

Supply Chain Management 2010 and Beyond

MAPPING THE FUTURE OF THE STRATEGIC SUPPLY CHAIN



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Through Partnerships*

Supply Chain Management 2010 and Beyond

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NOTICE

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Supply Chain Management 2010 and Beyond Executive Summary

TO:

APICS
APICS Educational and Research Foundation
Executive Advisory Board

FROM:

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SUBJECT:

Supply Chain Management
2010 and Beyond Project

DATE:

June 20, 2007

INTRODUCTION

Supply chain management (SCM) is now a fact of life. It is also a dynamic entity that is constantly changing and evolving in response to changes in technology, competitive actions, and customer demands. Supply chain managers recognize that their role has moved from being tactical to being strategic. This “new” supply chain is characterized by three major traits: (1) it is strategic; (2) it is dynamic; and, (3) it is customer-driven. It is strategic as it enhances the ability of a firm to develop and maintain strategic advantages in a competitive market. It is dynamic in that it is constantly evolving as a result of strategic changes in the firm, competitive actions, changes in technology, and shifts in customer needs. It is customer-driven as supply chains must focus on value propositions that are highly attractive to customers. The supply network that serves these customers must be optimized and react to supply uncertainties and demand variability.

New paradigms in supply chain management must evolve that guide new management strategies, identify new research agendas, and lead to dissemination of new knowledge to supply chain employees. To understand these new agendas, a two-part initiative was undertaken through a joint project with Michigan State University and the APICS Educational and Research Foundation. This summary provides a report of the major findings from the project.

The purpose of the project was to understand the key issues facing supply chain managers in the coming years and identify the key initiatives required to close the gap between today’s capabilities and the demands of the new supply chains. To address these challenges, two groups of experts were invited to participate in the project. The first were executives from a diverse group of companies representing a variety of industries and supply chain roles. The second group

consisted of academicians from a number of universities with well-respected supply chain programs. The project consisted of three phases:

Phase 1 - Background work aimed at identifying critical issues pertaining to supply chain management, leading academic researchers and supply chain practitioners, and firms considered to be at the leading edge of supply chain management.

Phase 2 - A Delphi study was administered to all participants to identify and prioritize the issues facing supply chain managers today, and the issues they expect to face out five years and beyond.

Phase 3 - A workshop was held at Michigan State University to bring together these supply chain experts and explore opportunities to meet these future challenges.

RESULTS

The Delphi study served as a mechanism to identify the most critical issues facing supply chain managers in 2010 and beyond. The results of the study showed these five issues to be most important in the future:

1. Supply chain disruptions and supply chain risk
2. Leadership within the supply chain
3. Managing the timely delivery of goods and services
4. Managing product innovation by drawing on the capabilities of the supply chain
5. Implementing appropriate technology to enable seamless exchange of information within the supply chain

During the workshop, participants described leadership as the people skills and talents needed to manage future supply chains.

In the second phase of the project, a workshop was held at Michigan State University on September 20-21, 2006, bringing together experts in supply chain management from industry and academia. The group identified 16 initiatives required to close the gap between current capabilities and future supply chain requirements. These 16 initiatives were summarized into the following six strategic initiatives:

- Achieve strategic visibility/alignment and information integration
- Acquire exemplary supply chain talent and leaders
- Use supply chain optimization models (e.g., risk, cost)
- Manage through a process orientation with appropriate measures
- Focus on relationship building and trust both between and within companies
- Align and realign supply chain architecture and structure

The participants agreed that closing the gap between current capabilities and future requirements is essential for excellent supply chain performance in 2010 and beyond. Those organizations that are best at closing the gap will have a competitive advantage. Those who have not prepared for the future will face unacceptable risk and higher total cost.

NEXT STEPS

After identifying the initiatives required to close the gap between current supply chain performance and future requirements, the workshop participants focused on identifying the management practices and research agendas that must be developed to improve supply chain execution. Also discussed was how the new knowledge might be best disseminated. Partici-

participants were asked to select one of six focused areas for further subgroup work. The subgroups included two that will address the supply chain body of knowledge: operational and strategic. Workshop participants felt it was important that universities and professional organizations be involved in providing the appropriate education and training for supply chain leaders of the future. The other four subgroups include: collaboration, metrics, risk, and cost models and will focus on providing direction for research and practice on the six strategic initiatives.

The Delphi study and workshop provided insight into the issues facing supply chain managers in 2010 and beyond, but must be validated using other industry and academic partners. A second group will be convened at a future date and the results combined and distributed to all participants. The workshop attendees agreed to reconvene at a future date for ongoing discussions and updates.

The project leaders would like to thank all the participants for their active engagement in both the Delphi study and the workshop. Your willingness to share information and ideas resulted in an agenda to pursue addressing and making progress on the critical issues identified in the study, which will drive improved performance in the supply chains.

SCM 2010 and Beyond: Why This Study Now?

OVERVIEW

Supply chain management (SCM) is now a fact of life. Increasingly managers, researchers, and educators recognize the importance of SCM as both a strategic and tactical weapon. However, the practice of supply chain management is ever changing. Initially, the supply chain was viewed as an entity that was primarily concerned with the upstream – suppliers and supplier management. By the mid 1990s, there was a change in orientation. The focus has shifted from the upstream to the entire supply chain. As we move into the middle of the first decade of the 21st century, we are seeing another shift in focus – from supply chain management to strategic supply chain management. As this transition takes, there is a strong need for researchers, managers, and educators to reassess the current and future stages of supply chain management with the goal of identifying, presenting, and implementing a new set of agendas – agendas targeted at directing, motivating, and facilitating research, knowledge dissemination,¹ and management/practice in this area.

As a result of these and other factors, it was decided that the time was right for a study aimed at uncovering, studying, and assessing the differences between today's supply chain and that of the future supply chain – the supply chain that we can expect to see in place within the next five years. To achieve these objectives, it was decided that a multiple method research approach would be employed – an approach

that combined a thorough literature review with a Delphi study and an on-site workshop. The overall goal of this approach would be to help answer the following questions:

- What does the current supply chain system look like? What are its major traits/features/attributes?
- What is the future supply chain system expected to look like? What are its major traits/features/attributes?
- To what extent is the future supply chain “superior” in performance to the current supply chain? Why?
- What are the gaps/obstacles that are preventing firms and their managers from making the transition from the current to the future supply chain and from realizing the potential benefits offered by the future supply chain?
- What action items can be identified that can be used by the various stakeholders to facilitate the transition from the current to the future supply chain?

Consistent with these questions, this study had, as its direct outcomes, three items:

- A quantitative description of the current and future supply chains (to be provided by the Delphi study).²

¹ The term “knowledge dissemination” is used rather than teaching for several reasons. First, in discussions with several knowledgeable practitioners in preparation for the study, the research team was left with the impression that teaching was viewed as something that took place in colleges and universities. Second, knowledge dissemination was viewed as a much broader activity – something that could be done within companies, with professional societies, and within educational institutions. Third, knowledge dissemination seemed to imply also a broader approach to getting the knowledge out. It was seen as something that could be done using the Internet, Webinars, seminars, and discussions. For these and other reasons, the team settled on this term within this report.

² A detailed discussion of the research methodology is reserved for the next chapter.

- A summary and discussion of the major gaps/obstacles affecting the ability of firms to make the transition from the current to the future supply chain.
- A set of three agendas containing actionable items targeted toward the three critical stakeholders – supply chain management practitioners, researchers, and educators.

This report presents the final results of this study. In it, you will find these three outcomes. It is hoped and expected that this report will serve to stimulate a discussion of whether you, as a manager, researcher, or educator, are ready to make this transition. In reviewing the findings presented in this report, it is important to recognize that what we are dealing with is a forecast of the future (albeit a forecast generated through the interaction of a selected group of highly knowledgeable people). Consequently, the reader is cautioned to remember this forecast, like any other forecast, comes with three warnings:

- All forecasts are wrong
- All forecasts change
- You or someone else will be responsible for the ultimate accuracy.

Before discussion of the research methodological approach underlying this study, it is first necessary to review the concept of the supply chain and the factors currently influencing its growth and evolution.

SUPPLY CHAIN MANAGEMENT - A FIELD IN TRANSITION

Supply chain management (SCM) is now recognized as one of the major developments in business thought for the 21st century. Many business schools, including the University of Michigan and Harvard, are developing

SCM curricula and programs. At the same time, definitions of various SCM perspectives and domain are maturing. Originally, SCM was viewed rather simplistically as a summation of operational activities in functional areas such as purchasing, operations management, and logistics. Today, SCM is increasingly seen to be a strategic, highly integrative management area that exceeds any single functional perspective. (See Figure 1-1, The Current Supply Chain, found on page 7.)

However, it is well known that supply chain management has developed primarily in the field. It is a field built and expanded by managers and by firms such as Toyota, McDonald's, Wal-Mart, and Dell. Consequently, the study (i.e., activities involving research and knowledge dissemination) of supply chain management has consistently lagged behind the practice of supply chain management. This is a situation that must be corrected if managers, educators, and researchers are to make appropriate contributions to this field.

Currently, there is evidence that the theory and practice of supply chain management is undergoing a major transformation – a transformation from tactical supply chain management (a field primarily of interest to logistics, operations and purchasing managers, and researchers) to strategic supply chain management. Strategic supply chain management is characterized by the three following major traits:

TOTAL

To be effective in teaching supply chain management, an instructor's coverage should address the total (complete) supply chain. A total coverage addresses both the upstream (supply-side) and downstream (demand-side) aspects of the supply chain, including a discussion of marketing and customer relationships. It also covers both domestic and global issues associated

with supply chain management. A total coverage views supply chains from a life cycle perspective, one that traces products from cradle to grave. A total coverage introduces students not only to the mathematical tools that support supply chain management decision-making, but also to the “soft” side of supply chain management, including the management of people, information, and organizational relationships. Finally, a total coverage includes discussions of planning activities and decision processes that cut across traditional functional organizations.

STRATEGIC

The supply chain concept exists as a means to enhance the ability of a firm to develop and maintain strategic advantages in a competitive marketplace. The benefits of supply chains extend beyond the operational dimensions of lead time, quality, and flexibility to the strategic and financial areas. Supply chains, if properly structured, can effectively combine the core competencies of a given firm with the skills and capabilities of its suppliers. However, to be strategic, supply chains must be driven by marketing strategies, targeting of customers, and the creation of value propositions that are highly attractive to these customers. Thus, our treatment of the supply chain will identify strategy and customers as the beginning points for all planning and decision-making activities.

DYNAMIC

Supply chains are seldom static. They are constantly changing and evolving as a result of strategic changes taking place within the firm, competitive actions, changes in technology, and shifts in targeted customers or in customers’ needs.

Strategic supply chain management is a relatively new development. It is a development that offers great

promise but one that raises numerous questions and unresolved issues that must be addressed should the promise of strategic supply chain management be realized.

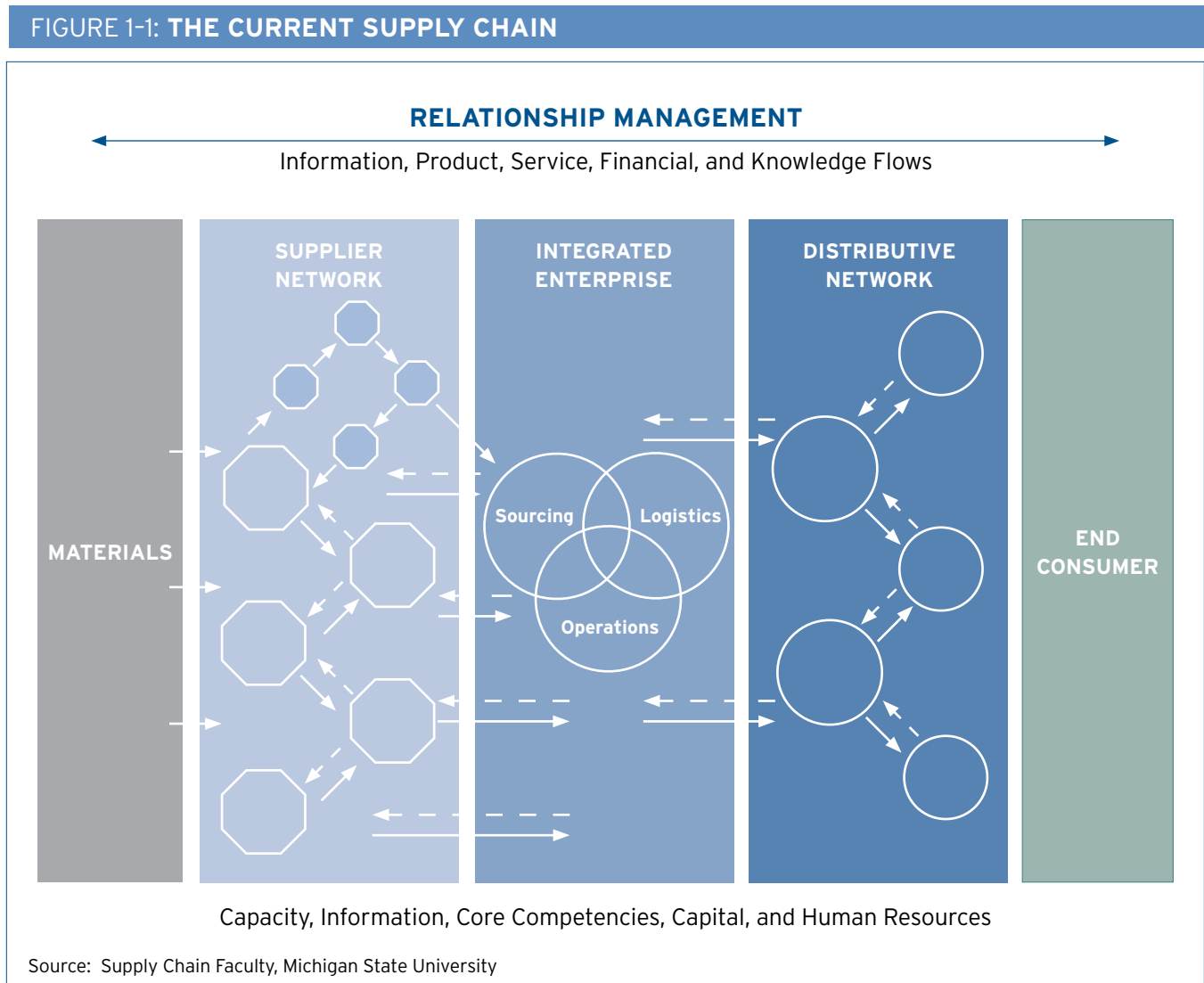
When dealing with these unresolved issues and questions, it is important to recognize that these issues must be framed in terms meaningful to the three key stakeholders: practitioners (those involved in the development, implementation, and evolution of supply chain management in the field); researchers (those involved in generating new knowledge focused primarily on the various aspects of supply chain management); and educators (those responsible for spreading the principles and practices of supply chain management to business students, graduate students, executives, and members of professional organizations).

