

# **TRENDS IN SUPPLY CHAIN MANAGEMENT JOB REQUIREMENTS: A LOGITUDIAL STUDY**

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This paper provides a longitudinal comparison and analysis of job requirements in supply chain management (SCM). The primary job data was collected from various sources including online job postings on recruiting websites and SCM professional organizations in the period of 2009-2011 and compared with the job data collected from similar job sources in 2004-2006. Based on the data comparison and analysis, we identify major changes and trends in the content- and skill-based categories of the SCM job requirements in a five-year period. The paper also presents trends in the content- and skill-based categories in relation to the required job experience. Finally, we found significant relationships between content- and skill-based categories of the SCM job requirements in 2009-2011. The findings of this study are valuable for developing a new and up-to-date SCM curriculum.

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## **I. INTRODUCTION**

The supply chain management (SCM) area evolved from a loose affiliation among functions such as purchasing, manufacturing, and logistics to an integrated and cross-functional discipline. Subsequently, the breadth and depth of knowledge and the skills required in the supply chain profession has changed substantially. In line with these changes, many professional organizations are modifying their names and broadening their scope in order to accommodate needs of the supply chain professional requirements. Also, an increasing number of educational institutions are offering supply chain management degree programs.

The evolutionary nature of supply chain management demands changes in: (a) the body of knowledge that is to be taught to professionals, (b) breadth and the depth of knowledge required by the SCM jobs/careers, and (c) the developments of tools/methods for solving

emerging problems. Bridging the gap between what is being taught and researched in universities and the SCM market requirements has been a moving target, which is evident from a number of articles published during the last two decades.

The academic response to the changes in SCM professional requirements began with the identification of content categories primarily through conceptual frameworks, surveys, and comparisons of leading SCM academic programs. This was later enhanced with an introduction of an empirical methodology that identified supply chain content- and skill-based requirements from the SCM job postings rather than conceptual frameworks and surveys. The empirical methodology was found to be effective in aligning the academic curriculum with the changing requirements of the market.

Our literature review, described in the next section, shows that a lot has changed in the supply chain profession during the first decade of

the 21<sup>st</sup> century. Subsequently, newer contents and skills are expected to be required from the supply chain professionals, and also the relative importance of these contents and skills is likely to be different. This is evident from the conceptual, review, and focus group discussions in the more recent SCM academic literature. As Rutner and Fawcett (2005) indicate, the rapidly changing supply chain job requirements often create gaps between the market requirements and the academic programs. Hence, monitoring the shifts in the supply chain job requirements and using this information to revise academic programs is critical to maintain the alignment between the two. The objective of this research is to extend the valuable empirical methodology of identifying content- and skill-based categories of SCM job requirements to a longitudinal analysis that compares those categories over a period of time. Specifically, this research accomplished the following: (1) identify new contents and skills by reviewing the literature on the emerging trends and developed a larger list of SCM contents and skills, (2) evaluate the relative importance of the contents and skills by analyzing supply chain job requirements during the period of 2009-2011 versus those requirements in 2004-2006, and (3) identify shifts in the SCM contents and skills demanded by today's supply chain jobs. The results of this research indicate some shifts in the knowledge and skills required from the supply chain professionals, and indicate the need for changes in the SCM curriculum.

The remaining part of the paper organized as follows. In Section II of the paper we analyze the literature and describe the motivation for our research. In Section III, we describe the research objectives, methodology and data collections. Then, in Section IV we present the results of the longitudinal analysis and discuss the important findings. Finally, in Section V we make conclusions and provide some perspectives on further research in this area.

## **II. LITERATURE REVIEW**

The evolutionary nature of SCM field is evident from a large number of articles published since its inception in 1990's. The very definition of what supply chain management means and what jobs and responsibilities it requires are still being debated. For example, through a joint academic-industry research initiative, Dischinger et al. (2006) define the roles and responsibilities of the supply chain professionals, and what skills and experiences should they have at their disposal. Giunipero, Handfield and Eltantawy (2006) identify the major shifts in supply management, which is a part of SCM, in the past decade through a qualitative study involving focus group meetings with 54 executives across the U.S.A. They find that supply management assumes a more strategic role, which is evident, according to the authors, from the following three SCM trends: (a) the need for building strategic relationships, (b) focusing on total cost and strategic cost reduction, and (c) collaboration and integration with suppliers.

The academic response to the changes in SCM professional requirements began with the identification of content categories primarily through conceptual frameworks and comparison of leading SCM programs. For example, Johnson and Pyke (2000) examined the SCM curricula used by many top engineering and graduate business schools. They presented a framework for analyzing the contents of the SCM programs and examined the structures of several courses at US institutions. Mangan and Christopher (2005) stated that there was an emerging realization that more investment is needed to develop appropriate managerial skills and competencies for supply chain managers. Using the survey and focus group discussions, the authors compared the importance given by the three groups of respondents (providers, graduate students and participants) for the key knowledge areas, competencies and skills.

