophecy. They cautioned that many firms were recognizing these implications and as a result were attempting to shift away from such techniques to a more collaborative and trusting relationship between the two parties. This opened the floodgates to research that focused on trust and mutual collaboration as the foundational pillars of effective buyer–supplier interaction and by extension superior firm performance (Jones et al. 1997; Handfield and Nichols 1999). Our sample alone points to 66 articles on these issues out of the 405 on supplier–buyer relationships representing $>16\%$ of all the articles in our sample, a somewhat impressive number for a subject area that was hardly discussed before 1999.

However, in light of agreement that there is a need to focus on the relationship aspect of SCM, there remains little consensus as to the terminology and conceptual framework that outlines these relationships (Golicic, Foggin and Mentzer 2003). Previously, researchers have outlined between seven and eight varying relationship dimensions that can be explored (Cannon and Perreault 1999; Rinehart, Eckert, Handfield, Page and Atkin 2004). However, based on our review of the literature, as well as Golicic et al. (2003), we categorize three different types of relationships that can be investigated — arms length or transactional exchanges, cooperative relationships and integration. The latter of these relationships fundamentally describes the essence of SCM as it includes the entire value chain and performs each of the channel functions (Webster 1992; Heide 1994; Nevin 1995; Mentzer et al. 2001). As such, there is a clear recognition of the delicate balance between power and risk sharing, and the need

for greater trust and commitment within the supply chain (Handfield and Bechtel 2002).

Nonetheless, despite this acknowledgment by researchers as to the limitations of transactional exchanges, and the need for greater vertical integration, the SCM literature is still laden with a general lack of systematic and empirical research examining and discussing these dynamics throughout the entire chain. Conversely, the emphasis has still been only on the integration and interaction with the two main players (i.e., focal firm and main supplier). This suggests a clear need in the literature for articles which involve closer examination and testing of supplier–buyer relationship issues with second and third tier suppliers, in order to establish how these issues impact the overall performance of the larger supply chain.

Overall, the categorization has highlighted the popularity of SCM as a field of research. Secondly, it has been shown that SCM Strategy, SCM Frameworks, Trends and Challenges, and Alliances/Relationships dominate the category areas. Thirdly, e-commerce (EC)/World Wide Web (WWW) as an area of SCM research has been a powerful phenomenon in the 21st century. Going forward, there is ample room for research in most areas. However, the topic area that appears to be saturated is SCM Frameworks, Trends and Challenges. Due to the maturation of this topic area, there is less of a need for research concerning new definitions, general issues, problems and benefits of SCM. Now that the literature has been categorized, there is a need to review the research methods utilized in studying SCM.

CATEGORIZATION OF RESEARCH METHODS

Empirical vs. Non-Empirical by Level of Analysis

During the early stages of the development of basic frameworks and topic categorizations, studies performed by researchers are generally non-empirical. These pieces, while essential in building the foundation of what is known about a given topic, are usually performed at the outset of a new research idea or topic, and provide the base by which future studies can test and refine the theories which they develop (Van Maanen 1979; Straub 1989). Theory-based empirical studies are based upon verifiable, factual and tested evidence (Bacharach 1989). Given our observation of the relative youth of the SCM field, as explained by the continued need to define itself, we categorized all 405 coded studies on the basis of the level of analysis used.

Table VI illustrates the frequency with which coded articles fell into empirical or non-empirical categories, as well as the corresponding year that they were published. Overall, it indicates that 70% of the total number of SCM articles published were empirical. Subsequent analysis determined whether the research was focused on the (1) focal firm, (2) dyad, (3) chain, or (4) network level of analysis. An examination of the data reveals that empirical SCM research exhibits a greater bias toward the dyadic level of analysis, while non-empirical research focuses on firm-level issues. Interestingly though, despite a larger number of empirical articles being published relative to non-empirical articles, the overall percentages of each level of analysis are similar. In other words, the levels of analysis appear to be relatively equally distributed across both empirical and non-empirical categories. For example, 37% of the empirical articles were at the firm level of analysis, compared with 39% of the non-empirical articles.