THE STRUCTURE OF THE REPORT

This report and its findings are presented in five chapters. The first chapter provides an introduction; the second presents the structure of the multimethod research methodology, as well as summarizing the results of the Delphi study (which identifies and rates in importance the various traits associated with today’s supply chain and those of the future supply chain). In the third chapter, the various gaps/obstacles that are inhibiting the transition from the current to the future supply chain are explored. The fourth chapter presents the action item agendas; the fifth chapter explores the issue of the next step. The various appendices found at the end of this report present material used during the execution of the Delphi study and in the workshop. As is noted in the fifth chapter, this study should not be viewed as an end, but rather as a starting point for future research into the strategic supply chain – SCM 2010 and beyond.

CONCLUDING COMMENTS

Supply chain management is now a fact of life. It is also a dynamic, living entity that is constantly changing. At times, these changes are small; at other times, the changes are significant and dramatic. The indications are that we are currently encountering a time of dynamic and significant change. The findings presented in this report should better prepare readers to meet the challenges of the new supply chain.



Background to the Study: The Research Methodology Outlined

OVERVIEW

This report summarizes the various phases generated at a workshop on “Supply Chain Management 2010 and Beyond” that was held at the James B. Henry Center for Executive Development, September 20-21, 2006. This workshop and its findings, in turn, were the result of a process that began in late 2005 with the decision to go forward with the workshop. At that time, it was decided that, if the workshop were to be successful, a structured approach would be necessary. In a subsequent meeting held on January 7, 2006, it was decided that a three-phase approach would be used:

- Phase 1 - Background work aimed at identifying critical issues pertaining to supply chain management, leading academic researchers and supply chain practitioners, and firms considered to be at the leading edge of supply chain management.
- Phase 2 - A Delphi study administered to all participants to identify and prioritize the issues facing supply chain managers today, and the issues they expect to face out five years and beyond.
- Phase 3 - A workshop at Michigan State University to bring together supply chain experts and explore opportunities to meet these future challenges.

PHASE I - BACKGROUND

This stage began in February 2006. It involved a literature review of the supply chain management-related body of knowledge to uncover issues suggested by previous studies. In developing this review, literature from both the academic and practitioner fields were examined. Among the journals selected for this review were:

- *The Journal of Operations Management*
- *The International Journal of Production Research*

- *Decision Sciences Journal*
- *Harvard Business Review*
- *Strategic Management Journal*
- *The Academy of Management Journal*
- *Sloan Management Review*
- *California Management Review*
- *The International Journal of Operations and Production Management*
- *The Journal of Business Logistics*
- *The Journal of Supply Chain Management*
- *The International Journal of Production Economics*

The review covered a time period from 1998 to the present date.

The purpose of the review was four-fold:

- To identify the major issues and concerns pertaining to the continued evolution and growth of supply chain management. These issues and concerns were critical since they formed the foundation for the Delphi study (as described in the next phase).
- To identify those researchers who were active in the study of issues pertaining to supply chain management.
- To identify those practitioners, consultants, and practitioner authors who were active in the study and reporting of issues pertaining to supply chain management.
- To identify companies that were considered to be at the leading edge of the theory and practice of strategic supply chain management (i.e., where the supply chain was used to help the firm either develop unique, compelling strategic objectives or where

the supply chain played a critical role in helping the firm attain its strategic objectives). In selecting these firms, the interest was not simply in those firms that dealt exclusively on the upstream/supply side of the supply chain. Rather, there was an explicit attempt to include firms that also focused on the downstream/demand side of the supply chain.

The information generated was reviewed by the members of the research team.³ The literature identified a list of relevant supply chain issues or concerns that were used to develop the Delphi study.

PHASE II - THE DELPHI STUDY

The development of the Delphi study phase began in late April 2006, with the final version of the Delphi form (Appendix 1) sent out on May 22, 2006. The panel of experts was notified that the Delphi questionnaire was available to be completed; the Delphi questionnaire was uploaded on the Michigan State University business server and available through the Internet. During this period, several critical events took place. First, funding for the workshop was secured. The project was funded in part by SAP, the APICS Educational and Research Foundation, Inc., the Department of Marketing and Supply Chain Management from the Broad College of Business at Michigan State University, and Joseph Sandor, the Hoagland-Metzler Chair of Strategic Sourcing at Michigan State University. Second, the research team (initially consisting of Steven A. Melnyk, Ph.D., Michigan State University; Rhonda Lummus, Ph.D., Iowa State University; and Robert J. Vokurka, Ph.D., Texas A&M University-Corpus Christi, welcomed an additional member, Joseph Sandor. Professor Sandor played a critical role in the successful comple-

tion of this project by providing his industry contacts. These contacts were extensively used in soliciting and securing highly placed industry participation (i.e., participation at the senior management level).

THE DELPHI STUDY DESCRIBED

In planning the on-site workshop, it was decided that for the group to focus on the issues and concerns of interest (rather than simply spending time on site identifying and discussing these issues) was to administer a Delphi questionnaire to the potential workshop members. The Delphi technique is a method used to obtain a reliable consensus of opinion from a group of experts by means of a series of questionnaires combined with controlled feedback (McKenna, 1994, p. 1221). As a technique, it is well designed to handle opinions rather than objective facts (Schmidt, 1997). It is also a widely used technique, having been used in more than 1,000 published research studies since its introduction during the late 1940s (McKenna, 1994).

The Delphi technique is most appropriate under the following conditions (Linstone & Turoff, 1975):

1. The research problem does not lend itself to precise analytical techniques but can benefit from subjective judgments on a collective basis.
2. The research population may present diverse backgrounds with respect to experience or expertise.
3. More subjects are needed than can effectively interact in a face-to-face exchange.
4. Disagreement among individuals may be so severe or politically charged that anonymity must be ensured.

³ The task of reviewing the literature and the Internet and gathering the resulting information was carried out by Hari Krishnan, an MBA student in the Broad School, along with Steven A. Melnyk, Ph.D., Robert Vokurka, Ph.D., and Rhonda Lummus, Ph.D.

5. Time, cost, and logistics would make frequent meetings of all the subjects unfeasible.

Of these five conditions, it was the first and the fifth that proved to be the primary reasons for the selection of the Delphi technique for this phase of the study.

The Delphi technique embodies the following key characteristics (Chocholik, Bouchard, Tan, & Ostrow, 1999; Loughlin & Moore, 1979; Whitman, 1990):

1. The use of a panel of "experts" for obtaining data.
2. Participants do not meet in face-to-face discussions.
3. The use of sequential questionnaires and/or interviews.
4. The systematic emergence of a concurrence of judgment/opinion.
5. The guarantee of anonymity for subjects' responses.
6. The use of frequency distributions to identify patterns of agreement.
7. The use of two or more rounds between which a summary of the results of the previous round is communicated and evaluated by panel members.

The Delphi study use in this research (see Appendix 1) was developed by drawing on the findings of the literature review carried out during Phase I. The initial questionnaire was subjected to thorough pretesting and was submitted to various groups of executives within the Executive Development Programs of Michigan State University who were involved in supply chain management activities. Based on feedback received from these groups, the initial Delphi questionnaire was revised. Once revised, it was posted on the Internet.

The first round of the Delphi ran from May 22 to June 9, 2006. These were summarized and included as part of the second round of the Delphi (which ran from July 15 to August 10). The results of the first round can be found in Appendix 2. The results generated from this second round were collected and summarized for presentation during the first session of the workshop (September 21, 2006). The results are presented in Table 2-1.

In interpreting these results, it is important to note that all of the items listed were evaluated using a 5-point Likert scale, where "1" denoted that the item was regarded as irrelevant by the respondent; "3" indicated that the item was somewhat important; and, "5" denoted that the item was regarded as "critical." Consistent with the theme of "Supply Chain Management 2010 and Beyond," the Delphi forced the experts to assess each trait along two time dimensions: importance today and importance five years from today.

The results paint an interesting picture. Critical to managing today's supply chain are issues such as delivery, supply chain disruptions, leadership, security, and trust (to name some of those issues rated at a 3.75 level or above). Yet, managing tomorrow's supply chain is viewed as being far more complex and demanding.

One way of assessing this change is to look at those traits rated 4.00 or higher. For today, only 3 traits were rated so highly. Yet, five years from now, there are 16 traits out of 26 that were rated at this level.

In the future, the supply chain will be asked to do more than simply deliver goods and services. It will be asked to deal with issues such as supply chain disruptions and risk management and leadership within the supply chain. It will be asked to develop and manage supply

TABLE 2-1: DELPHI RESULTS - SECOND ROUND DELPHI RESULTS

ROUND 1 ITEMS	Importance Now			Importance 5 Years from Now		
	Round 1 Mean	Round 2 Mean	R1 to R2 Change	Round 1 Mean	Round 2 Mean	R1 to R2 Change
1 Supply chain disruptions and supply chain risk	4.25	4.29	0.04	4.58	4.86	0.28
2 Leadership within the supply chain	4.00	4.24	0.24	4.38	4.72	0.34
3 Managing the timely delivery of goods and services	4.25	4.33	0.08	4.58	4.57	(0.01)
4 Managing product innovation by drawing on the capabilities of the supply chain	3.29	3.48	0.19	4.33	4.52	0.19
5 Implementing appropriate technology to allow seamless exchange of information within the supply chain	3.67	3.76	0.09	4.46	4.48	0.02
6 Developing trust between supply chain members	3.92	3.89	(0.03)	4.42	4.40	(0.02)
7 Measuring performance across activities and partners within the supply chain	3.58	3.76	0.18	4.33	4.38	0.05
8 Protecting intellectual property within the supply chain	3.75	3.90	0.15	4.29	4.38	0.09
9 Managing and structuring relationships within the supply chain	3.92	3.81	(0.11)	4.20	4.33	0.13
10 Power relationships within the supply chain	3.79	3.81	0.02	4.08	4.29	0.21
11 Maintaining visibility and control within the supply chain	3.88	3.95	0.07	4.29	4.29	0.00
12 Changing/realigning performance measurement across activities and partners within the supply chain	3.50	3.33	(0.17)	4.08	4.19	0.11
13 Maintaining and protecting security within the supply chain	3.63	3.90	0.27	4.17	4.15	(0.02)
14 Managing and improving environmental performance within the supply chain	3.13	3.20	0.07	4.00	4.05	0.05

TABLE 2-1: DELPHI RESULTS - SECOND ROUND DELPHI RESULTS CONTINUED

ROUND 1 Continued	Importance Now			Importance 5 Years from Now			
	Issue	Round 1 Mean	Round 2 Mean	R1 to R2 Change	Round 1 Mean	Round 2 Mean	R1 to R2 Change
15	Developing and maintaining appropriate communication and connectivity within the supply chain	3.75	3.75	0.00	4.25	4.05	(0.20)
16	Using the resources of the supply chain to identify new and unique solutions to existing and new problems	3.17	3.45	0.28	4.13	4.00	(0.13)
17	Rapid redesign of supply chains to meet changing customer needs	3.67	3.38	(0.29)	4.21	3.90	(0.31)
18	Sharing rewards and financial risk within the supply chain	3.13	3.19	0.06	4.00	3.86	(0.14)
19	Managing confidentiality within the supply chain	3.63	3.62	(0.01)	3.83	3.86	0.03
20	Developing and implementing strategic segmentation/spend analysis on the customer side of the supply chains	3.46	3.38	(0.08)	3.96	3.76	(0.20)
21	Developing and implementing strategic segmentation/spend analysis on the supply side	3.46	3.71	0.25	3.92	3.67	(0.25)
22	Developing, changing, and maintaining the appropriate organizational cultures within the critical partners of the supply chain	3.29	3.00	(0.29)	3.67	3.62	(0.05)
23	Responding to the "China Price" syndrome (i.e., a competitor who emphasizes and delivers low cost)	3.75	3.81	0.06	3.38	3.52	0.14
24	Identifying and managing channel conflict	3.50	3.05	(0.45)	3.67	3.43	(0.24)
25	Governance within the supply chain (e.g., Sarbanes-Oxley)	3.33	3.38	0.05	3.58	3.38	(0.20)
26	Colocating key stakeholders within the supply chain	3.00	3.14	0.14	3.25	3.24	(0.01)

TABLE 2-1: DELPHI RESULTS - SECOND ROUND DELPHI RESULTS CONTINUED

ROUND 2 Additional Items Issue	Importance Now			Importance 5 Years from Now		
	Round 1 Mean	Round 2 Mean	R1 to R2 Change	Round 1 Mean	Round 2 Mean	R1 to R2 Change
Supply chain talent management including training, skill building, competency development, and career development		4.20			4.60	
Managing fuel and transportation costs		3.86			4.29	
Supply chain infrastructures worldwide, e.g., port, airports, highways, railroads		3.55			4.19	
Managing environmental issues and recycling of materials		3.24			4.00	
Development of new technologies that affect supply chain efficiency, e.g., RFID		3.48			4.00	
Collaborative supply chain forecasting		3.30			3.96	
Process improvements and waste reduction		3.57			3.90	
Identification and development of alternate materials		3.40			3.75	
Alternate material identification and development		3.24			3.62	
Managing supplier diversity		2.81			2.81	

chains that can reduce environmental costs, be agile in using supply chain capabilities to design and deliver superior solutions to customers, and it will be asked to manage and protect not only physical assets but also intellectual property assets (an issue consistent with a supply chain that is moving from simply product development to product design and innovation).

In short, the future is going to be challenging. To meet those future challenges, organizations must start putting programs in place and take action today. Identifying those programs and actions is the major focus of this study's third phase.