Radovilsky, Hegde and Kandasamy (2007) deployed a new methodology to identify the supply chain knowledge and competencies, which are based on the SCM job postings rather

than conceptual, survey and focus group methods. This research identified patterns of both the content-based and skill-based categories required in SCM jobs and also analyzed the relationship between the two. Further, the patterns in contents and skills are analyzed at three levels (entry, middle and senior levels) of SCM jobs. The findings of this research were very valuable in aligning supply chain courses and programs to the market requirements. Sodhi, Son and Tang (2008) expanded this stream of research by: (1) analyzing the supply chain contents and skills requirements based on online supply chain job postings, (2) measuring the relative coverage of the supply chain topics in MBA-level courses, and (3) comparing the relative importance of job requirements on the demand side, which was estimated from SCM jobs, with the relative importance of topics on the supply side, derived from reviewing supply chain courses in MBA curricula. Their analysis identified the oversupply and undersupply of topics by educational institution as compared to the demands of the SCM job market.

Supply chain management has continued to transform and emerge into newer directions during the past five years (2007-2011). We now want to review papers that highlight and characterize the important trends in the supply chain management area. Mollenkopf et al. (2010) provide an extensive literature review to examine research and practice with respect to the concurrent implementation of green, lean, and global supply chain strategies. The emergence of these three topics is also evident from other research publications as well. McCrea (2010) conducted interviews with experts in the supply chain field to identify the major trends and compile supply chain outlook. Four major trends identified in this article are: the rebounding economy, shifts in sourcing emphasis to global outsourcing, the greening of the supply chain, and emerging technologies.

Schoenherr (2009) provides a large-scale and structured review of published logistics and supply chain management research articles

within a global context, and identify a number of common themes in these articles. The themes include: (1) human resource issues specifically the skills and training needs in the respective countries, (2) supply chain practices within the context of specific nations, (3) global risk management issues such as disruptions, epidemics, threat of international terrorism and political issues, and (4) green supply chain and reverse logistics. Maruchecka et al. (2011) examine the product safety issues and challenges that arise in five industries that are increasingly globalizing their supply chains: food, pharmaceuticals, medical devices, consumer products and automobiles. The authors state that operations and supply chain management has to develop innovative solutions to address problems pertaining to regulations and standards, product lifecycle management, traceability and recall management, and supplier relationships.

Wisma (2008) provides an analysis of global supply chain management in terms of micro and macro cultural considerations. He argues that logistical/distribution and infrastructure issues typically tend to drive many international business decisions, but broader contextual issues are equally important. The contextual factors that affect the global supply chain management include: culture, language, corporate governance, politics and law, contractual issues and technology. Lusch (2011) discusses the trend towards reframing of the supply chain management toward the concepts of service; states that a view is emerging that is refocusing SCM on partnerships, relationships, networks, and value creation. He states that a variety of scholars and practitioners have begun to reexamine the fundamental purpose, processes, and functions of supply chains and also how best to characterize them in a global and competitive supply environment.

The discussion of the latest SCM articles presented above indicates that the characteristics of the SCM field and its professions might have shifted again. Specifically, the manufacturing related topics have become less prominent,

instead a number of new topics seem to gain prominence in the supply chain profession. The new SCM concepts include: global issues such as supply chain risks, supply chain disruptions, product safety, sustainability and green supply chain, service orientation, culture and language, legal and contract issues, lean management, and information technology development. Subsequently, the contents and skills required in the supply chain profession are also changing. Rossetti and Dooley (2010) indicate that there is a major gap between the SCM programs in academia and practice. The authors employ the computerized text analysis of job descriptions to study what skills, tasks, and responsibilities are associated with SCM jobs. They indicate that SCM is composed of three distinct clusters of jobs: Sourcing, Operations Consultant and SC Information Management; each requires distinct skill sets. In addition, the authors suggest that business schools may differentiate their offerings by focusing on one of the clusters and can provide students with the skills that will facilitate entry into positions that have specific requirements.