The dyadic analysis level proved to be the predominate level of analysis, encompassing roughly 41% of all 405 articles. The reason for this occurrence is that much of the literature examines the relationship between a single buyer and primary supplier, ignoring tests of other links

TABLE VI

Primary Level of Analysis (Empirical vs. Non-Empirical)

Level of Analysis	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total	Percentage
Empirical												
Firm	1	4	7	8	7	7	7	11	20	33	105	37%
Dyadic	4	3	12	9	12	9	11	18	15	27	120	42%
Chain	0	3	6	2	3	5	4	8	6	4	41	15%
Network	0	1	0	1	1	2	3	5	1	3	17	6%
Subtotal	5	11	25	20	23	23	25	42	42	67	283	100%
Non-Empirical												
Firm	0	2	3	4	6	2	2	4	2	22	47	39%
Dyadic	0	1	2	3	8	3	4	6	9	8	44	36%
Chain	0	1	1	2	4	3	2	4	5	0	22	18%
Network	0	0	0	1	1	1	0	3	0	3	9	7%
Subtotal	0	4	6	10	19	9	8	17	16	33	122	100%
Total	5	15	31	30	42	32	33	59	58	100	405	

TABLE VII

Primary Research Methods Design (Empirical vs. Non-Empirical)

Article Type	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total	Percentage
Empirical												
Survey	4	9	22	17	20	23	19	40	32	59	245	61%
Simulation/model	1	2	3	3	3	0	6	2	10	8	38	9%
Subtotal	5	11	25	20	23	23	25	42	42	67	283	70%
Non-empirical												
Case analysis	0	1	2	4	6	4	3	4	6	13	43	11%
Conceptual	0	2	3	3	4	3	3	5	5	10	38	9%
Theoretical	0	1	0	0	3	1	0	5	2	1	13	3%
Methodological	0	0	1	2	2	0	0	1	2	4	12	3%
Literature review	0	0	0	0	2	1	2	0	1	5	11	3%
Normative	0	0	0	1	2	0	0	2	0	0	5	1%
Subtotal	0	4	6	10	19	9	8	17	16	33	122	30%
Total	5	15	31	30	42	32	33	59	58	100	405	100%

in the supply chain. The firm level of analysis and chain level of analysis accounted for 38% and 16% of all studies analyzed, respectively. The network level of analysis accounted for 5% of the articles reviewed. These results point to the need for future studies examining multiple aspects of the supply chain at either the chain or network level. While more difficult to perform, studies of this nature will enhance the overall understanding of supply chain networks for both managers and academics. The number of published articles using the dyadic and firm levels of analysis did not change significantly over the last 10 years. While low in number, more articles using the network level of analysis have been published since 2002.

Table VII further breaks up the types of studies fitting into the empirical or non-empirical categories by research method design. Non-empirical studies accounted for 30% of the overall number of SCM articles in the study, with case studies (n=43) and conceptual articles (n=38) being the leading research design (Yin 1994). Again, this seems to further support our observation that SCM is still a very young discipline as researchers have mostly been trying to provide general frameworks, models, etc. of SCM. With regard to empirical studies, surveys were found to be the most popular research method employed. Simulation/Model research methods represented 9% of the total number of empirical articles published. Similarly, conceptual research was 9% of the non-empirical total. Theoretical studies, SCM methods studies, literature reviews, and normative articles were the least common studies published, consisting of 10% of all articles meeting the criteria of our analysis. For each of the last 10 years, empirical research was, as expected, the most dominant type of research performed across the nine journals.

Primary Data Analysis Techniques

Table VIII shows the frequency of empirical data analysis techniques. In order to provide deeper insight as to the most common methods of analysis, the techniques are divided between basic and advanced data analysis techniques. Basic data analysis consisted of descriptive statistics, means testing, correlation and content analysis. Advanced data analysis techniques consisted of regression, factor analysis, SEM/path analysis, ANOVA and cluster analysis. The least common types of data analysis techniques were content analysis and Discriminant Analysis/Cluster analysis. Overall, the basic data analysis techniques and advanced data analysis techniques were used fairly equally. Additionally, there was no appearance of an increasing trend in the usage of more advanced data analysis techniques over more basic techniques across the years.