PHASE III - THE WORKSHOPS

The literature review and the Delphi study provided input into the third phase of the project – the on-site workshop. The goal of the workshop was to bring together the participants for the purposes of:

- Expanding on the findings of the Delphi study
- Understanding the major issues and gaps affecting the movement of supply chains between the current and future states
- Developing agendas in three critical areas (practice, research, and knowledge dissemination) aimed at closing/resolving the gaps previously identified.

Achieving these objectives required an on-site workshop since the face-to-face discussion and dynamic interchange of ideas and comments were seen as critical to the success of the project and to the resulting quality of the documents/outputs generated from this workshop.

To participate in the workshop, attendees had to have participated in the first two rounds of the Delphi study. Further, to make participating in the workshop attrac-

tive, the organizers secured external funding to pay for all expenses (hotel, meals) incurred by the participants once they arrived onsite.

The organizers developed a general process framework for the workshop. That is, the workshop was envisioned as consisting of the following activities:

- An introductory session to review the objectives, summarize the results of the Delphi, and review the workshop protocol
- A series of small group breakout sessions were followed by large group discussions. At each stage in the process, the participants would break into three small groups, where the issues/topics assigned to them would be discussed. Each group's interactions would be managed by a facilitator. At the end of the small group activities, the participants would meet to review the results and identify the critical issues before attending an ending summary session.

Consistent with the general approach, a workshop protocol was developed (see Appendix 3). This protocol was designed to ensure consistency and structure in the various activities. Supporting each of the small group breakout sessions was a set of standard reporting forms (to be used for capturing and reporting the results of each small group) and a recorder to transcribe the results. Once the protocol was final, it was possible to prepare the agenda (see Appendix 4). The workshop facilitators and recorders are identified in Table 2-2. The workshop was held at the James B. Henry Center for Executive Development at Michigan State University and brought together 23 supply chain experts. Appendix 5 identifies the participants and their organizations. The information generated from the workshop is presented in the next two chapters.

TABLE 2-2: WORKSHOP FACILITATORS AND RECORDERS

Session	Facilitator	Recorder
Small Group Breakouts	Rhonda Lummus	Delvon Parker
	Robert J. Vokurka	Shawn Jones
	F. Robert Jacobs	Laird Burns
Large Group Discussions	Steven A. Melnyk Joseph Sandor	Laird Burns

Identifying the Gaps

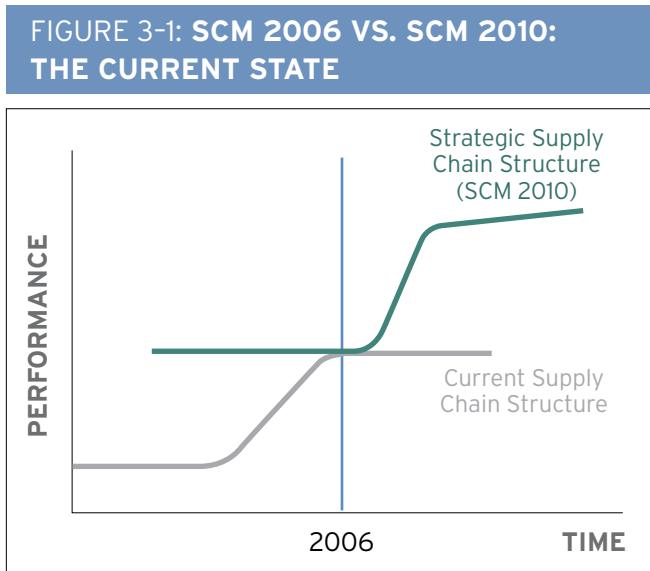
The task facing most managers today is that of transitioning their supply chains from the tactical level to the strategic level. This is not an easy transition to make since it requires identifying and overcoming several critical gaps. Identifying and describing these gaps became the focus of the second session of the workshop.

From the discussions during the workshop, the research team developed a picture of two supply chains (Figure 3-1). The first is the current supply chain. As experienced by many firms, this supply chain may be effective (able to meet or satisfy corporate objectives) and efficient (able to satisfy these needs at a lower total cost relative to the alternatives available). Yet, as can be seen from Figure 1, this chain is reaching the upper limits of its performance potential. The reasons for this upper limit may be due to the nature of this supply chain. It is primarily a tactical supply chain – one that is charged with carrying out the directions of upper management but one whose capabilities are often not completely understood or appreciated by those who are charged with setting corporate strategy.

It is a supply chain that is often narrowly focused. Its charge is often stated in terms of execution and cost. The strategic implications of the supply chain are often overlooked. Consequently, with the existing supply chain, there is a chasm between those who work with and in the supply chain and those who oversee the resources of the firm and who are charged with identifying ways that the firm can generate higher relative levels of value.

Against this first supply chain, there exists another emerging supply chain – one denoted as SCM 2010. In contrast to the first supply chain, this supply chain is very different. It is strategic; it deals with not only execution but also with product design (within the context of the supply chain); it is strongly global (i.e., it embraces and plans for the global dimension of sourcing and marketing); it is highly adaptive to changes in both supply and demand; it focuses on cost avoidance (avoid making bad decisions in the first place) and cost savings (which is correcting the effects of a bad decision previously made); it recognizes the presence of risk (and that risk is more than simply supply chain disruption); and it plans for and manages risk appropriately. It is viewed as a strategic asset and in many cases a core competency. It is a system that encourages and fosters collaboration and trust where appropriate. It evaluates performance along multiple dimensions – lead time, cost, quality, risk exposure, consistency with strategic objectives, and environmental considerations.

While the current supply chain has reached the upper limits of its performance potential, this new supply chain has yet to reach its full potential. More importantly, while the current supply chain is approaching the end of its life cycle, this new strategic supply chain is at the start of its life cycle. The question to be ad-



dressed is – how do we get from one supply chain to the other? To do that, we must understand the gaps that stand in the way of this transition.

GAPS

The participants, both academicians and practitioners, noted that most of the major supply chain characteristics had gaps from where organizations are today in supply chain management practices, processes, and relationships. These gaps could be grouped into six major categories:

- Strategic visibility and alignment
- Talent management and leadership
- Supply chain models including optimization, risk, and cost
- Process orientation including measures, information, and integration
- Relationships and trust
- Supply chain architecture and structure

Strategic visibility and alignment: There is still a lack of a strategic perspective of the supply chain in many organizations. Senior management does not yet fully understand the value of the supply chain and that the benefits need to be better measured and recognized. In some organizations, a more refined alignment of operations, logistics, and supply management needs to take place to more fully exploit the value of supply chain management. A truly global perspective is needed.

Talent management and leadership: There is a shortage of talent management in the field of supply chain management. An insufficient supply of competent cross-functionally trained supply chain professionals exists. Competency models need to be developed to

better identify and prepare individuals for key supply chain roles. Global business skills need to be developed since commerce today expands across national borders. A better identification of the required body of knowledge at both the operational (undergraduate) and strategic (graduate) educational levels is needed. There are insufficient ties between educational institutions and industry and more student and faculty internships would be valuable. Individuals need to advance through supply chain competencies, gaining cross-functional experience, to become supply chain leaders.

Supply chain models including optimization, risk, and cost: There are insufficient validated models for supply chain optimization, risk minimization, and cost. Organizations are putting the pieces together, but more is needed in the way of defined supply chain models for evaluation and optimization of the entire chain. Management needs better understanding of the risk drivers and strategic importance of risk management. This includes competitive, supply side, and natural disaster disruptions, as well as better awareness of risk's flip side – opportunity. The opportunity includes not only developing distinctive and sustainable cost advantage but also finding ways to better engage the supply base to drive top-line growth.

Process orientation including measures, information, and integration: Supply chain activities are still often functionally based. More of a process orientation is needed to fully extract the potential value of supply chain alignment. This requires measurements that cross functional boundaries and the information needed to adequately monitor performance and improvements. Many measures used today are short-term, and interfirm measures are needed for supply chain activities. Appropriate information is sometimes

difficult to extract and there are incompatible IT systems among organizations.

Relationships and trust: An integral part of effective supply chain management is the personal relationships among people across processes and organizations. This requires an appropriate reward structure and top management support internally. Externally, goal congruency, trust, communication, and integrated processes are all prerequisites. Trust involves both internal and external supply chain relationships.

Supply chain architecture and structure: There is a need for better methodologies of total supply chain network design including real-time information and visibility. Value streams need to be mapped for value drivers using defined procedures and prioritization mechanisms and rules. Tools for automatically mapping numerous supply networks would be useful, as well as the identification of choke points from the aggregation of supply chains.

MICRO-GAPS

These six gaps identify major sets of obstacles and issues that managers must be prepared to address if the supply chain is to realize its strategic potential. Yet, these six gaps are in many ways too broad. To further define them, a number of very specific issues and gaps were identified during the workshop. Specifically, 16 micro-gaps were identified. To facilitate their discussion, they are grouped around the six major gaps that they were associated with during the general discussion session. This grouping is summarized in Table 3-1.

STRATEGIC VISIBILITY AND ALIGNMENT

The first micro-gap identified was that of **Strategic Supply Chain Investment and Improvements**. Specifically, with this first micro-gap, the participants noted that management has to make significant improve-

ments and investments in the supply chain if its potential is to be realized. These investments are not simply in brick and mortar. Rather, they are investments in performance measurement systems, linkages between supply chain design and management and the overall business plan, the development of supply chain advocates and champions at the upper levels of corporate management, and in shifting the perspective of management from the short term to the long term.

These investments are needed because, currently, supply chains and their managers are limited by the following factors:

- Short-term perspectives (building a strategic supply chain is a long-term undertaking and it must be evaluated in terms of the long term)
- Lack of critical capabilities in the supply chain (due to a lack of necessary investments)
- Failure to recognize the supply chain's critical role in delivering value at the corporate level and to recognize that supply chain management could be viewed as a strategic core competency
- Insufficient feedback or communication between top management and those managers involved in the supply chain. Consequently, those at the top are often unaware of the capabilities and limitations of their supply chains. In contrast, those involved with the design and management of the supply chain are unaware or unable to restate the corporate objectives into terms meaningful for the supply chain. The result is a significant disconnect between these two groups.
- Reward systems are not commensurate with the required long-term focus. In most firms, supply chain performance is rewarded in terms of short-term cost cutting and cost savings activities. Such

TABLE 3-1: MAPPING MICRO-GAP ISSUES AGAINST THE GAPS

Gaps	Micro-Gaps
Strategic visibility and alignment	Strategic supply chain investment and improvements
	Global How to develop skills sets to know every market in every country and effectively manage this, intercultural training
	Information and supply chain visibility
	“Cradle-to-Cradle” management
Talent management and leadership	Leadership
	Resolving supply network paradoxes
	Talent management
Supply chain models including optimization, risk, and cost.	Total supply network optimization – visibility, real-time information, multiple supply chains of unequal importance
	Supply chain governance Leadership team is not cognizant of supply chain value
	Risk management, planning, strategy
Process orientation including measures, information, and integration	Supply network measures
	Product innovation using supply chain input
	Business process integration
Relationship and trust	Collaboration and relationships How to redefine boundaries of what people focus on to induce collaboration, rewards for this
Supply chain architecture and structure	Layered and dynamic supply chains
	Supply chain structure – physical

a perspective encourages managers to overlook activities such as early supplier involvement (ESI), and new product development and supply chain designs.

- Little or insufficient publicity for the impact and importance of the supply chain. Consequently, there is limited or no recognition either internally or externally for the role of the corporate supply chain.
- Not enough supply chain advocates/champions at the upper management levels. Consequently, there is no one at the upper management levels who is protecting and nurturing the supply chain participants and who is promoting supply chain capabilities and importance at this level.
- Viewing supply chain management as simply a purchasing function. Such a perspective emphasizes buying and selling; it does not adequately recognize that effective supply chain management involves a number of activities beyond purchasing – activities such as engineering, logistics, supplier development, product design, accounting measurement, alignment and coordination of information flow, and critical business processes.

Addressing these factors is critical because, if unaddressed, they will effectively hinder the ability of the firm to transition its supply chain to a strategic supply chain. Tackling these gaps requires increased investment and a significant change in top management awareness and attitudes.

The second micro-gap is that of the **Global Gap**. This gap is a reflection of the fact that most supply chains must now operate in a global environment. In this new environment, extensive interdependency is the

rule, not the exception. It is an environment where the lowering of trade and political barriers and the rapid growth of digital technology has made it possible to do almost instantaneously business with billions of buyers and suppliers across the world. This is the very notion that underlies the recent best seller, *The World is Flat: A Brief History of the 21st Century* (Friedman, 2005).⁴

Effectively operating in this new and broader environment requires the development and encouragement of new skills. These skills include more than simply business skills. They include skills involving language and intercultural awareness. The following is a list of the critical skills strategic supply chain managers need to not only survive but also thrive in this new environment:

- Understanding of the markets (domestic and global)
- Understanding of capacity (both from a volume and capability perspective). Capacity is critical to supply chains since supply chains can be viewed as capacity chains. Yet, for many managers and even researchers, capacity remains one of the most complex and difficult concepts to explain. One of the reasons lies in the nature of capacity. Capacity is more than volume (the number of units of output produced per time period). It also involves capabilities. Capabilities, which are the products of processes, assets, infrastructure, system organization, and system extensions (additional investments made in extending/enhancing corporate or supply chain assets) define the strengths and weaknesses of the firm and of the supply chain. Capabilities define what one system is “good” at doing and what that same system is “poor” at doing. When dealing