This research is motivated by several important observations derived from the previously done studies. First, the empirical methodology deployed by Radovilsky, Hegde and Kandasamy (2007), Sodhi, Son and Tang (2008), and Rossetti and Dooley (2010) is found to be effective in aligning the curriculum with the requirements demanded by supply chain professions. Second, in addition to the traditional supply chain topics identified by prior research studies, a number of new contents and skills are likely to be required in the supply chain profession. Third, a longitudinal study, proposed in this paper, can identify the shifts in the relative importance of the required supply chain contents and skills. For example, the longitudinal study done by Murphy and Poist (2007) compares the skill requirements of senior-level logisticians in 1991 and in 2006 using the survey data collected from executive search firms. In this research, we extend the previously developed methodology of

analyzing SCM job requirements to a longitudinal analysis of those requirements in order to identify the trends in SCM contents and skills demanded by the market. We explain the research objectives, data and methodology in the following section.

### **III. OBJECTIVES, DATA, AND METHODOLOGY**

The three main objectives of this research were to: (a) identify key content-based and skill-based categories associated with the SCM job market; (a) provide, employing these categories, a longitudinal comparison and analysis of the SCM-related jobs in 2009-2011 versus 2004-2006; and (c) identify important trends in developing SCM curriculum based on this longitudinal comparison and analysis. These objectives, although similar to the objectives presented in some studies discussed in the previous section of this paper, have two principal differences. First, we provide a longitudinal comparison and analysis of content- and skill-based categories related to SCM jobs. Second, we longitudinally compare these categories in relation to job experience/job level, which was not considered, to the best of our knowledge, in any previously done research on this subject.

Based on the main research objectives, we formulated the following research questions:

- What are content-based and skill-based categories associated with SCM job market requirements that are relevant to both time periods of 2009-2011 and 2004-2006?
- How do these periods compare in terms of the frequencies of SCM job requirements in various content-based and skill-based categories?
- How would these frequencies have changed over the described period in relation to years of experience?
- What are relationships between SCM content-based and skill-based categories?

- What implications these findings may have on SCM curriculum?

The SCM content- and skill-based categories used for this research are mostly derived from the respective categories employed

in the two previously done studies by Radovilsky, Hegde and Kandasamy (2007), and Sodhi, Son and Tang (2008). The categories of these research papers do overlap each other to some extent; however, there were a number of categories unique to each study (see Table 1).

TABLE 1. Content-based and Skill-based Categories and Their Sources.

<i>Content-Based Categories</i>		<i>Skill-Based Categories</i>	
<i>Name</i>	<i>Sources*</i>	<i>Name</i>	<i>Sources*</i>
Location and Supply Chain Design	1&2	General Analytical and Problem Solving	1&2
Transportation, Logistics, and Distribution Management	1&2	Basic IT	1&2
Inventory and Materials Management	1&2	Team Work	1&2
Sourcing, Procurement and Supplier Management	1&2	Leadership	1&2
Information Technology Management (ERP and E-commerce)	1&2	Communication	1&2
Supply Chain Analysis and Planning	2	ERP and Other Software	1&2
Lean Management and Lean Sigma	2	Modeling/Decision Making	1&2
Quality Management and Six Sigma	2	Spreadsheet and Database	1&2
Master Scheduling	2	Project Management	1
Capacity Management	2	Statistics	1
Process Improvement	2	Negotiations	2
Supply Chain Finance and Accounting	2	Time Management	2
Marketing and Channel Restructuring	1	Ethics	2
Product Design and New Product Introduction	1	Multiple Languages and Culture	N
Service and After Sales Support	1	Change Management	N
Reverse Logistics	1	Other Skills	2
Global Supply Chain Issues	1		
Sustainability and Green Supply Chain	1		
Contract and Legal Issues in Supply Chain Management	N		
Supply Chain Risk and Product Safety Management	N		
Product Lifecycle Management (PLM)	N		

\*Sources: 1= Sodhi, Son, and Tang (2008), 2 = Radovilsky, Hegde, and Kandasamy (2007), 1&2 = common for both papers, N = additional (new) item.

Based on the review of SCM literature described in Section II, we also identified additional content- and skill-based categories not included in the above mentioned studies. For example, for the content-based categories, we added “Contract and Legal Issues in Supply Chain Management”, “Supply Chain Risk and Product Safety Management”, and “Product Lifecycle Management (PLM)”. These categories were used to consider potentially new directions in the SCM job markets.

To identify actual SCM job requirements and associate them with the described content- and skill-based SCM categories, we evaluated various SCM jobs from (1) general job listing websites like careerbuilder.com and dice.com; (2) specialized SCM job recruitment websites including SupplyChainJobs.com and procurementservices.com; and (3) job-related websites of SCM professional organizations like the Institute of Supply Management (ISM), Council of Supply Chain Management Professionals (CSCMP), and APICS -The Association for Operations Management.