The "other analysis" category consisted of miscellaneous techniques that did not fall into any of the other categories and that were infrequently used. This included data analysis techniques such as a Delphi study, specially developed mathematical economic models, or cross-tab analysis. These are all valid data analysis techniques, but fell out of the commonly defined framework used to categorize articles in this study.

An important area for future studies is the use of more advanced data analysis techniques to test the various theories developed and presented. Many studies published between 1997 and 2006 used more basic correlation analysis techniques to explain supply chain phenomena. This was appropriate for testing the simpler firm and dyadic level relationships that characterized the majority of SCM research over the 10-year period. However, as noted, more complex, network level research would provide a significantly more powerful

TABLE VIII

Primary Data Analysis Techniques for Articles Using Empirical Methods

Data Analysis Techniques	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
Basic data analysis techniques											
Descriptives	1	2	5	4	3	6	8	5	4	15	53
Correlation	0	1	3	2	4	2	1	3	5	10	31
Means testing	0	1	5	1	2	5	4	4	1	1	24
Content analysis	0	1	0	1	1	0	1	3	1	3	11
Subtotal	1	5	13	8	10	13	14	15	11	29	119
Advanced data analysis techniques											
Regression	1	3	4	3	3	5	4	4	8	9	44
Factor analysis	1	2	3	4	4	3	2	8	9	4	40
Path analysis/SEM	0	0	3	2	4	1	2	6	6	5	29
ANOVA	1	1	2	1	1	1	1	2	3	7	20
DA/cluster analysis	1	0	0	0	1	0	0	0	2	3	7
Subtotal	4	6	12	10	13	10	9	20	28	28	140
Other analysis											
Subtotal	0	0	0	2	0	0	2	7	3	10	24
Total	5	11	25	20	23	23	25	42	42	67	283

value-addition for both researchers and industry practitioners. These more complex research questions may require the use of more advanced analysis techniques (e.g., social network analysis).

SCM Publication by Journal

Of the 405 articles reviewed, 55% of the articles pertaining to SCM were published in *Journal of Supply Chain Management, International Journal of Physical Distribution & Logistics Management*, and *Journal of Operations Management*. We can find no reason for this occurrence that relates to article quality, prestige, and so forth. Instead, we believe that this is an indication of researchers' possible perceptions regarding each of journals favorable view of SCM as a topic for publication. Our findings indicate a wide range of articles published in SCM, headed by strategy and frameworks. This disagrees with Burgess, Singh and Koroglu's (2006) argument, which indicates that SCM is currently viewed from an operations perspective, as opposed to a broader strategic management concept. When viewing SCM research from a wider range of journals and a longer time period, it does indicate that researchers have covered both operational and strategic aspects of SCM. Finally, it should be noted that journals such as *Industrial Marketing Management*, *Management Science* and *Decision Sciences* have published numerous articles on SCM, and have published more SCM articles as the years have progressed. Table IX presents the breakdown of articles published in each journal.

DISCUSSION

Although the supply chain literature has developed considerably over the last decade and there have