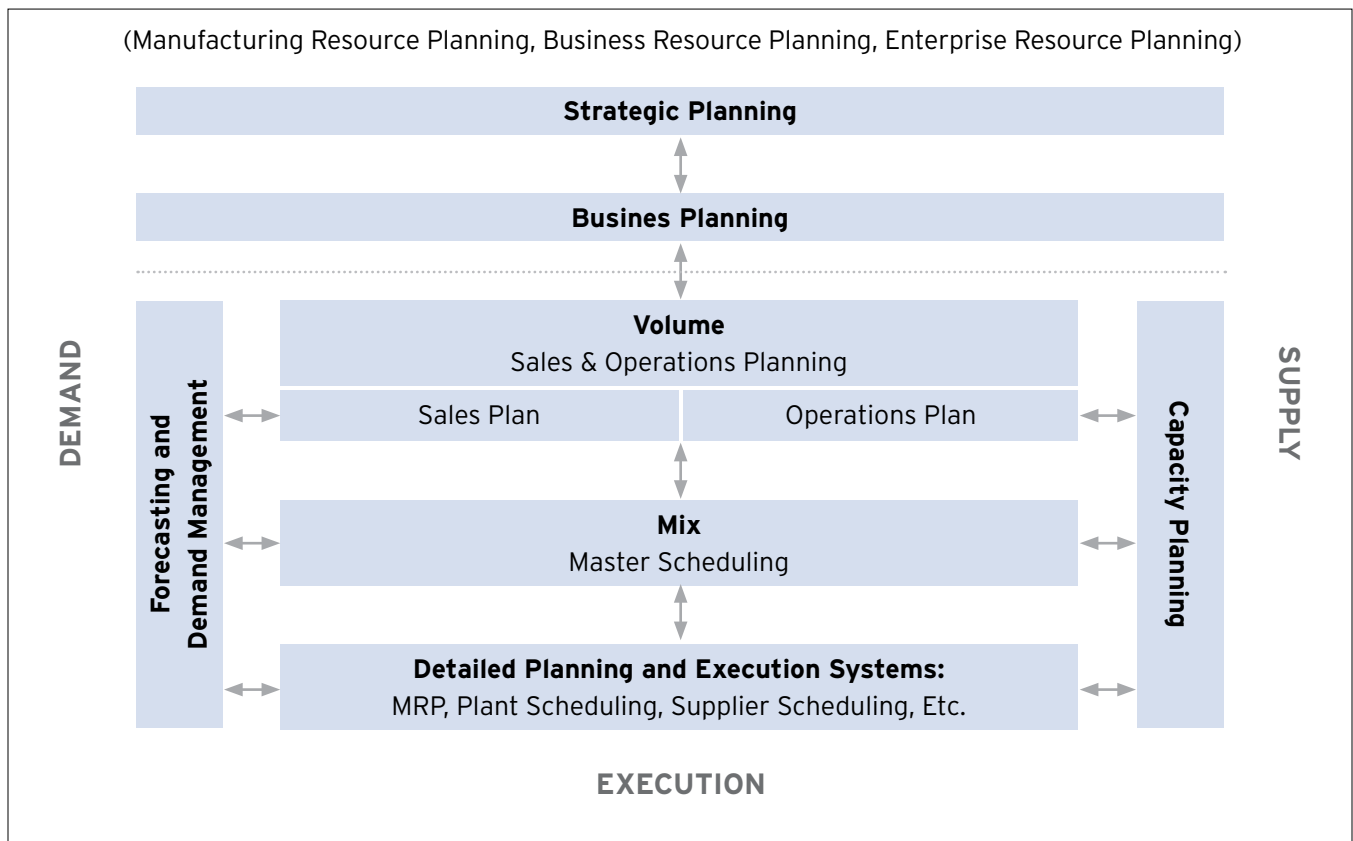
⁴ Thomas L. Friedman, *The World is Flat: A Brief History of the 21st Century*, (New York, NY: Farrar, Straus, and Giroux, 2005).

with supply chains, the challenge facing managers is to ensure that the capabilities of the supply chain are properly aligned and coordinated so to better meet the needs of customers. While sufficiently difficult to achieve domestically, this alignment is even more critical when dealing with global supply chains. Because of separations in terms of time, distance, and culture, it is possible to structure a supply chain in which the capabilities of the suppliers are mismatched with the needs of the customers. The results of such mismatches can and are often disastrous for the firm and the customers.

thriving in the global environment requires more than simply generating production plans and transmitting product orders to foreign suppliers. Rather, it involves developing a planning system that focuses on issues such as matching the capabilities of the supply base with the needs of the customers; it involves developing a planning system that builds and uses supply chain visibility to identify and mitigate potential problems; it involves building a planning system that promotes collaboration and coordination of activities within the supply chain. Consequently, we should view the traditional resource planning system (Figure 3-2) as the starting

- Enhanced and broader planning. Surviving and

FIGURE 3-2: THE RESOURCE PLANNING SYSTEM



point for managing global supply chains. By itself, it is not enough; it has to be enhanced and broadened. While appropriate for managing the internal factory, it is not adequate to the needs of managing and directing the global supply chain.

- Understanding the critical costs incurred when going overseas. In many cases, doing business in locations such as the People's Republic of China may mean that labor costs are lower. However, in exchange for these lower labor costs, the firm may find itself faced by higher fixed/overhead costs since it has to build the infrastructure necessary to grow the expertise and capabilities of these new facilities. The firm's management may have to teach management and planning skills to the plant management of these new facilities. It may have to set up the information and planning systems needed for the new plant to carry out its activities. All of these activities require investments that the firm may not have planned for and which may offset any labor savings.
- Recognizing the "risk" implications of global supply chains. Global supply chains, by their very nature, have some interesting traits. First, they are spatially longer – they cover more geographic distance. They are potentially more "fragile." If something happens anywhere in the supply chain (e.g., a plant fire at the supplier's site, a ship carrying the products from the suppliers sinks, the products are held up for longer than expected at inspection), the

supply chain can take longer to respond. With the more prevalent usage of lean systems and practices (resulting in reduced buffers), these supply chains also become increasingly fragile – less able to quickly and efficiently deal with such risks. For example, the SARS crisis of 2003 adversely affected the delivery performance of many North American firms that depended on supplies coming from the Far East. In many cases, the managers from these North American firms were unable to travel to the Far East and visit their suppliers (to assess the extent of the problems and the options available to them) because of travel restrictions imposed by the various governments involved. Without adequate buffer stocks to protect the North American firms, performance was adversely affected as deliveries fell and costs increased. Finally, when dealing with global supply chains, there is the risk of not being able to adequately protect intellectual property. The participants noted several instances of where products embodying significant investments in intellectual property were outsourced overseas. Eventually, the buying organizations learned that the suppliers were sharing/selling the intellectual property to others or they were engaged in "third shift" activities.⁵ In these cases, global supply chains could and did compromise intellectual property. All of these are the different types of risk imposed by global supply chains.

⁵ The "third shift" describes a situation where a supplier located typically in the Far East will produce the goods with significant intellectual property for two shifts for the buying organization (the organization that invested time, money, and effort in developing new products and its associated intellectual property). Production over these two shifts is needed to meet the needs of the customers. However, these same supplier firms have extra capacity available on the last shift. Consequently, they make small cosmetic changes to the product and then manufacture and sell it for a lower price. These firms have not had to make the same investments in developing the intellectual property that the buying organizations did. This is a real and significant threat to intellectual property.

- The need to develop a better cultural understanding (e.g., language, value system, country morals, and legal system). For example, when dealing with firms in some countries, it is difficult to get their managers to admit fault for any problem, even if it directly attributable to them. For these managers, saving face is critical. In other cases, foreign subordinates are hesitant to offer suggestions or to criticize the actions of their superiors (while Western managers may expect this input). For these subordinates, it is culturally inappropriate for them to challenge the actions of their superiors.
- The need to understand the impact of governmental differences on global supply chain management. When dealing with product and information flows that cross international boundaries, management must deal with differences in governmental regulations. What is appropriate in one country may not be appropriate in another. When building a product that consists of components sourced from various countries, there is the question of what standards (e.g. quality, environmental) to apply. The participants brought up numerous instances where the regulations of various countries in which they operated were difficult to “harmonize.” Dealing with the task of how to bring harmony out of conflicting regulations was recognized to be a major challenge facing any manager working with the global supply chain.
- Improved continuous environmental scanning, as it relates to the global supply chain.
 - Better assessment of risk potential
 - SWOT (Strengths/Weakness/Opportunities/Threats) analysis
 - Capacity analysis across the supply chain.
- The need to improve communication internally. The participants recognized that supply chain success involves not only better communication with external partners but also the breaking down of barriers within the company.

The third micro-gap is that of **Information and Supply Chain Visibility**. The gap involves information not being visible to all participants in the supply chain, from end-to-end. There are multiple causes for this gap including:

- Access issues – Not all participants have access to needed information. Some information may be available to supply chain partners closest to the customer and may not be shared back to all supply chain members.
- Data integrity – Incorrect or missing information. This is a critical issue when dealing with global supply chains. In many cases, suppliers located in the Far East have very limited information systems. In many cases, the management of these foreign firms is unaware of the need for data that are complete, current, and accurate. They are unaware of the importance of good data. For those managers who may be aware of the need for good data integrity, they may be preoccupied with the needs of meeting current production requirements. In some countries, the suppliers they are dealing with are very new. One director noted that one supplier had just recently opened a plant in what had been a rice field a year earlier. The employees in this operation had been farmers the prior year. This meant that the need for good data and high levels of data integrity was “shelved” while the management at the new plant focused on such issues as teaching employees, organizing production, and meeting

production schedules. The bottom line – when dealing with global supply chains, data integrity is an issue and a concern, not a given.

- System incompatibility – Systems for supply chain partners cannot properly communicate. While the system may provide the needed information within one firm, it may not be capable of sharing information across firms.
- Lack of content clarity – The basic breakdown of communication among supply chain partners, with the result that what the customer wants (and thinks that they have clearly communicated) is not what the supplier has heard and understood. This is a critical issue when dealing with global supply chains. One participant told the story of working with a Far Eastern supplier. The discussions had been long, protracted, and difficult. At the end, the person in charge of negotiations for the American firm had laid out their requirements in a great deal of detail. The question was then posed - “Do you understand what you must do?” The supplier replied, after a pause, “Yes.” The American firm walked away thinking that everyone agreed to the resulting plans and requirements. Yet, when the relationship was put into action, the supplier did not perform to the level required. The managers at the American firm, in frustration, asked how the supplying company could fail since it had indicated that it understood what was needed. In the resulting discussion, what came out was that the supplier had not lied – it understood what the customers wanted. However, no one asked to indicate whether the supplier could meet those requirements.
- Missing a global perspective – Managers must realize that global supply chain management is more

than buying and selling globally. It involves issues of how to bring together assets that are globally dispersed to better meet the ever-changing needs of its customers. It also means recognizing that today’s suppliers may not be suppliers in the future. This point was driven home by the comments made by one vice-president of global sourcing. He observed that in a recent trip to China, he was told by the management of one firm that it was currently exporting more than 90 percent of its output, in five years time the management expected that 100 percent of its production would be directed to meeting the growing internal demands of the Chinese market. Furthermore, in 10 years, the management at this Chinese firm expected that the China market would become the largest customer base - far outstripping the ability of Chinese suppliers to meet these needs. This would mean that the surplus in demand would have to be met through imports into China. The potential problem for many American firms, noted this vice-president, would be the lack of manufacturing capacity in the United State – capacity that was eliminated because of decisions previously made to outsource that same production to China. Avoiding this and other problems requires that management embrace a global perspective when doing both short-term and long-term planning.

- Too reactive – Tactical, not strategic, in nature. Potential problems are not identified and addressed in advance. Rather, the problems are identified once they become evident. The system then works on correcting the effects of the problem. Most global supply chains suffer because they emphasize problem correction rather problem prevention. In other words, they are not designed and managed “correctly.” In many cases, these flaws are

compounded by the location of suppliers (often far away from us); the inability of suppliers to secure financial resources at the same rates as their often larger customers; and the relative “immaturity” of their internal information, planning, and production processes.

Information and supply chain visibility is critical because in today's world, potential issues and problems must be identified and addressed before they become real problems. Once they become real problems, the traits of the new supply chain (global, dispersed) can hinder the ability of the firm to quickly deal with these issues. Just as visibility when driving a car is critical, so is visibility when managing the supply chain.

The fourth micro-gap involves firms and their supply chains adopting a **“Cradle-to-Cradle”** perspective when it comes to materials and inputs. The participants recognized that in the future the demand for inputs and materials would increase at a rate beyond that of the suppliers' ability to provide. This increase is not simply because of factors such as the limited supply of raw materials. Rather, it was also due in large part to the emergence of countries such as the People's Republic of China and India as dominant product consumers. Consider the following statistic. By 2010, it is expected that China will have more than 1.4 billion people of which some 660 million will be between the ages of 20-50 (IIASA, 2006).⁶ This age group will generate the greatest level of demand as consumers of goods and services. Consequently, this demand is expected to greatly exceed the capacity of Chinese factories, thus requiring that China became

a major importer of world goods and services. This trend, which is not limited to China but also includes India and other countries, is expected to increase the demand of raw materials to the point that the competition for scarce materials will significantly inflate prices and limit availability.

One way of reducing this impact is to become better at preserving existing raw materials. That is, firms must become not only more efficient (use less material per every unit of output) but also do a better job of tracking and reducing the amount of raw material lost as scrap or as pollution. In the past, this approach has been referred to as “cradle-to-grave” - from extraction from the earth to the return of the material to the earth. This approach is fundamentally flawed in implementation because it is associated with “recycling.” Recycling involves capturing scrap, salvage, and rework and returning it to a state that allows that material to be used as a raw material again. The problem with this approach is that the resulting raw material may be of a lower grade than the original material. In many cases, this new material cannot be used to satisfy original demand. Additional material must be extracted to meet this original demand. What is needed is an alternative approach - one in which raw materials can be returned to the same state as they were in originally so that they can be used to meet the original demand.

McDonough and Braungart (2002)⁷ have coined the term “cradle-to-cradle” to describe this new approach. To implement this new approach (one that is needed to meet the “threat” of low cost countries such as China

⁶ http://www.iiasa.ac.at/Research/LUC/ChinaFood/data/pop/pop_1.htm, October 4, 2006.

⁷ W. McDonough & M. Braungart, *Cradle to Cradle* (New York, NY: North Point Press, 2002).

as a major and growing source of demand) requires a coordinated approach within the supply chain. It requires a change in how activities (including purchasing and product design) are carried out. It requires new performance measures that highlight (and reward) efforts aimed at attaining the goals of a “cradle-to-cradle” approach. Traditional recycling (which McDonough and Braungart refer to as “down-cycling”) must be discouraged since it does not preserve existing levels of supply. In short, the new supply chain must become better at preserving existing levels of supply not simply because it is environmentally and socially correct. Rather, it must do so because such activities are demanded by the realities of the new environment.

TALENT MANAGEMENT AND LEADERSHIP

There are three micro-gaps that must be addressed as part of this gap. The first is that of leadership.

Leadership focuses on acquiring and developing exemplary supply chain talent and leaders. Currently, there is a lack of a strategic view and supply chain perspective or orientation. There is also a lack of measurements that drive leadership and the strategic integration necessary. Many organizations are faced with the problem of trying to determine how supply chain personnel fit within the organizational structure. All of these lead to a need to better identify and nurture talent in organizations to provide the supply chain leadership necessary for future success.