Overall, we have evaluated 252 job postings in the period of 2009-2011 from the specified websites. These jobs were almost equally distributed between manufacturing (49%) and service (51%) industries. For each evaluated job, we identify its requirements, and then fit them into one or several appropriate content-based or skill-based categories. In addition, we monitor some other attributes of posted jobs including required/desired degree (bachelor, master, etc.), location of jobs in various states, required/desirable professional certificates (CSCP from APICS, CPM from ISM, etc.), and experience levels. In this paper, we utilize the following classification of job levels based on experience:

- Entry level jobs with 1 to 4 years of experience
- Middle level jobs with 5 to 7 years of experience

- Upper level jobs with 8 and above years of experience.

To facilitate the evaluation of SCM jobs, a special Excel-based spreadsheet was developed. The columns of the spreadsheet represent content-based and skill-based categories presented in Table 1, and also job-related attributes like degree, job location, certification, and job level. The rows of the spreadsheet describe jobs being evaluated and their respective requirements that we grouped into various categories and job attributes. This information was used to identify frequencies of various content- and skill-related categories in 2009-2011. We also obtained, based on the previously done studies (Radovilsky, Hegde and Kandasamy, 2007; Sodhi, Son, and Tang, 2008), frequencies of content-based and skill-based categories from the period of 2004-2006, when these studies were conducted. These data were used for comparison with the frequencies that we identified for the period of 2009-2011. Thus, in this study, we intend to perform a 5-year longitudinal comparison and analysis of SCM job market.

#### **IV. LONGITUDINAL COMPARISON AND ANALYSIS OF SCM JOB MARKET**

In this section we compare and analyze SCM job market requirements in 2009-2011, summarized in the discussed content- and skill-based categories, versus those in 2004-2006. The content-based frequencies of these two periods and their differences are presented in Table 2 in descending order of the frequencies in 2009-2011.

The table data shows that for a number of categories the changes of frequencies' values are relatively insignificant. This is true for the categories like “Lean Management and Lean Sigma”, “Transportation, Logistics, and Distribution Management”, “Process Improvement”, “Service and After Sales Support”, and “Supply Chain Finance and Accounting”, where the differences of

frequencies are no more than 5%. However, for several content-based categories including “Supply Chain Analysis and Planning”, “Master Scheduling”, “Capacity Planning”, “Product Design and New Product Introduction”, there is a substantial reduction of frequency values in 2009-2011 vs. 2004-2006. The specified decrease in frequencies may be explained by the fact that in the last five years the emphasis in SCM jobs has, at least partially, shifted from manufacturing planning, scheduling, and new product introduction to more requirements in supply management, supply chain information technology, and global aspects of supply chain. For example, a significant reduction of the

“Supply Chain Analysis and Planning” frequency in 2009-2011 vs. 2004-2006 may be explained by shifting job requirements from materials, capacity and distribution resource planning to sourcing and procurement planning and analysis, which form a separate category of “Sourcing, Procurement, and Supply Management.” In fact, the latter category along with “Inventory and Materials Management”, “Information Technology Management”, “Global Supply Chain Issues”, and “Sustainability and Green Supply Chain” experienced a moderate to significant increase in frequencies over the five-year period.

TABLE 2. Frequencies of Content-based Categories: 2009-2011 vs. 2004-2006.

<i>Content-Based Categories</i>	<i>Content-Based Frequency (%)</i>		
	<i>2004-2006 Jobs</i>	<i>2009-2011 Jobs</i>	<i>Difference, 2009-2011 vs. 2004-2006</i>
Sourcing, Procurement and Supplier Management	47.4	55.2	7.8
Inventory and Materials Management	35.5	46.8	11.3
Lean Management and Lean Sigma	36.4	38.9	2.5
Transportation, Logistics, and Distribution Management	40.8	38.1	-2.7
Information Technology Management (ERP and E-commerce)	28.9	36.1	7.2
Supply Chain Analysis and Planning	58.3	35.3	-23.0
Process Improvement	36.4	34.9	-1.5
Quality Management and Six Sigma	33.3	29.8	-3.6
Contract and Legal Issues in Supply Chain Management*		26.6	N/A
Service and After Sales Support	24.7	25.4	0.7
Global Supply Chain Issues	4.7	18.3	13.6
Master Scheduling	27.6	15.9	-11.7
Supply Chain Finance and Accounting	10.5	11.1	0.6
Marketing and Channel Restructuring	28.0	8.7	-19.3
Sustainability and Green Supply Chain	2.3	7.5	5.2
Capacity Management	18.4	6.7	-11.7
Product Design and New Product Introduction	14.8	4.8	-10.0
Reverse Logistics	0.0	2.4	2.4
Location and Supply Chain Design	2.6	1.6	-1.0
Supply Chain Risk and Product Safety Management*		1.2	N/A
Product Lifecycle Management (PLM)*		0.4	N/A

\*Data in 2004-2006 is not available.