TABLE IX

SCM Publications by Journal

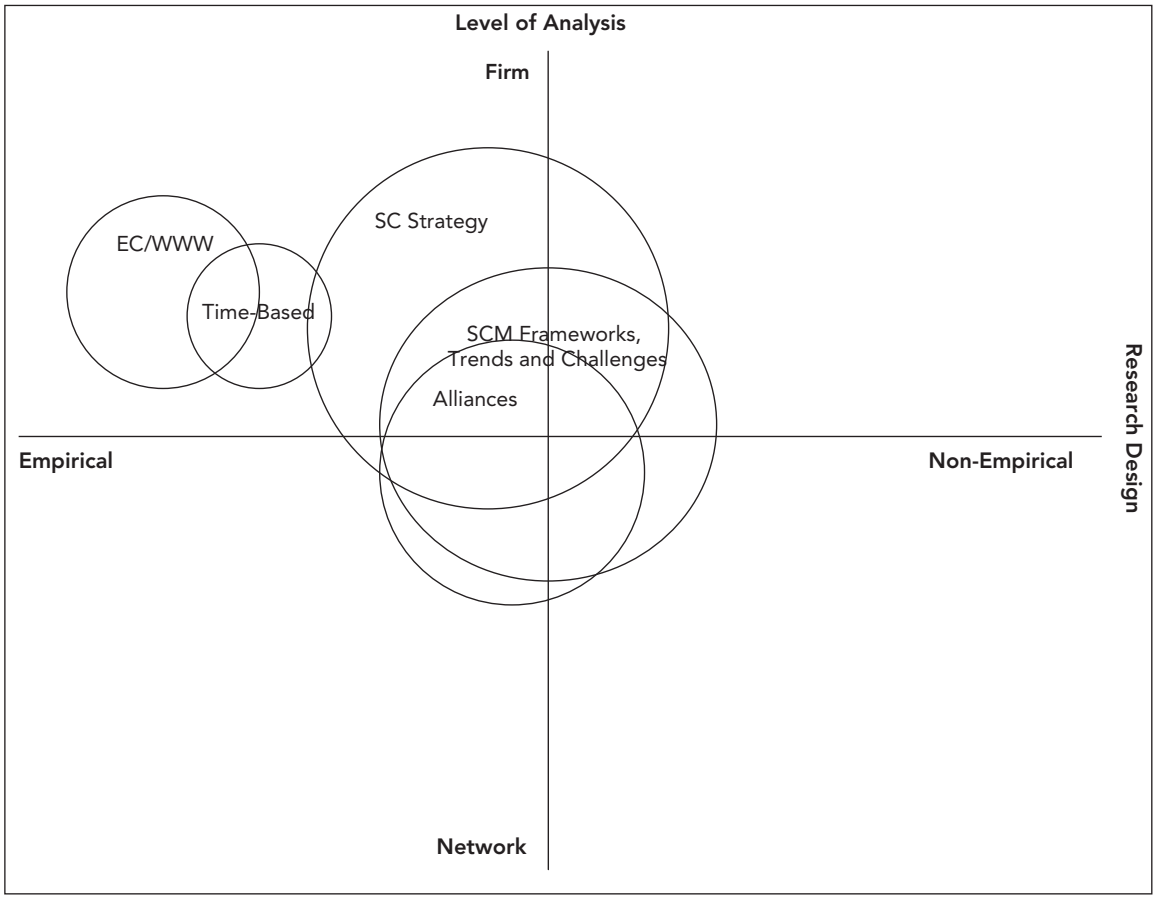
Journals	Frequency
Journal of Supply Chain Management	88
International Journal of Physical Distribution & Logistics Management	79
Journal of Operations Management	54
International Journal of Logistics Management	48
Journal of Business Logistics	40
International Journal of Operations and Production Management	35
Industrial Marketing Management	28
Management Science	17
Decision Sciences	16
Total	405

been clear paradigm shifts, there are still considerable advancements to be made in the field both from a theoretical and empirical standpoint. The last decade has witnessed a proliferation of fields not previously mentioned in the SCM literature. For example, supply chain strategy has seen a tremendous growth as a research topic for academics, as well as an area of practical importance to industry leaders. SCM frameworks, trends and challenges indicate that the field is continually redefining itself. Further, the need to manage relationships and alliances across the supply chain continues to generate researcher interest. A lagging trend in the SCM literature is environmental, for example, green supply chain and social responsibility. The practitioner literature, meanwhile, is increasing its coverage of green supply chains and their carbon footprint (Cooling 2007; Plambeck 2007). Going forward, we would expect this topic area to receive increased attention from academics.

The evolution of IT systems and e-commerce within the supply chain context are increasingly popular topics, though not as popular as alliances/relationships. Researchers recognize that e-commerce has the potential to completely revolutionize supply chains. E-commerce is continually evolving, potentially explaining why third party providers such as Covisint have migrated from automotive to healthcare. Electronic interchanges help firms achieve cost savings and better integrate their business partnerships. SCM research in the e-commerce area also addresses streamlining processes associated with inventory management and order fulfillment. The past 2 years witnessed an increase in IT-related articles due to issues of collaboration and information sharing in supply chains.