The second micro-gap is **Resolving Supply Network Paradoxes**. Effective supply chain management requires different approaches and a different perspective. Practices that may have worked well in managing the internal factory can create problems when applied to the supply chain. These “inconsistencies” or paradoxes must be identified and addressed in advance if

the potential problems are to be avoided. An example of such a paradox discussed over the course of the workshop focuses on the relationship between supply design and cost performance. If the supply chain is designed right the first time, then there should be very little opportunity for subsequent cost reduction. However, in most organizations, supply chain improvement is measured in terms of cost reduction (which encourages the supply chain to be not initially optimally designed). It was pointed out by several participants that most firms have accounting systems in place to capture the impact of cost savings (which according to one participant is nothing more than correcting the effects of bad decisions previously made). Few firms, in contrast, have accounting systems that can accurately capture and report the impact of cost avoidance. Consequently, while management desires cost avoidance, it rewards cost savings.

The third micro-gap is **Talent Management**. There is a need to develop competency models for the types of talent that is needed now and into the future. Previous talent needs were more functional in nature, requiring training in a specific discipline. Supply chain employees are now needed who are more generalists and can integrate with various disciplines. Today, there is a lack of sufficient supply chain graduates and demand outstrips supply. There are insufficient ties between industry and educational institutions to foster the development of talent. Finally, there is a dearth of student (at the undergraduate, graduate, and doctoral levels) and faculty internships to provide a training ground and experience base. There are too few students who understand strategic supply chain management. There are far too few faculty who can teach strategic supply chain management.

It is interesting to note that this concern with leader-

ship and talent is unique to supply chain management. In a recent issue of *The Economist* (October 7, 2006), the survey section focused on the hunt for talent.⁸

SUPPLY CHAIN MODELS INCLUDING OPTIMIZATION, RISK, AND COST

The focus here is on studying and improving system performance through the building and analysis of models. Included under this section are the following two micro-gaps.

Total Supply Network Optimization focuses on the need to develop and use various optimization models, (e.g., risk, developing target costs, cost models) as a basis for identifying various forms of system performance. An analysis of the inhibitors to more widely using these tools today reveals the lack of trust and reticence to share information among supply chain partners, a lack of visibility in not clearly knowing what the customer wants, different objectives among supply chain partners, and the distribution of power within supply chains. Models are only as good as the information factored into the model – another deficiency in today's supply chain activities.

The next gap involves that of **Supply Chain Governance**. Governance involves having processes and systems that are transparent and whose operations can be monitored regularly. The goal of improved governance is to ensure that all those involved with the system are following current processes and proce-

dures. Currently, governance is a major issue for many North American firms. For example, within the United States, the level of overall system governance is being elevated in importance and enhanced in performance – developments that can be attributed to the implementation of Sarbanes-Oxley Act of 2002.⁹

Increasingly, the need for governance is spreading from accounting and reporting activities to other areas. One area expected to be affected by this spread is that of supply chain management. The view of the participants is that most firms are unprepared for this development. At present, internally, there is a lack of process ownership and accountability for supply chain activities. This lack of governance may eventually raise concerns regarding the manner in which contracts are awarded, relationships managed, and performance evaluated. When it comes to system and procedure governance, many supply chain systems can be regarded as “black boxes.”

To the participants, governance had both an internal and external dimension. Internally, governance involved not only process ownership and accountability (as previously noted) but also governance regarding crisis planning. Overall, there was a lack of adequate governance and ownership involving crisis planning. One indication was the widespread lack of business continuity planning.¹⁰ Consequently, few firms are prepared to deal with the emergence of a sudden change in the conditions of supply and/or demand. For

⁸ “The Battle for Brainpower,” *The Economist*, October 7, 2006, survey pp. 1-24.

⁹ Pub. L. No. 107-204, 116 Stat. 745, also known as the Public Company Accounting Reform and Investor Protection Act of 2002 and commonly called SOX or SarbOx; July 30, 2002.

¹⁰ Business continuity planning (BCP) is a formal procedure/system used to identify the major forms of risk (and their associated impacts) facing an organization, to formulate plans and strategies aimed at reducing these risks (or offsetting their impact), and to create a plan for how an organization will resume partially or completely interrupted critical function(s) within a predetermined time after disruption.

most firms, crisis planning and short-term crisis-driven reaction is more the rule rather than the exception. Disruptions can have a catastrophic impact on the performance of supply chains because many supply chains are being “leaned” out in response to demands for better performance (lead time, quality, flexibility) and reduced cost.

In addition to the need for better governance for business continuity planning, there is also a need for better governance for supply chain security. Governments in Europe, Canada, and the United States, to name a few, face the potential for terrorism. Weapons can be smuggled into the country using supply chains developed by companies for importing components. Furthermore, these same supply chains can be used as a vehicle for spreading the effects of the acts of terrorism. Consequently, governments are increasingly placing the responsibility for supply chain security on the private sector.

Within the United States, the federal government has implemented a voluntary program – the Customs-Trade Partnership against Terrorism (C-TPAT). This program offers participants the opportunity to benefit from expedited customs inspections at the border. To secure this benefit, among others, the firm must be willing to take over responsibility for the security of its own supply chain and for controlling/monitoring activities within its foreign suppliers. Achieving this objective requires extensive governance in the supply chain.

Externally, there also needs to be a better understanding of the power bases and the role and impact of the supply chain captain. The supply chain captain is that person within the supply chain who takes over responsibility for monitoring and coordinating activities and for dealing with any problems as they arise. Further,

understanding is required of choke points, where the process flows and integration across the supply chain might be hindered. A choke point can be viewed as a bottleneck within the supply chain. It is an area that limits overall supply chain performance as a result of aggregation. That is, one firm taking the action alone will have no major impact on the performance of the supply chain. However, numerous firms, each acting independently of each other taking the same action, can be expected to create a constraint.

An example of the choke point concept can be found in the following story. A British aerospace firm, in order to reduce overall costs, decided to standardize on one specific type of Plexiglas. The reason – the supply of this component was relatively high, the demand low. By standardizing on it, it was hoped that costs would fall. However, the problem was that other European aerospace designers had examined the same problem and arrived at the same conclusion. Consequently, the demand had escalated, while the supply had not. The end result – price went up and availability fell. As can be seen from this example, the actions of the various customers had created a choke point.

Finally, there is the gap of **Risk Management, Planning, and Strategy**. The balance between buffers, postponement, and optimal costs for robust supply needs better understanding and application. As firms reduce buffers in the form of lead time, capacity (i.e., suppliers), and inventory, their supply chains become more susceptible to any potential disruption or change in timing within the supply chain. The importance of understanding supply chain risk cannot be underestimated. Management’s perspective on risks must include a strategic view. Managers must implement risk management processes and methods, acquire analytical tools, and understand supplier processes including

the notion of choke points as they apply to supply chains. Managers must identify and understand critical supply points, as they affect and are affected by disruptions. They must understand risk drivers, including the probabilities and the impact of the drivers.

In addition, risk management needs to focus on not only supply-side changes but also changes on the demand side. It must not consider reductions in supply but also unexpected increases in demand (increases that exceed the capacity either of the firm or its supply base). Both types of changes can and do adversely affect the performance of the supply chain.

PROCESS ORIENTATION INCLUDING MEASURES, INFORMATION, AND INTEGRATION

As previously noted, the supply chain can be best understood as the system created by the interrelationship of the various processes. Consequently, effective supply chain management requires a strong process orientation. In achieving this process orientation, the participants addressed three micro-gaps.

A major micro-gap affecting the implementation of this process awareness involves the lack of appropriate and meaningful **Supply Network Measures**. Performance measures are critical within the firm since they form the communication and feedback system of the firm. Metrics (which consist of three elements – the numerical measure, the standard, and the reward system) communicate to top management the impact of systems, such as the supply chain, to the achievement of overall financial and strategic objectives. Metrics are used to translate overall strategic objectives into operational terms (i.e., what do I, as a stockroom clerk, have to do well for the firm to achieve corporate objectives). If implemented correctly between supply chain

partners, metrics facilitate the coordination of actions among partners. If implemented incorrectly, metrics contribute to friction and frustration. Metrics tell the people involved in the system (be it at the corporate or supply chain levels) what is important and, more important, what is not important. For example, if something is not measured and/or not rewarded, then implicitly, management is telling its personnel that activity is not important.

Supply chains should be managed through a process orientation with appropriate measures. Further work is needed on supply chain measures including:

- Proof points are needed to show how measures work and to gain knowledge from early adopters.
- An understanding is required of what are the right measures.
- Information must be made accessible and be able to be extracted.
- Companies must overcome incompatible information technology (IT) systems in the supply chain.
- Analysis tools must be developed that transform data into information.
- Personnel must acquire adequate skill sets.
- Longer term measures must be developed.
- Aligned and coordinated interfirm measures (most are intrafirm measures) must be designed.

Although supply chain measures are needed across the supply chain, they also must be linked to single firm financial and operational measures.

The participants expressed frustration with current supply chain metrics. Often, these metrics only evaluated the impact of the supply chain on the cost savings incurred by the firm. This approach emphasized cost

savings at the expense of cost avoidance; it emphasized short-term gains at the expense of potentially greater long-term gains. It also contributes to a situation where it is acceptable for the firm to do better, but at the expense of its supply chain partners.

There is the micro-gap involving **Product Innovation Using Supply Chain Input**. Increased collaboration is needed between supply chain partners in efforts to improve product designs while reducing time to market. Also, supply chain partners need to work more closely together to offer product solutions and incorporate newer technologies where appropriate. Increasingly, the focus of many firms is shifting from reduced cost to competition through innovation. To succeed with this new strategy, firms must rely not only on their capabilities but also on the skills and capabilities of their supply chain partners (both upstream/supply side and downstream/customer side). By drawing on these capabilities and skills, the firm can potentially reduce lead times and costs while also improving quality. It can also deliver products and services that better meet the needs of critical customers.

The final micro-gap associated with the process orientation, including measures, information, and integration gap, is **Business Process Integration**. Organizations and supply chains need a broader process orientation. Individual functions don't always map well to the business processes, and functional boundaries may need to change to new boundaries – a new paradigm. Needed are touchpoints and linkages between functions, while maintaining ownership, but with shared metrics.

RELATIONSHIP AND TRUST

Central to this gap was addressing issues pertaining to **Collaboration and Relationships**. There needs to be a greater focus on relationship building and trust between and within organizations. An improvement would be a redefinition of boundaries of what people focus on to induce collaboration and provide rewards for doing this. There are internal problems that need to be overcome such as power struggles, egos, an inconsistent reward structure, and a lack of integrated process thinking. Top management support and processes such as sales and operations planning (S&OP) foster these types of improved relationships. Externally, there is a need for more trust, both between individuals and organizations. The participants noted that in many industries trust was present some years ago. However, as the pressure to improve performance increased, many purchasing managers focused primarily on price. Any collaboration between suppliers and buyers that had resulted in either overall shared cost savings, reduced lead times, or better product designs were often overlooked and in some cases ignored. Examples were offered of product designs generated through collaborations that were turned over to other suppliers to build. The rationale frequently given was that these new suppliers were able to build the product at a lower cost. This practice was seen as playing a critical role in the loss of trust now present in many supply chains.

Constraints to collaboration and trust are methods of communication, lack of integrated processes across firm boundaries, goal incongruity, and plans that are not followed by implementation (talking the walk, but not walking the talk). Increased globalization brings about additional constraints such as distance, cultural inconsistencies, language barriers, and time zones.

SUPPLY CHAIN ARCHITECTURE AND STRUCTURE

As previously noted, the sixth gap focuses on the design and structure of supply chain. Addressing this final gap requires dealing with two separate but related micro-gaps.

The first such micro-gap is that of **Layered and Dynamic Supply Chains**. Supply chain architecture needs to be aligned and realigned as they are dynamic. Maintaining this alignment is not a simple task because most supply chains are not one dimensional. At a minimum, most supply chains consist of four layers:

- **The product supply chain:** the supply chain structure is responsible for managing the design, manufacture, and delivery of the goods and services demanded by the customers. This chain is constantly changing in response to changes in customer demand, competitive actions, government mandates, technological change, or supply base changes (Gattorna, 2006).
- **The financial supply chain:** the financial supply chain focuses on the financial flows and ownership of the financial resources needed by the supply chain. In many cases, the benefits anticipated by outsourcing to the supply base have been reduced by the inability of smaller firms to secure access to needed financial resources at the same favorable levels secured by the larger customers (Hartley-Urquhart, 2006).
- **The information supply chain.** This supply chain focuses on the flow, management, and ownership of information through the supply chain.
- **The competency supply chain.** This supply chain deals with the nature of core competencies within the supply chain. It identifies the core skills of the various supply chain partners and how these core competencies are interlinked.

In addition, this sixth gap also focuses on the amount of visibility needed in the supply chain and how the structure of the supply chain can be used to support this visibility requirement (modular versus integrated).

Finally, there is the micro-gap of **Physical Supply Chain Structure**. Improvements continue to be necessary for better supply chains' physical structures and material flows, focusing on issues such as the location of supply chain partners, the physical linkages that exist among partners, and the number/type of supply chain nodes.

These various micro-gaps are critical because how they are addressed and resolved will determine the shape of the future supply chain – supply chain 2010. A set of agendas aimed at closing the gaps is the focus of the chapter: “Closing the Gaps: The Agendas for Action.”

Closing the Gaps: The Agendas for Action

Having identified the gaps, the task next facing the workshop participants was that of closing those gaps. The participants were charged with the task of developing agendas – lists of actionable items that would ultimately be prioritized and set to form the basis for initiatives and projects at the university, corporate, or professional society levels. Initially, the goal would be to generate three agendas: practice, research, and knowledge dissemination. However, it soon became evident that the practice agenda was not appropriate. Managers, it was pointed out, would do what is appropriate. After all, they are also the ones who are blazing the trail into strategic supply chain management. Consequently, it was decided to focus on the latter two agendas.

THE AGENDA FOR RESEARCH

Of the six gaps discussed in the preceding chapter, the research agenda focuses on the following five: (1) Strategic visibility and alignment; (2) Supply chain models including cost optimization and risk mitigation; (3) Process orientation including measures, information, and integration; (4) Relationships and trust; and, (5) Supply chain architecture and structure. Talent management and leadership will be the focus of the agenda for knowledge dissemination.