TABLE 3. Frequencies of Content-based Categories for Different Levels of Job Experience

<i>Content-Based Categories</i>	<i>Entry Level Jobs (%)</i>			<i>Middle Level Jobs (%)</i>			<i>Upper Level Jobs (%)</i>		
	<i>2004-2006</i>	<i>2009-2011</i>	<i>Change</i>	<i>2004-2006</i>	<i>2009-2011</i>	<i>Change</i>	<i>2004-2006</i>	<i>2009-2011</i>	<i>Change</i>
Transportation, Logistics, and Distribution Management	41.1	42.2	1.1	37.1	23.9	-13.2	45.2	58.9	13.7
Sourcing, Procurement and Supplier Management	44.7	48.9	4.2	45.6	55.8	10.2	52.3	61.4	9.1
Lean Management and Lean Sigma	30.3	40.8	10.5	41	39.3	-1.7	45.3	52.4	7.1
Contract and Legal Issues in Supply Chain Management*		37.8	N/A		23.1	N/A		8.1	N/A
Quality Management and Six Sigma	17.5	16.7	-0.8	37.9	25.6	-12.3	69.4	24.3	-45.1
Information Technology Management (ERP and E-commerce)	20.4	25.7	5.3	32.1	40.2	8.1	51.9	64.3	12.4
Supply Chain Analysis and Planning	52.9	35.7	-17.2	54.3	32.5	-21.8	85.7	43.2	-42.5
Process Improvement	25.8	29.6	3.8	38.4	37.6	-0.8	55	40.5	-14.5
Inventory and Materials Management	38.9	65.5	26.6	29.7	57.3	27.6	33.5	40.3	6.8
Service and After Sales Support*		20.4	N/A		29.1	N/A		27	N/A
Master Scheduling	28.6	19.4	-9.2	25.6	13.7	-11.9	30.6	13.5	-17.1
Global Supply Chain Issues*		18.4	N/A		20.5	N/A		30.8	N/A
Marketing and Channel Restructuring*		14.3	N/A		5.1	N/A		5.4	N/A
Supply Chain Finance and Accounting	8.4	8.2	-0.2	6.8	11.1	4.3	27.6	18.9	-8.7
Product Design and New Product Introduction*		5.1	N/A		6	N/A		0	N/A
Capacity Management	24	2	-22	12.3	2.6	-9.7	21.1	12.4	-8.7
Sustainability and Green Supply Chain*		2	N/A		6.8	N/A		24.3	24.3
Supply Chain Risk and Product Safety Management*		2	N/A		0.9	N/A		0	N/A
Product Lifecycle Management (PLM)*		1	N/A		0	N/A		0	N/A
Location and Supply Chain Design	3.3	0	-3.3	2.3	3.4	1.1	0	0	0
Reverse Logistics*		0	N/A		4.3	N/A		2.7	N/A

\*Data in 2004-2006 is not available.



The new trends in content-based categories are also confirmed by a relatively high frequency (26.6%) of jobs requiring the knowledge of contract management and legal aspects of SCM, which may stem from the increased role of outsourcing and global supply chain needs (see Table 2). However, we need to indicate that this particular category was not used in the 2004-2006 studies. In these previously done studies, the contract and legal SCM issues might be a part of other content-based categories, for example, sourcing and procurement. Finally, we would like to point out that some content-based categories, like “Reverse Logistics”, “Location and Supply Chain Design”, “Supply Chain Risk and Product Safety Management”, and “Product Lifecycle Management”, contain very low frequencies that practically did not alter over the investigated period.

The longitudinal evaluation of changes in content-based categories for different levels of experience revealed several important differences between these levels (see Table 3). The entry level jobs have, to most extent, similar changes in content-based frequencies as those presented in Table 2. Contrary to that, the upper level of jobs show an increase of frequencies in several content-based categories, e.g., “Transportation, Logistics, and Distribution Management”, “Sourcing, Procurement, and Supplier Management”, “Lean Management and Lean Sigma”, “Global Supply Chain Issues”, and “Sustainability and Green Supply Chain”. These changes from the patterns presented in Table 2 may be due to the fact that the upper level jobs necessitate more strategically oriented content as opposed to entry level jobs.