While the frequency of publications by content area indicates publication popularity, it is not a reflection on the research designs and methods of analysis. Figure 2 illustrates the patterns of the top five SCM categories in terms of research design and level of analysis. The diameter of each circle represents the number of articles in each category relative to other categories. A circle with a larger diameter reflects that more articles are included in the category relative to other categories that are represented by circles of a smaller diameter. The size of each circle is drawn relative to the size of the other circles. The *x*-axis of this figure represents the range of levels of analysis (firm, dyadic, chain and network). The positioning of each circle reflects the focus and extent of the levels of analysis in the articles included in each category. For example, the circle, "SC Strategy" displays that the

FIGURE 2
Research Design and Level of Analysis Across the Top Five SCM Categories



articles in the category focuses primarily on firm and a dyadic level of analysis. It also displays that no articles focus on the network level. The *y*-axis represents research design (empirical versus non-empirical). The positioning of each circle reflects the extent to which articles in each category are empirical or non-empirical studies. For example, the position of the circle, "Time-Based Strategies" reflects that all articles included in the category, "Time-Based Strategies" are empirical studies. The positioning of the circle, "SCM Strategy" reflects that in the category "SCM Strategy," the number of empirical articles is higher than that of non-empirical articles.

Analysis of the figure indicates that the majority of research is empirical in nature and at the firm level of analysis. Van Maanen's (1979) life cycle theory argues that research in a new field starts with a non-empirical focus, and then moves to adopt more empirical studies. In line with this theory, it would appear that the field of SCM is entering, or has moved from its infancy to a more mature state. Two of the newer SCM categories, EC/WWW and Time-Based Strategies, were researched immediately using empirical methods. What has changed is the level of analysis, which tends to be focused on the firm level and less on a network level. Our review indicates a dominance of research at the focal firm level or one link upstream or downstream. Future research needs to extend to multiple levels of the supply chain. Collecting this data will prove a major challenge to researchers.

Through its graphical depiction of the data, this aspect of our analysis also helped us to uncover another interesting observation regarding the maturity of various categories examined in this analysis. Traditional topic categories, such as alliances, strategy and frameworks seem to be normalized around the center of the distribution. The breadth of these topics make them candidates for both empirical and non-empirical analysis at both the firm and network level. Meanwhile, newer techniques such as time based competition and EC are studied more using empirical analysis.

As previously mentioned, researchers still have not agreed on the perfect definition of processes and functions to include in SCM. Consensus regarding the definition of supply chain is that it is the flow of information, goods and processes from the original supplier to the final customers (Lambert and Cooper 2000; Mentzer et al. 2001). What is certain is that there are multiple inter-organizational entities involved in supply chain activities and exchanges. However, 79% of empirical and non-empirical SCM studies performed in the past 10 years are either at the focal firm or dyadic level of analysis. They analyze a maximum of one link in the supply chain, as opposed to studying more than two parties in the chain, or the entire network, which are both far more complex. We must question whether we are truly studying supply chains or merely re-labeling the study of relationships between two parties in the supply chain.

LIMITATIONS

A potential limitation of this study is that the in-depth analysis stops after 2006. Due to the sheer depth and breadth of the study (requiring coding of an initial base of 784 articles), a decision was made to cap our detailed analysis at calendar year end 2006. A general review of the articles published thus far in 2007 yields trends comparable to 2006. Also, some readers might be curious as to why this study does not cover the years before 1997. In actuality, this study initially encompassed 22 years of SCM research. The reason for compressing the examination to 10 years was due to the nature of the literature written in those years before 1997. Most earlier research did not focus on SCM, but rather on logistics management. Therefore, true SCM research is really little more than a decade old. This reality becomes clearer when you take into account the fact that modern researchers are still trying to develop a basic definition for SCM.

FUTURE RESEARCH

There are still clear opportunities for growth and improvements within the SCM literature. For example, the academic literature has multiple studies focusing on one link in the supply chain, e.g., focal firm to customer or focal firm to supplier. In essence, is SCM just a new label for relationship management? Further, critics in the practitioner realm generally argue that researchers fail to investigate the true dynamics of the field, with little effort being exerted toward understanding the day-to-day challenges practitioners face (Gulati 2007; Markides 2007; McGahan 2007; Tushman and O'Reily 2007).