STRATEGIC VISIBILITY AND ALIGNMENT

Under this topic, three issues were raised requiring research. The answers to the questions that these issues raised could not be readily found and are needed:

WHAT IS THE IMPACT OF THE SUPPLY CHAIN ON CORPORATE PERFORMANCE?

In general, the impact of the supply chain is evaluated in most firms in terms of traditional price impacts and cost savings. That is, the question most frequently asked is, “How much did we save by outsourcing an

activity, bidding some good or service, negotiating, or fire fighting?” As a consequence of this approach, most managers see the supply chain as something that is used to reduce price and nothing more. This mindset reduces the overall attractiveness of, and opportunity from, supply chain management. However, effective and efficient supply chain management can and does affect and enhance the ability of the supply chain to better compete in the marketplace. Firms such as IBM, Toyota, Honda, Harley-Davidson, P&G, Deere, and others recognize supply chain management as a corporate core competency – a skill set that the firm develops to earn a sustainable competitive advantage.

To move the supply chain from primarily tactical/price oriented to strategic, research is needed that identifies and assesses the total impact of the supply chain on corporate performance. By total impact, the participants meant understanding the impact of effective and efficient supply chain management on overall financial performance (i.e., earnings per share, stock price, top-line growth, and the ability to secure funds at preferred rates). Other research must link performance to new product development, assurance of supply, risk mitigation, product delivery lead time, product design lead time, ability to respond quickly and efficiently to changes in demand (either upwards or downwards), and the ability to quickly reconfigure product design in response to market demand or to changes in the conditions of supply. In addressing these questions, it is important that the answers not simply be limited to perceptual responses (e.g., having a person respond by strongly agreeing to the statement that “Our supply chain has greatly enabled us to reduce product design lead times”). Rather, what is needed are quantitative, objective responses – responses that identify the exact

size of the improvements in terms of dollars and days (if appropriate), as well as understanding the specific processes that produced such favorable performance.

Researchers who answer these questions will give supply chain practitioners the ammunition needed to show that supply chain is not simply tactical, but rather strategic. Addressing these questions can help demonstrate to managers at the top level that strategic supply chain management is not simply a tool for reducing cost but also for increasing sales and for generating higher levels of value faster and better than the competition.

WHEN DO FIRMS BENEFIT FROM SUPPLY CHAIN MANAGEMENT OVER TIME?

This question takes a different approach to the task of assessing the impact of the supply chain on the firm. This approach recognizes that building the “right” supply chain means building an asset. Whenever you build an asset, whether it is a building or a name or a supply chain, you have to invest time, effort, and money. Dealing with such investment incurs costs upfront for benefits that are generated later. This question looks at identifying the time until breakeven. That is, we are interested in identifying how long it takes to reach the point where the total benefits generated by the supply chain offset the total investments that the firm has made in its supply chain.

This is not an easy question to address since the resulting costs and benefits are contingent upon a number of different factors, including:

- The types of supply chain relationships being built
- The current stage of supply chain development
- The rate of change and level of competition within

the environment in which the firm competes

- The position of the firm within the supply chain and its ability (based on conditions such as its power relative to those of the customers and the suppliers) to influence actions within the supply chain (Porter, 1980).

A critical task in addressing this question is to identify those factors that can influence the timing and quantity of investments and revenues accruing from the supply chain.

HOW DOES A FIRM LEVERAGE REAL-TIME INFORMATION?

As recognized by Hayes, Pisano, Upton, and Wheelwright (2005), information technology and information-intensive operations are critical traits of the new strategic supply chain environment in which many managers and firms now find themselves competing. This means that firms and management can benefit from real-time information. Problems can be identified as they occur. Shipments can be tracked in real time. They can also identify and correct potential problems before they occur. However, real-time information, as a corporate asset and as an operational capability, is a relatively new development. Consequently, there is confusion surrounding its use, the conditions affecting its use, and the impact of its use on internal operations, corporate performance, and supply chain performance.

To reduce the level of confusion, more research is needed to address the following questions:

- What is the impact of real-time information on corporate and supply chain performance? What are the financial impacts? What are the qualitative

impacts? What impact does real-time information have on strategy?

- What conditions/prerequisites must be satisfied (at either the operational, corporate, or supply chain levels) before the firm realizes the potential benefits offered by real-time information systems?
- What conditions are most conducive to the use of real-time information within a supply chain? What conditions are least conducive?
- What conditions influence how far down (i.e., the number of tiers away from the firm) that information flows from the firm should go?
- For what type of events/problems is real-time information most appropriate? For what types of events/problems is it least needed?
- Is real-time information needed or should there be lags in the information flows?

SUPPLY CHAIN MODELS INCLUDING RISK MITIGATION AND COST OPTIMIZATION

Of the various gaps discussed in the workshop, the one that evoked the greatest amount of discussion involved risk and risk management within the supply chain. This gap is currently most visible to top management and it is the one generating the most publicity in the business press (e.g., Sheffi, 2005). Managers and researchers are becoming increasingly aware of the need to provide more insight into the concept of supply chain risk and its management. Risk, is viewed as anything that adversely affects the three major parameters of supply: price, quantity, or timing.

In contrast to much of the current body of knowledge (which is highly descriptive, prescriptive in tone, and often based on case or anecdotal evidence), a different, more quantitative approach is needed. Analytical and simulation-based models are needed. These mod-

els would enable researchers and managers to explore alternative situations and problems scenarios without having to worry about exposing the firm and its supply chain to potentially dangerous and catastrophic events. These quantitative models can be used to address questions such as:

- What are possible strategies and tactics that can be used to manage and mitigate risk? Under what conditions are these various strategies most effective or least effective?
- What is the impact of “learning” (either at the management or corporate level) on risk management over time?
- What methods can be developed to identify potentially risky supply chain subnets and choke points that are located at any level on the supply side. Can leading indicators of such potential danger points be developed? These questions try to get at an issue that disturbed the participants. This involved situations where the location of the risk (e.g., disruption or bottleneck) is not close to the firm (i.e., where the disruption is not at tier one). In these situations, the lack of visibility and control creates a situation where the risks are essentially hidden to the firm. Managers at these firms are unable to anticipate or prevent these potential hidden problems. Developing and testing models, tools, and leading indicators aimed at uncovering such “hidden” dangers is the major intent of this research action item.
- What types of metrics (financial and otherwise) can be developed that are indicative of management’s ability to control risk and the firm’s exposure to risk? What types of metrics can be used to monitor or predict problems in key suppliers in the upstream supply chain?

- How risky is sole sourcing? What is the system cost of sole sourcing? Is sole sourcing more or less risky than multiple suppliers sourcing for the same goods and services? To what extent does trust mitigate risk in either sole or multiple sourced supply arrangements? Dual sourcing is preferred in many cases, but sometimes it is not feasible. Under these conditions, the major challenge facing the firm and its management is what to do to best protect the firm from possible problems in the supply chain due to sole sourcing.
- What is the impact of risk and risk management on new product design? The increasing importance of product design and innovation for many firms results from the major feeling that it was difficult to compete against countries like China and India on the basis of price. Managers are now interested in identifying the types of risk (internal and external) they can expect to encounter. What strategies and techniques can be developed and implemented to address these risks?
- Can a broader model of supply chain risk management be developed? Currently, attention is focused on the disruption component alone. However, there are more issues to risk management than supply disruption. There are strategic issues, personal and corporate attitudes to risk, and the ability of the firm to either weather or control its exposure to risk. These factors need to be incorporated into a larger model of risk that looks at both the negative impacts as well as positive opportunities.
- What risk management options are available for dealing with the various types of risk – geographic (e.g., an earthquake shutting down supplier production); supply chain length (being exposed to supply chain risk emanating from a supplier located at the second or third tier in the supply chain); geo-political (e.g., having a critical supplier located in a country where the threat of war is constant and real); competitive (e.g., a critical supplier is acquired by a major competitor); and financial (e.g., a major customer files for bankruptcy? Can these various categories of risk be expressed in monetary terms? Can a general or broad risk index be developed? Such a risk index is important because it permits comparisons across firms. It also encourages benchmarking and corporate learning (as firms performing poorly on the index seek out firms that are doing better and try to learn from them). Such an index makes risk more meaningful to top management.
- Can operational measures and models of supply chain resilience and robustness be developed? As a result of factors such as the greater reliance on long supply chains combined with more emphasis on focusing on core competencies and greater usage of lean principles and practices (resulting in the general reductions in buffers), supply chains are becoming more “fragile.” It is important to understand how the firm responds to this threat of supply chain fragility. Key to this response is addressing the issues of robustness and resilience. Robustness describes the ability of the firm to resist the onset of a supply chain disruption (as measured in terms of time, quantity of production lost, and cost). Resilience describes how quickly the firm can recover, once the disruption has manifested itself. While relatively straightforward to describe, developing indexes or operational definitions of these two constructs is far more difficult and demanding, but both researchers and managers need them.

- What factors influence supply chain resilience and robustness? Here, the focus shifts to strategies and tactics such as the use and placement of buffers, and product redesign and postponement strategies (having a product that can be dynamically redesigned in response to changes in the conditions of price, quantity, or timing of supply). Others include the use of information to provide a warning of potential difficulties and the use of alternative, secured suppliers. These strategies need to be assessed using tools such as computer simulation and analytical models to understand the factors influencing their use and effectiveness.
- How can firms deal with “aggregation” effects? Most of the approaches to supply chain risk management look at the firm and its supply chain in isolation. The assumption is that when actions are taken by one firm to manage risk, the competition is essentially neutral. Yet, there are instances where actions taken by one firm to control risk are positive if no one else does the same thing. However, if everyone else implements the same action, the aggregated effects can be totally unexpected. One of the participants shared the following story in the workshop. The participant’s firm was dealing with product proliferation in a certain component. To improve supply conditions and to increase leverage (buying power through concentration of purchases), it was decided to standardize on a certain component that was currently in excess supply. It was anticipated that standardization, combined with the increase in purchasing volume, would enhance continuity of supply and would reduce the purchase price. However, what the firm’s buyers

were not aware of was that many of its competitors, faced by similar situations, had arrived at the same conclusion and implemented the same course of action. The result – demand increased to the point that it exceeded supply. Instead of lower prices and assured supply, the firm was faced by increasing prices and being placed on allocation. The buyers were also put in the unenviable position of having to explain to its upper management why they were unable to deliver on the promises that they had made. What these buyers had encountered were the effects of aggregation.

- Can better supply predictive performance be linked to improved overall financial performance as indicated by increased EPS and stock price?
- What are the impacts of different payment terms?

PROCESS ORIENTATION INCLUDING MEASURES, INFORMATION, AND INTEGRATION

While there were many issues discussed when talking about this gap, only one issue and research need was continuously repeated – the development, usage, and impact of performance measures for evaluating or assessing supply chain performance. As pointed out previously in this report, there is a tendency in many firms for managers to use internal measures (typically those focusing on cost savings). Several concerns were raised about this practice:

- Such measures focus on price/cost savings, rather than cost avoidance.¹¹ Such measures also tend to overlook or under report performance on activities or projects that deliver important improvements (both strategically and to our customers) in lead

¹¹ It is interesting to note that the participants had difficulty in identifying any cost-based measures that were able to track and report cost avoidance. The lack of such a measure was seen as a major reason that many firms were unable to successfully pursue projects and supply chain activities that emphasized cost avoidance rather than cost savings.

time, new product innovation, quality, or flexibility.

- Such measures emphasize benefits to the firm rather than benefits that are shared by the entire supply network.
- Such measures emphasize quantitative benefits that can be measured rather than qualitative benefits (e.g., goodwill, improvements in reputation).
- Such measures can threaten trust and collaboration between supply chain partners. The participants shared stories where trust and collaboration were apparently thrown away to achieve measurable (and rewarded) price/cost savings. One participant gave an example of a firm that had worked with a major customer to design a new system. Once the specifications had been decided, the customer decided to implement the purchasing decision by turning over issues pertaining to product design to the engineering group. Issues pertaining to the product purchase (such as the price and the terms of delivery) were turned over to the purchasing group. This group, since it was being measured on the size of the cost reduction that it generated, decided to take the hard-line when negotiating the purchase contract with the supplier. The buyers wanted the lowest price. The supplier pointed out that some considerations had to be given because of the sizable investments that were made in designing the product – investments that were encouraged by the buying organization. The buyers took the position that such investments were effectively “sunk” costs and not relevant. When the supplying firm was unable to meet the target cost requirements, the buyers took the design and outsourced it to another supplier. This action effectively destroyed the possibility of any future cooperation between these two organizations.

Given the potential negative impact that internal performance measures could have on accurately and completely reporting supply chain performance and on how supply chain relationships are managed, the participants wanted rigorous research addressing the following questions:

- What is the impact of using internal measures to evaluate supply chain performance? To what extent can managers use internal measures to evaluate supply performance? If managers cannot use such internal measures, what alternative performance measures are there?

RELATIONSHIPS AND TRUST

During the breakout discussions, as well as in the large group discussion, the importance of collaboration, trust, and having the “right” relationships in place was stressed. One participant bemoaned the loss of trust that was attributed to the introduction of Lean/Just-in-Time and the advent of purchasing managers who emphasized cost reduction above everything else. Consequently, the participants felt that there was a significant lack of knowledge regarding trust, relationship identification, relationship building, and relationship maintenance. Research was needed in these areas, and the following research questions were identified:

- Where are the best practices in terms of relationship and trust within the supply chain? Specifically, there is a need for a set of detailed case studies focusing on how firms that have developed and maintained successful and mutually beneficial supply chain relationships.
- What is the value (measured either quantitatively or qualitatively) of trust?
- What factors influence trust?
- How can trust be built in a relationship when it is

needed but does not exist?

- How can trust be sustained?