TABLE 4. Frequencies of Skill-based Categories: 2009-2011 vs. 2004-2006

<i>Skill-Based Categories</i>	<i>Skill-Based Frequency (%)</i>		
	<i>2004-2006 Jobs</i>	<i>2009-2011 Jobs</i>	<i>Difference, 2009-2011 vs. 2004-2006</i>
Communication	76.2	75.4	-0.8
Team Work	70.8	69.4	-1.4
General Analytical and Problem Solving	65.8	68.7	2.9
ERP and Other Software	43.2	57.9	14.7
Leadership	46.5	48.0	1.5
Spreadsheet and Database	41.3	47.2	5.9
Project Management	41.7	39.7	-2.0
Negotiations	22.9	32.9	10.0
Statistics	12.1	23.4	11.3
Multiple Languages and Culture*		19.0	N/A
Basic IT	23.2	17.1	-6.1
Modeling/Decision Making	15.8	15.9	0.1
Change Management*		10.3	N/A
Other Skills	15.1	15.1	-5.6
Time Management	4.0	8.8	-4.8
Ethics*		2.8	N/A

\*Data in 2004-2006 is not available.

TABLE 5. Skill-based Frequencies of Different Levels of Job Experience.

<i>Skill-Based Categories</i>	<i>Entry Level Jobs (%)</i>			<i>Middle Level Jobs (%)</i>			<i>Upper Level (%)</i>		
	<i>2004-2006</i>	<i>2009-2011</i>	<i>Change</i>	<i>2004-2006</i>	<i>2009-2011</i>	<i>Change</i>	<i>2004-2006</i>	<i>2009-2011</i>	<i>Change</i>
Communication	78.8	70.4	-8.4	69.5	82.1	12.6	83.1	87.6	4.5
Team Work	71.7	69.4	-2.3	65.9	64.1	-1.8	82.8	86.5	3.7
General Analytical and Problem Solving	63.6	62.2	-1.4	67.1	66.7	-0.4	75.9	79.9	4
Spreadsheet and Database	48.5	49	0.5	38.9	48.7	9.8	24.6	37.8	13.2
ERP and Other Software	24.3	34.7	10.4	37.2	41.2	4.0	26.4	45.9	19.5
Leadership	32.3	32.7	0.4	53.7	52.1	-1.6	75.9	75.7	-0.2
Negotiations	17.2	31.6	14.4	22.9	34.2	11.3	31	32.4	1.4
Statistics*		22.4	N/A		23.9	N/A		24.3	N/A
Multiple Languages and Culture*		21.4	N/A		17.1	N/A		18.9	N/A
Project Management	33.4	19	-14.4	51.4	49.3	-2.1	55.2	56.2	1.0
Basic IT	23.2	12.2	-11.0	20.4	10.3	-10.1	23.5	11.4	-12.1
Modeling/Decision Making	16.2	10.2	-6.0	10.4	18.8	8.4	12.4	21.6	9.2
Other Skills	12.1	7.1	-5.0	14.6	12.8	-1.8	27.6	5.4	-22.2
Change Management*		6.1	N/A		12.8	N/A		13.5	N/A
Time Management	5.1	3.1	-2.0	3.2	0	-3.2	20.7	18.9	-1.8
Ethics*		3.1	N/A		1.7	N/A		5.4	N/A

\*Data in 2004-2006 is not available.

The longitudinal comparison of the skill-based requirements in SCM jobs (see Table 4) confirms that communication, team work, analytical and problem solving skills remain most frequently required skills in SCM jobs (above 60% of frequency). The data also demonstrate that around half of skill-based frequencies alter insignificantly in the five-year period. The changes of frequencies in categories like “Communication”, “Team Work”, “General Analytical and Problem Solving”, “Leadership” and some others were really low, i.e., no more than 5%. However, there are some skill-based categories with a substantial increase of frequencies in the SCM job market requirements, e.g., “ERP and Other Software”, “Negotiations”,

and “Statistics”. It is also important to point out that the “Multiple Languages and Culture” and “Change Management” categories have a moderate frequency level, 19.0% and 10.3%, respectively, which was not indicated in the 2004-2006 period.

The comparison of longitudinal changes in skill-based frequencies for different levels of work experience (see Table 5) reveal several important changes in the skill-related job requirements over the described period. For the first five most frequent skill-based categories, the data show moderate to high increase of those frequencies in 2009-2011 vs. 2004-2006 for upper level jobs, and in particular, for “Communication”, “Team Work”, “General

Analytical and Problem Solving”, “Spreadsheet and Database”, and “ERP and Other Software”. For the entry- and middle level jobs, changes are mostly mixed with exception of “ERP and Other Software”, “Negotiation”, and “Communication (for middle level) skills, where the increase is significant.

In addition to longitudinal comparison of the content- and skill-based categories of job requirements, we also analyzed the statistical relationships between the two sets of data. To identify these relationships, we calculated

correlation coefficients between each pair of content-based and skill-based categories for the 2009-2011 job market. The correlation matrix for 10 most frequent content- and skill-based categories is presented in Table 6. To measure the statistical significance of the correlation coefficients in the matrix, we estimated that a correlation coefficient with an absolute value of 0.317, based on a two-tail T-test with the significance level of 0.05, is statistically significant.