One of the objectives of this study was to identify some recent trends in the SCM field across a wide spectrum of scholarly thought. Additionally, we offer some suggestions for future research, identifying existing gaps in the literature as well as isolating key challenges SCM researchers face and offering possible suggestions to overcoming these barriers. As seen from our results section, we have outlined the various subject categories that have increased and decreased throughout the last 10 years in supply chain research. It is our hope that researchers will use the gaps identified herein to generate much needed conceptual and empirical work in the SCM literature, thereby creating a body of literature that is more heavily influenced by a deeper analysis of the supply chain on a chain wide or network basis as opposed to the more popular dyadic studies. Certainly, there is ample opportunity for a wide range of methodological tools to analyze such chain wide or network phenomena. Rich detailed qualitative methodologies using approaches such as grounded theory and snowballing to delve deeply into a supply chain can prove to be valuable additions to the literature. Qualitative studies focusing on networks and using analogies to social networks in the consumer literature could serve as a point of entry to better understand these complex interdependent network relationships.

Other research opportunities involving the unit of analysis and types of analysis were uncovered. Among the top three categories researched during the 10-year period analyzed, the vast majority of articles fit within the firm and dyadic units of analysis. Also, the majority of the articles in the top three categories used empirical analysis techniques. Despite the large frequency with which research falls into these categories, the categories themselves are not fully developed. Therefore, we propose that researchers place an emphasis on filling these voids by studying whether or not previous and future findings hold at extended levels of analysis, such as chains and networks. Also, performing research that utilizes various non-empirical methods may help round out the quality and understanding of the topics being researched.

We do hasten to add that despite our identification of several gaps in the literature we are well aware of the unique challenges faced by SCM researchers in their day-to-day activities. Tanner (1999) outlined a number of challenges experienced by organization behavior researchers, indeed these challenges are very similar to the numerous challenges faced by researchers in the SCM field, and include (1) low response rates, (2) limited access to research samples, (3) funding, (4) time for studies and (5) poor theoretical integration. He also offered some solutions to these barriers that include building relationships with trade associations to facilitate networking and greater access to national populations as they may be avenues toward decreasing data collection time periods and associated expenses. Tanner (1999) also suggests borrowing classical approaches and findings to supplement new studies and develop new theory specific to the SCM field. However, even in light of suggestions by Tanner (1999) as to overcoming existing barriers, there are existing shortcomings in SCM research that cannot be addressed simply by these recommendations.

Based on this research we offer a compilation of some of the historical shortcomings in the SCM literature, as well as some possible solutions to overcoming these issues and improving the overall quality of SCM research. These include the following categories: (1) small sample sizes, (2) one-tier investigations, (3) limited methodological analysis, (4) incomplete findings presented, (5) lack of longitudinal studies and (6) limited global supply chain analysis.

Some of these findings, particularly those related to sample size and methodology, are generally mentioned in operations management methods based literature. However, these issues are not discussed in the context of SCM. Meanwhile other findings, such as one-tier investigations and limited global analysis are critical to SCM.

Small Sample Sizes

Malhotra and Grover (1998) found that 30% of the operations management survey studies they assessed suffered from statistical conclusion errors due to small sample sizes. Tanner (1999) addressed this with his suggestion to involve trade associations to increase access to more companies and by extension increase sample sizes. Additionally, researchers can delve into a few companies but examine multiple tiers and many suppliers within each tier in order to further increase sample sizes and observe more network or chain wide phenomena. Addressing this issue will ensure that a more system-wide perspective of SCM is achieved within academic research and can partially counter the small sample size problem.

One-Tier Investigations

Many of the articles reviewed only looked at the relationship between the main supplier and the manufacturer, which very often represents an important dynamic. However, within the dyad there is a multiplicity of issues that are yet to be addressed. Additionally, the interrelationship between multiple suppliers is yet to be systematically investigated. One alternative is to focus on one organization and increase the sample size by looking at all of the suppliers of that organization across the various tiers, thereby offering a much richer sample in terms of the interaction between suppliers and purchasers across the entire chain. Meixell and Gargeya (2005) indicate that future research should focus on multi-tier supply chains at both external suppliers and internal production sites. While more difficult to perform, future studies which expand the focus beyond simple one-tier buyer–seller relationships are necessary for understanding how further supply chain efficiencies can be achieved.