SUPPLY CHAIN ARCHITECTURE AND STRUCTURE

The issue of supply chain architecture and structure is closely related to relationship building. This issue deals with how the supply chain is structured and involves dealing with issues such as the level of integration and coordination between supply chain partners. It also addresses how much visibility (i.e., how far up and down the supply chain) is needed. In light of these issues, the following critical questions were identified:

- What are the various organizational structures available to a firm and under what conditions are the various structures most appropriate or least appropriate? How does an organization manage the process of realigning its structure? During the discussion, the participants identified several potential structures – e.g., customer focus, program focus, and joint governance. Yet, it was noted that these might not be a comprehensive set of possible structures. The following questions strive to identify the comprehensive set of organizational structures and then to assess and evaluate these structures.
- What are the common supply chain architectures (patterns for organizing the partners and the relationships between them) in use today? Under what conditions are the various structures most or least appropriate?
- What are the performance implications of the various supply chain structures and architectures?
- What factors influence the performance and sustainability of each structure?
- What guidelines are available for helping managers

transition from one supply chain architecture form to another?

- What structures are appropriate for emerging supply markets?
- What is the role of technology in supply chain structures (e.g., individual technologies, virtual organizations, work practices, “no roof” home offices, and so forth)?
- What are the prerequisite conditions for changing supply chain architectures?

These major items were identified as part of the research agenda. It is interesting to note that when these items were presented in the large group meeting, one of the practitioners stated that research answers would be obtained to the first questions, then that person would be willing to send participants to a seminar where these “answers” would be presented. This statement was interpreted as a vote of confidence for the research agenda.

THE AGENDA FOR KNOWLEDGE DISSEMINATION

The large number of research issues raised in the preceding section emphasizes the fact that supply chain management (especially strategic supply chain management) is a relatively new development. Consequently, relatively little is known about it, but the demand for knowledge is growing.

The same lack of knowledge was evident when developing an action agenda for knowledge dissemination. The group consensus was that while there was a great demand for knowledge about supply chain management, the knowledge base for meeting this demand was relatively small, sparse, or missing entirely in certain areas. To meet this growing demand, something

was needed. To address these and other knowledge gaps, the following action items were proposed:

- Develop detailed bodies of knowledge for both tactical and strategic supply chain management. The first step in developing any form of agenda focused on knowledge dissemination was to establish the body of knowledge that had to be mastered or taught. When dealing with supply chain management, it was agreed that this body of knowledge broke into two major but related components: the tactical body of knowledge and the strategic body of knowledge.

When most firms recruit a person for a supply chain management position, they tend to recruit for a specific functional position (e.g., a buyer or a production scheduler, or a warehouse manager). Most of these needs were satisfied by many of the undergraduate programs found at colleges and universities throughout the United States and Canada. Yet, the issue for these programs is to identify what topics (i.e., the body of knowledge) had to be taught to the students so that they had the skills and knowledge to effectively work in supply chain management at the tactical level. At present, there is no universally agreed upon body of knowledge. Every college or university or professional society has implemented their somewhat unique view of what needs to be taught.

One way of improving the quality of tactical supply chain professionals is to develop and present a tactical body of knowledge. This body of knowledge would identify the topics and skills that should be taught to the tactical supply chain manager.

Complementing this body of knowledge should be

a strategic body of knowledge. An effort should be made to identify those skills and content areas that everyone who is charged with managing supply chain at a strategic level should be realistically expected to know. Further, these two bodies of knowledge should be compared to identify those areas where there is an overlap in knowledge and those areas that should be strongly differentiated between the two levels. There should be a clear delineation between what makes a strategic supply chain manager and what makes a tactical supply chain manager. Further, the tactical body of knowledge should identify the minimum level of exposure to strategic issues. Similarly the strategic body of knowledge should identify the minimum level of knowledge of tactical issues.

Finally, these bodies of knowledge must establish what a minimally qualified candidate in either strategic or tactical supply chain management can be realistically expected to know. These standards would also explicitly lay out base competency levels and expectations for students at both levels, tactical and strategic.

- Develop and maintain a catalog of cases dealing with supply chain management. One of the major problems facing anyone interested in teaching supply chain management is the simple lack of good cases that deal with the various aspects of supply chain management (e.g., forecasting and inventory management within the supply chain, new product development within the supply chain, and managing supply chain disruptions). Cases that are available come from a large number of different sources. Some are well known (e.g., the case libraries from the Harvard Business School, the Darden Business School, and the Ivey School at the University of Western Ontario). Others are available

from international sources. Still others come from professional societies and organizations. Consequently, what is needed is a thorough review of the cases offered by these various sources with the goal of identifying those that are appropriate for use when teaching supply chain management topics. The cases identified from this review should be brought together and examined so that the content can be categorized and a brief summary of the case generated. This information should be then used to develop an online database of appropriate cases. Such a database should be made available (through a controlled access) to anyone involved in teaching supply chain management. It should also be augmented over time by the following information:

- Teaching notes
- Experience with its use
- A rating review
- Suggestions for how to best use it
- Suggested discussion questions
- Appropriate readings to accompany the case
- Other cases on similar topics to the case

Finally, this database should be reviewed regularly to identify potential topic deficiencies (i.e., supply chain topics of interest but for which there are few, if any, appropriate cases). This information should be shared with cases writers and institutions involved in case writing to help encourage the development of cases filling these needs.

- Develop an online portal site aimed at providing “one-stop shopping” for supply chain management information. The online information relevant to supply chain management can be described as di-

verse, large, and spread across a number of different sites. Consequently, searching the Internet for information and stories pertaining to supply chain management can be described as frustrating and very much of a hit or miss task. Instead, a portal for supply chain management is proposed – something akin to the GlobalEDGE™ portal¹² developed by Michigan State University’s CIBER Center. This portal, which gets more than a million hits per month, is viewed as the major source of information on global business. Such a portal, ideally hosted by either a university or professional society, would provide an extremely useful resource for knowledge dissemination and research.

- Promote greater collaboration among industry, professional societies, and universities/colleges. Supply chain management is a field of study that is currently being pioneered by work being done by leading-edge practitioners working in forward-thinking firms. It is also a field that is experiencing an increasing level of demand for good, rigorous, useful, practical research. It is also experiencing a lack of well-trained business school graduates – people who can immediately step into supply chain related positions and provide the direction and drive needed. Meeting these needs on an ongoing basis requires more than interim one-on-one interactions between two or more of the groups. It requires a different approach. To this end, it is proposed that some form of organization or vehicle be developed for encouraging this ongoing collaboration such as a consortium of firms, professional societies, and universities/colleges that are dedicated to supply chain management (specifically strategic supply chain management). This consor-

¹² <http://globaledge.msu.edu/ibrd/>.

tium should promote collaboration through regular meetings, Webinars, research grant programs, and newsletters and be structured to deliver real, measurable value to the involved participants.

- Modify the college/university reward systems to encourage greater emphasis on teaching and on writing/developing/supervising supply chain cases. It is well known that in many business schools, research, not teaching, is not only encouraged but also rewarded. While the reasons for this emphasis are well known, this approach has adversely affected teaching. Many educators are not devoting the time and effort necessary to keep their teaching material relevant because such activities are not rewarded. Many educators are not developing or writing cases or supervising others who write cases. Again, such activities are not rewarded. The results are gaps affecting supply chain management education – gaps that must be covered in the near future.
- Use industry professionals to supplement college/university learning. It is important that students be exposed to not only the theory but the practice of supply chain management. One way of achieving this objective is to develop and implement a program of having professors of practice. That is, industry professionals would be sponsored to spend a minimum of one semester teaching in a university and sharing with the students their experiences in supply chain management. Such a program would not only ensure that students were introduced to the practice of supply chain management, but it would also increase the attractiveness of supply chain management programs, thus drawing the best students to this program.
- Establish and lay out the role of colleges/universities in supply chain education. At present, there is a great deal of confusion regarding what should be taught to students in colleges/universities at either the tactical or strategic levels. For example, some of the industry workshop participants felt that universities taught too much theory and gave too little exposure to practical applications. Consequently, when firms hired these students, managers found that they had to invest in further training and education (especially in practical applications) before these candidates could be expected to be productive. By practical applications, the industry participants did not mean applications such as enterprise resources planning systems or other specific programs. Rather, the students should be exposed to forecasting, the application of project management, capacity planning, collaboration, cost modeling, risk mitigation, and performance measurement (to name a few).
- College/university curriculum should be realigned with the six gaps identified in the chapter, “Closing the Gaps: The Agendas for Action.” The participants noted that the six gaps in supply chain management are critical. Colleges and universities should be encouraged to reexamine their course offerings to determine the extent to which they address the gaps. Failure to address these gaps will critically limit students’ interest. The group also recommended extending the same approach to supply chain programs put on by professional organizations such as Institute for Supply Management, APICS The Association for Operations Management), Purchasing Management Association of Canada, and Council for Supply Chain Management Professionals.

- Attempt to increase the proportion of college/university educators who have practical industry experience. The workshop participants recognized that effective education and knowledge dissemination is greatly enhanced when the educators have a familiarity with the topics that extends beyond what the educators have read. One mechanism for developing such a familiarity is to introduce industrial sabbaticals. Companies would provide opportunities for educators to spend at least one term working with the firm and learning about the practice of supply chain management. To enhance the attractiveness of these sabbaticals, a research project could also be embedded in the sabbaticals.

The workshop participants strongly voiced their opinion that groups involved in knowledge dissemination focused on supply chain management face a potential golden age – a period in which they can educate students and practitioners alike in a field with great and growing demand. However, if the institutions are to benefit from this golden age, they must provide knowledge that is relevant, useful, timely, and current. The action items presented in this section are intended to help these institutions provide such knowledge.

THE AGENDA FOR PRACTITIONERS

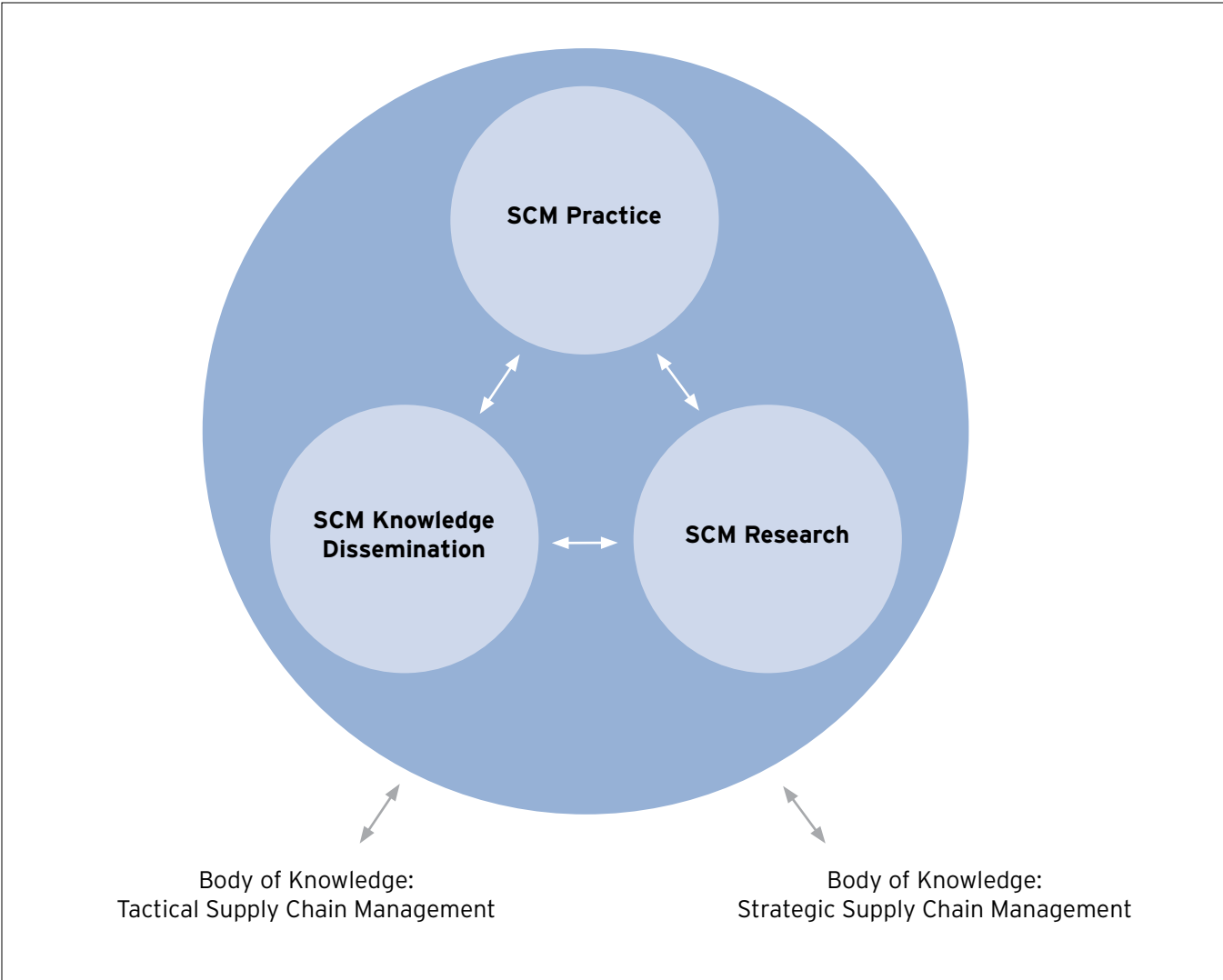
Initially, when planning the Delphi study/workshop, it was intended that the practitioners would generate their own agenda of action items. However, as the workshop progressed, it was generally agreed that it did not make sense for there to be a separate agenda for practitioners. Practitioners (especially those who are working in forward-looking organizations) have a

very good idea of what they must do to continue tapping into the benefits offered by supply chain management. They could only benefit from the first two agendas, and consequently, it was decided to focus on those.

INTEGRATING AGENDA

At the end of workshop, the participants reviewed the various agendas and were struck by one fact. These are not three separate agendas; they are three related agendas. When taken together (Figure 4-1), it is clear that what the various agendas are achieving is contributing to the building of two critical bodies of knowledge – one for tactical supply chain management and one for strategic supply chain management. These two bodies of knowledge form the foundations to build the strategic supply chain, the newest version of supply chain management.