TABLE 6. Correlation Between Content and Skill Categories for SCM Jobs in 2009-2011

Content-Based Categories	Skill-Based Categories									
	Communication	Team Work	General Analytical and Problem Solving	ERP and Other Software	Leadership	Spreadsheet and Database	Project Management	Negotiations	Statistics	Multiple Languages and Culture
Sourcing, Procurement and Supplier Management	0.35	0.36	0.56	0.14	0.41	0.49	-0.02	0.35	0.26	0.40
Inventory and Materials Management	0.45	0.12	0.21	0.40	0.00	0.10	0.29	0.28	0.46	0.10
Lean Management and Lean Sigma	0.34	0.41	0.35	0.28	0.24	0.38	0.32	-0.13	0.34	-0.11
Transportation, Logistics, and Distribution Management	0.20	0.00	-0.13	0.23	0.30	0.40	-0.01	0.21	0.38	0.39
Information Technology Management (ERP and E-commerce)	0.41	0.13	0.23	0.55	0.32	0.51	0.31	0.00	-0.10	0.00
Supply Chain Analysis and Planning	0.12	0.30	0.31	0.42	-0.10	0.31	-0.12	0.16	0.44	0.20
Process Improvement	0.23	0.31	0.30	-0.13	0.33	0.00	-0.12	0.12	0.31	-0.02
Quality Management and Six Sigma	0.33	0.38	-0.12	0.10	0.40	0.02	0.32	-0.11	0.39	0.03
Contract and Legal Issues in Supply Chain Management*	0.46	0.12	-0.10	0.09	0.11	0.24	0.02	0.46	-0.13	0.27
Service and After Sales Support	0.40	0.35	0.23	-0.12	0.30	-0.01	0.10	0.10	0.20	0.00

The correlation data in Table 6 shows an extensive number of statistically significant correlation coefficients. Moreover, each content-based category contains two or more (up to five) of these coefficients with the respective skill-based categories. For example, the “Sourcing, Procurement, and Supplier Management” content category exhibits statistically significant relationships with a number of skill categories including “Communication”, “Team Work”, “General Analysis and Problem Solving”, “Leadership”, “Spreadsheet and Database”, “Negotiations”, and “Multiple Languages and Culture”. The “Inventory and Materials Management” content category is strongly related to “Communications”, “ERP and Other Software”, and “Statistics”. Overall, the information on the strength of relationships between the content- and skill-based categories of the SCM jobs can be extremely useful in developing a new or improving existing curriculum in this field by emphasizing appropriate skills, derived from this correlation

analysis, in various subjects (content areas) of supply chain management education.

**V. CONCLUSION**

The three main contributions of this research are: (a) identifying major trends in SCM job requirements based on the longitudinal comparison and analysis of the content- and skill-based categories related to SCM jobs in a five-year period, (b) presenting trends in the content- and skill-based categories in relation to the required job experience (job level), and (c) recognizing statistically significant relationships between content-based and skill-based categories of the SCM job requirements in 2009-2011.

First, the longitudinal comparison and analysis of the U.S. SCM job market in a five-year period, from 2004-2006 to 2009-2011, confirm some important trends in job requirements (see Tables 7 and 8). These trends exist for both content-based and skill-based categories of the job market.

TABLE 7. Main Trends in Content-based Categories

<i>Five Most Important Content-Based Categories in 2009-2011</i>	<i>Five Content-Based Categories with Most Increase in Frequency (2009-2011 vs. 2004-2006)</i>	<i>Five Content-Based Categories with Most Decrease in Frequency (2009-2011 vs. 2004-2006)</i>
Sourcing, Procurement, and Supplier Management	Global Supply Chain Issues	Supply Chain Analysis and Planning
Inventory and Materials Management	Inventory and Materials Management	Marketing and Channel Restructuring
Lean Management and Six Sigma	Sourcing, Procurement, and Supplier Management	Master Scheduling
Transportation, Logistics, and Distribution Management	Information Technology Management (ERP and E-commerce)	Capacity Management
Information Technology Management (ERP and E-commerce)	Contract and Legal Issues in Supply Chain Management*	Product Design and New Product Introduction

\*Data in 2004-2006 is not available.