Limited Methodological Analysis

Several of the articles limited their methodology to correlation analysis where multiple regression or SEM would have provided a more in-depth analysis. Further, they often failed to report descriptive information such as sample size, frame of reference or even response rate. If future studies are to improve, the analyses presented need to be more sophisticated or at least more thorough. Researchers could examine related fields to benchmark reporting standards for analytical procedures, as well as some of the shortcomings of past work. This is consistent with van Hoek (2001) who argues that triangulation is a good way to mix qualitative and quantitative methods, resulting in cross-method synergies and an improved approach for studying SCM.

Lack of Longitudinal Studies

Most studies represent a specific moment in time while in many instances a longitudinal study would be far more informative. Although these studies require considerably longer time-frames, following a group of firms longitudinally would provide significant data in developing megatrends in the supply chain. While longitudinal data are difficult to collect, these data provide an effective

tool for studying organizational processes and enhance confidence in the assessment of causality (Malhotra and Grover 1998). SCM research which, for example, captures multi-tiered buyer–supplier relationships over a product life-cycle might be much more beneficial than if viewed at a single point in time.

Limited Global Supply Chain Analysis

Globalization is becoming a powerful force within corporations and the world community. Thus, it is critical that researchers work to examine global SCM research questions, regardless of data access issues. American companies, and their foreign counterparts, are increasingly doing business overseas. Why is it that Wal-Mart, a company heralded for its efficient SCM, can succeed in Asia but not in Europe? Global Supply Chain represents one of the least published topics within SCM literature over the past decade. However, at this moment, it is arguably one of the most critical to industry practitioners. In a study addressing SCM postponement, van Hoek (2001) argues that future research addressing this topic on a global supply chain basis is needed. Questions such as these might be best-answered using case-based research, a methodology that has not been widely used by SCM researchers during the past decade.

Continuing to advance the more popular streams of SCM literature is important for the evolution of the field. Supply chain strategy, trends, alliances, etc. are important, and will continue to be in ever-changing industry environments. We hope that the future research implications developed in this study will assist in attempting to address SCM's unanswered questions. Doing so will, undoubtedly, expand our understanding and knowledge of SCM.

CONCLUSION

The SCM field is continually redefining itself. Past literature reviews provided valuable results, but were based upon the random selection of articles, book chapters and conference proceedings (Croom et al. 2000; Burgess et al., 2006). Other literature reviews were either more focused on operations management or examined a single journal (Carter and Ellram 2003; Rungtusanatham et al., 2003). Additionally, the most recent review suspended data collection in 2003 (Burgess et al. 2006). The aim of this study was to provide an up-to-date and extensive review of the SCM literature that was focused on a broad definition of the SCM concept.

It is our hope that researchers will use the gaps identified herein to generate much needed conceptual and empirical work in the SCM literature, thereby creating a body of literature that is more heavily influenced by a deeper analysis of the supply chain on a chain wide or network basis as opposed to the more popular dyadic studies. Certainly, there is ample opportunity for a wide range of methodological tools to analyze such chain wide or network phenomena. Rich detailed qualitative methodologies using approaches such as grounded theory and snowballing to delve deeply into a supply chain can prove to be valuable additions to the literature. Qualitative studies focusing on networks and using analogies to social networks in the consumer literature could serve as a point of entry to better understand these complex interdependent network relationships.

Despite our identification of several gaps in the literature we are well aware of the unique challenges faced by SCM researchers in their day-to-day activities. Collecting data on multiple supply chain tiers is a research challenge in itself, particularly when combined with low response rates and lack of sufficient research funding. Given pressures on faculty to publish empirical work, network studies can prove to be a high risk, low reward strategy. Meanwhile, longitudinal studies take years to conduct. Advances in supply chain research could best be funded through multi-year grants with associations, government agencies and businesses. Clearly, our research shows a need for more network level analysis.

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