TABLE 8. Main Trends in Skill-based Categories

<i>Five Most Important Skill-Based Categories in 2009-2011</i>	<i>Five Skill-Based Categories with Most Increase in Frequency (2009-2011 vs. 2004-2006)</i>	<i>Five Skill-Based Categories with Most Decrease in Frequency (2009-2011 vs. 2004-2006)</i>
Communication	ERP and Other Software	Basic IT
Team Work	Negotiations	Other Skills
General Analytical and Problem Solving	Statistics	Time Management
ERP and Other Software	Multiple Languages and Culture*	Project Management
Leadership	Change Management*	Team Work

\*Data in 2004-2006 is not available.

The substantial changes in content-based categories (Table 7) are related to the increased frequencies of job requirements for global issues in supply chain, inventory and materials management, sourcing and procurement, information technology management, and SCM contract and legal issues. It is important to point out that these trends are specifically evident for the upper level of jobs requiring 8 or more years of experience. At the same time, we prove the notion, presented in the Literature Review and corroborated by several previously done researches, that the SCM job requirements related to production and manufacturing have been decreasing over time. These include reduction in the frequencies of job requirements associated with master scheduling, supply chain planning, capacity management, and new product introduction.

Second, the longitudinal comparison of the skill-based requirements in SCM jobs proves some important trends in the growing requirements for ERP and other software, negotiation, and statistical skills along with expertise in multiple language, foreign culture, and change management (see Table 8). However, our research also confirms that

communication, team work, and analytical and problem solving skills remain most frequently required skills in SCM jobs (above 50% of frequency).

Finally, we identified statistically significant correlation coefficients between content-based and skill-based categories for the (see Table 6). Each content-based category contains at least two, and, sometimes, up to four-five of these coefficients with the respective skill-based categories. This may be directly used in developing the SCM coursework in terms of pedagogy and delivery methods. The latter may be specifically useful for designing undergraduate and master's SCM courses within general business education, or creating new concentrations/options or majors in SCM.

## VI. REFERENCES

- Dischinger, J., Closs, D.J., McCulloch, E., Speier, C., Grenoble, W. and Marshall, D., "The Emerging Supply Chain Management Profession", *Supply Chain Management Review*, 10(1), 2006, 62-68.
- Giunipero, L., Handfield, R.B. and Eltantawy, R., "Supply management's evolution: key

- skill sets for the supply manager of the future”, *International Journal of Operations & Production Management*, 26(7), 2006, 822-844.
- Johnson, M. E. and Pyke, D.F., “A Framework for Teaching the supply chain management”, *Production and Operations Management*, 9(1), 2000, 2-18.
- Lusch, R., “Reframing Supply Chain Management: A Service-Dominant Logic Perspective”, *Journal of Supply Chain Management*, 47(1), 2011, 14-18.
- McCrea, B., “Outlook 2011: 4 Trends Shaping the Supply Chain Future”, *Supply Chain Management Review*, 14(7), 2010, 2-6.
- Mangan, J. and Christopher, M., “Management development and the supply chain manager of the future”, *International Journal of Logistics Management*, 16(2), 2005, 178-191.
- Maruchecka, A., Greisb, N., Mena, N. and Cai, L., “Product safety and security in the global supply chain: Issues, challenges and research opportunities”, *Journal of Operations Management*, 29(7/8), 2011, 707–720.
- Mollenkopf, D., Stolze, H., Tate, W.L. and Ueltschy, M., “Green, lean, and global supply chains”, *International Journal of Physical Distribution & Logistics Management*, 40(1/2), 2010, 14-41.
- Murphy, P. and Poist, R.F., “Skill requirements of senior-level logisticians: a longitudinal assessment”, *Supply Chain Management: An International Journal*, 12(6), 2007, 423-431.
- Radovilsky, Z., Hegde, V.G. and Kandasamy, G., “Development of Supply Chain Management through Job Market Requirements”, *California Journal of Operations Management*, 5(1), 2007, 52-59.
- Rossetti, C.L. and Dooley, K.J., “Job Types in the Supply Chain Management Profession”, *Journal of Supply Chain Management*, 46(3), 2010, 40-56.
- Rutner, S.M. and Fawcett, S. E., “The State of Supply Chain Education”, *Supply Chain Management Review*, 9(6), 2005, 55-60.
- Sodhi, M.S., Son, B. and Tang, C.S., “ASP, The Art and Science of Practice: What Employers Demand from Applicants for MBA-Level Supply Chain Jobs and the Coverage of Supply Chain Topics in MBA Courses”, *Interfaces*, 38(6), 2008, 469-484.
- Wisma, M., “Global Business Management: Current Trends and Practices”, *The Journal of Applied Business and Economics*, 8(1), 2008, 96-109.
- Schoenherr, T., “Logistics and Supply Chain Management Applications within a Global Context: An Overview”, *Journal of Business Logistics*, 30(2), 2009, 1-25.