FIGURE 4-1: INTEGRATING THE THREE AGENDAS



Mapping the Future of Supply Chain Management: Concluding Comments

After establishing the various agendas, the major tasks facing the workshop participants were completed. This final chapter summarizes what has been uncovered and focuses on what needs to be done. In reviewing the findings with the participants, the following key points were uncovered:

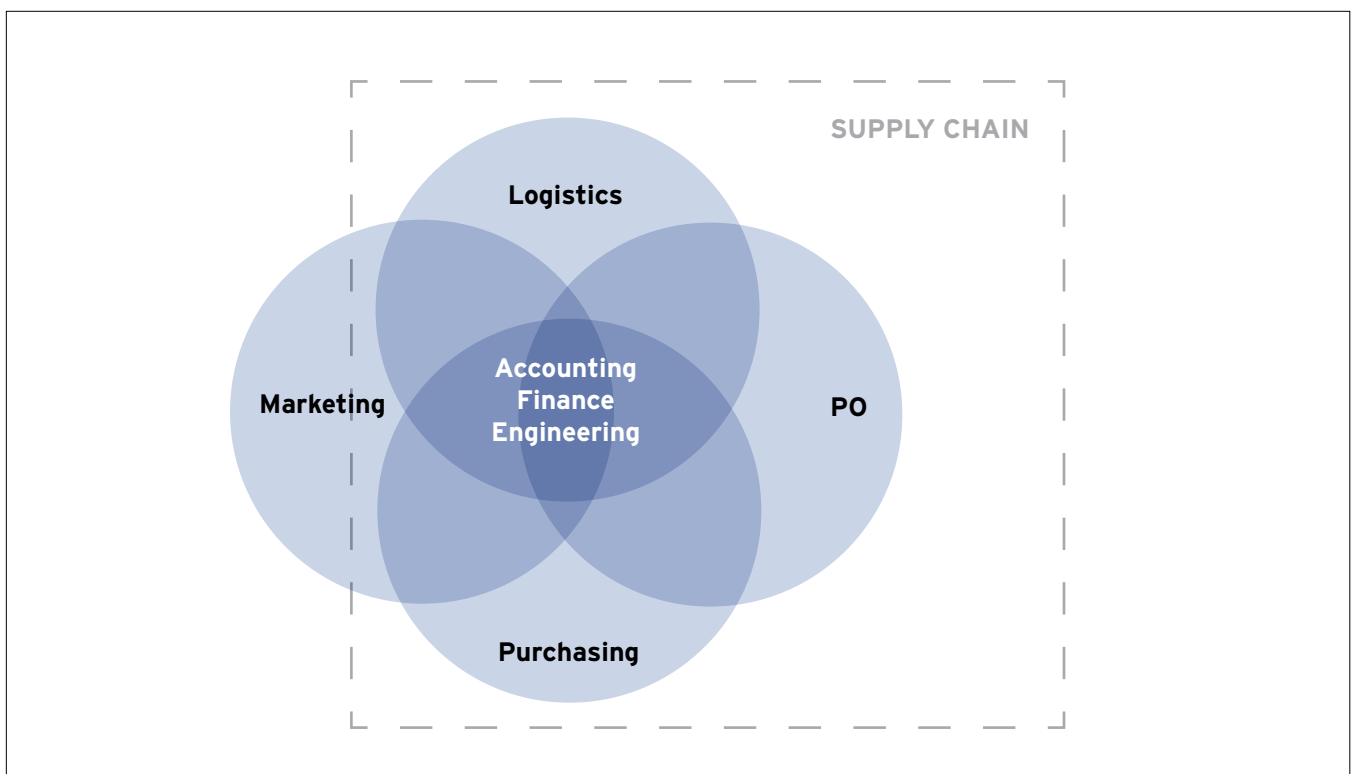
- The shape of supply chain management is indeed changing. Today's supply chain is evolving from one that is fundamentally order-oriented, cost-driven, and execution-focused to one that is strategically focused, design-oriented, dynamic, and driven by multiple objectives. The trends and factors discussed in this report strongly support this transition.
- When dealing with supply chain issues, there is a tendency to confuse direct costs with total costs. When suggesting the supply chain is too preoccupied with costs, what is actually meant is that it is too preoccupied with direct or individual item or process costs. This is in contrast with strategic supply chain management, which is concerned with total cost. Understanding this total cost perspective is one of the major obstacles to the implementation of strategic supply chain management. One of the major problems facing managers is the inability of accounting systems to accurately quantify strategic total costs resulting from activities such as early supplier involvement, new product development, risk management, collaboration, joint governance, and integration.
- Supply chain management is changing from being a system that is primarily jointly managed by three traditional corporate functions – purchasing/sourcing, logistics/transportation, and operations management, to a system that must draw on the capabilities of all functions of the firm – accounting, finance, engineering, and marketing, as well as the three traditional functions. This new state is illustrated in Figure 5-1.
- Supply chain management is increasingly forcing managers and researchers to think in terms of managing operations and processes across corporate boundaries.
- The focus of supply chain management is shifting from the upstream/supply side to the downstream/demand side. It is the customer that drives the supply chain, not the supply base.
- The focus of supply chain management is shifting from management to supply chain design/redesign – of products, processes, and the entire supply chain.
- Supply chain management is now becoming a core competency – a skill set some firms are developing and turning into a vehicle for generating and maintaining a sustainable competitive advantage in their respective markets.
- The term “supply chain management” may be a misleading term. Supply chain management, to many of the workshop participants, suffers from three major misconceptions. The first is that it seems to imply that the focus of supply chain management is the supply base (i.e., the upstream portion of the supply chain). In light of earlier discussions, that is not the case. Second, the term focuses attention on management rather than design. Third, the term “chain” implies linear relationships. Supply chains display a wide range of structures. Some of the structures are linear and chainlike in structure, while others exhibit parallel

and simultaneous structures (where the suppliers interact directly with the firm's critical customers). Consequently, several replacement terms were suggested, including supply network optimization, value network optimization, and value network systems.

- During final discussions, a new view of the supply chain was proposed – the adaptive supply chain. The supply chain must deal with and respond to challenges and changes taking place on both the supply and demand sides. On the supply side, these challenges can take the form of changing availability/prices of raw materials. On the demand

side, these changes reflect changes, in the customer mix and changing customer demands. As these conditions emerge, the supply chain must be able to quickly and efficiently realign itself to compensate and respond to these changes. The analogy to the adaptive supply chain is the dynamic bill of material used by automotive companies to deal with components such as a catalytic converter. A catalytic converter employs a number of very expensive metals. As the price of the metals changes, the automotive firms can change the portion of metals used to include more of the less expensive metals and less of the more expensive metals. This is an example of an adaptive model.

FIGURE 5-1: UNDERSTANDING THE IMPACT OF THE NEW SUPPLY CHAIN FROM A CORPORATE PERSPECTIVE



SETTING OUT THE NEXT STEPS

The final step in the Delphi study/workshop was to set out the next steps for participants. Three critical steps were identified:

Dissemination of the Results. The first and most critical step is to ensure the findings generated by this study are distributed to the appropriate groups to encourage action consistent with the findings and to create awareness of the issues raised. Consequently, the research team will communicate the results in several ways. First, an executive summary has been written and will be made available to the participants and to other executives interested in supply chain management. Second, this report will be distributed to groups and organizations interested in supply chain management (e.g., APICS, ISM). Third, presentations based on this workshop have been developed and are being delivered. One at the APICS 2007 International Conference and others are targeted at ISM and IPSERA, to name a few. Fourth, a series of research papers based on the Delphi study and workshop and targeted toward specific, well-regarded academic and practitioner journals will be written and submitted for publication. In focusing on this step, the research team recognizes that the findings presented in this report will not have significant impact either on research or practice, unless the information is distributed and made available.

Small Group Activities. At the end of the workshop, the participants wanted to continue to work on exploring issues pertaining to the various gaps identified during the workshop. Consequently, a series of small groups were formed. These groups were challenged to identify the tactical supply chain body of knowledge, the strategic supply chain body of knowledge, and models for supply chain risk management. These

groups will work to explore the issues and questions in each area. Group reports will be generated and made available in the future.

Validating the Results and Repeating the Process.

The findings reported in this study involve a set of researchers and firms. When carrying out such a focused study, there is always the danger that the findings may not be generalizable (i.e., that they reflect the bias of the groups involved and not the true trends they are trying to uncover). Furthermore, identifying the future supply chain management system is essentially a forecasting problem involving a dynamic system. What appears to be the future of supply chain management today may not seem the same in one or two years. In light of these considerations, two decisions were made. First, this study would be replicated at least one more time in North America. It would also be replicated in Europe and the Far East. These replications would help identify the trends and factors that appear to be common and the trends and factors that appear to be regionally specific. These repetitions would also help the research team assess the extent to which the trends and issues uncovered by this study are generalizable. (These sessions have been held in 2007 and will continue in the future.)

Second, given that supply chain management is highly dynamic and ever-changing, it is not enough to have only one study. Such a study should be repeated in another two or three years. The results of such a study should help to better establish those trends that are still present and to identify new trends and developments that are shaping the supply chain of the future.

FINAL COMMENTS

Supply chain management is changing. If researchers, educators, and practitioners are to be prepared

to cope with these changes, they must be identified and discussed in advance. After all, participating and preparing for change is preferred to reacting to it once the change has taken place. The tactical supply chain, while still important, is being replaced by a new more powerful supply chain, the strategic supply chain. This report has identified gaps that should be recognized and addressed to shift from the tactical to the strategic supply chain. This research has attempted to direct and shape future activities in terms of research and knowledge dissemination.

In the end however, what this study has found is that in spite of how much we know about supply chain management, there is much more that we do not know. This study has found that the future of supply chain management is bright, and the opportunities offered in the field are both numerous and growing. Such a state bodes well for the future of supply chain management as a field of practice and for research.

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Appendix 1: Delphi Letter - Round 1

Identifying the Future Directions of Strategic Supply Chain Management

OVERVIEW

First of all, thank you again for participating in this first round of the Delphi Study on Strategic Supply Chain Management. After you have finished reading this introduction, you will be directed to the Delphi Study itself. Please remember that you are being asked for your assessment – there is no right or wrong answer. Rather, there is only your answer. Please complete all portions. It is also important you provide any comments or insights you feel are appropriate in response to the questions. When you have completed the survey, the results will be reviewed by the project leaders and returned to you in summarized form for the second round of the study.

From the time this document has been sent out (May 22, 2006), you will have until June to complete it. Should you have any questions, please feel free to contact Steven A. Melnyk (melnyk@msu.edu/517-353-6381). As always, all contributions will be anonymous in the summarized returns.

We look forward to receiving your responses.

Steven A. Melnyk, Ph.D.
Michigan State University

Robert J. Vokurka, Ph.D.
Texas A&M - Corpus Christi

Rhonda Lummus, Ph.D.
Iowa State University

PART ONE: DEMOGRAPHICS

The following section is necessary to establish the demographics of the respondents.

1. Select from the following list the one that best describes your current employment?
 - a. Self-employed:
 - b. Government Employee:
 - c. Business Employee:
Please identify the industry:
 - d. University/College Faculty
 - e. Other (Please describe):
2. What is your current job title?
3. How long have you been in your current position? years.
4. How long have you been involved with supply chain management? years.

PART TWO: DEFINING STRATEGIC SUPPLY CHAIN MANAGEMENT

For the following section, please review and comment on the following definitions of (1) a supply chain, (2) supply chain management, and (3) strategic supply chain management using the following scale:

1	2	3	4	5
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

1. Supply Chain

A supply chain is defined by the entire network of organizations and activities involved in (1) designing a set of products or services and related processes, (2) acquiring and converting inputs into these products or services, (3) distributing and consuming these products or services, and, (4) disposing of these products or services.

Do you agree with this definition? **1** **2** **3** **4** **5**

What changes would you make?

2. Supply Chain Management

Supply chain management is the management of relationships, materials, and flows that connect the parties and activities in a supply chain.

Do you agree with this definition? **1** **2** **3** **4** **5**

What changes would you make?

3. Strategic Supply Chain Management

Strategic supply chain management involves the decisions that shape the long-term capabilities of the company's supply chain functions and their contribution to overall strategy through the ongoing reconciliation of market requirements and supply chain resources.

Do you agree with this definition? **1** **2** **3** **4** **5**

What changes would you make?

PART THREE: ASSESSING THE IMPORTANCE OF SUPPLY CHAIN TRENDS AND DEVELOPMENTS

For each of the following issues, evaluate their importance in managing supply chains TODAY and FIVE YEARS FROM NOW. Please use the following scale:

- 1**
Irrelevant
- 2**
Minimal Importance
- 3**
Some Importance
- 4**
Important
- 5**
Critical

ISSUE	IMPORTANCE NOW					IMPORTANCE IN 5 YEARS				
Leadership within the supply chain.	1	2	3	4	5	1	2	3	4	5
Power relationships within the supply chain.	1	2	3	4	5	1	2	3	4	5
Supply chain disruptions and supply chain risk	1	2	3	4	5	1	2	3	4	5
Identifying and managing channel conflict.	1	2	3	4	5	1	2	3	4	5
Governance within the supply chain (e.g., Sarbanes-Oxley).	1	2	3	4	5	1	2	3	4	5
Managing and structuring relationships within the supply chain.	1	2	3	4	5	1	2	3	4	5
Managing and improving environmental performance within the supply chain.	1	2	3	4	5	1	2	3	4	5
Developing and implementing strategic segmentation/spend analysis on the supply side.	1	2	3	4	5	1	2	3	4	5
Developing and implementing strategic segmentation/spend analysis on the customer side of the supply chain.	1	2	3	4	5	1	2	3	4	5
Measuring performance across activities and partners within the supply chain.	1	2	3	4	5	1	2	3	4	5
Sharing rewards and financial risk within the supply chain.	1	2	3	4	5	1	2	3	4	5
Changing/re-aligning performance measurement across activities and partners within the supply chain.	1	2	3	4	5	1	2	3	4	5

ISSUE	IMPORTANCE NOW					IMPORTANCE IN 5 YEARS				
Colocating key stakeholders within the supply chain.	1	2	3	4	5	1	2	3	4	5
Managing product innovation by drawing on the capabilities of the supply chain.	1	2	3	4	5	1	2	3	4	5
Responding to the “China Price” syndrome (i.e., a competitor who emphasizes and delivers low cost).	1	2	3	4	5	1	2	3	4	5
Managing confidentiality within the supply chain.	1	2	3	4	5	1	2	3	4	5
Protecting intellectual property within the supply chain.	1	2	3	4	5	1	2	3	4	5
Maintaining visibility and control within the supply chain.	1	2	3	4	5	1	2	3	4	5
Maintaining and protecting security within the supply chain.	1	2	3	4	5	1	2	3	4	5
Using the resources of the supply chain to identify new and unique solutions to existing and new problems.	1	2	3	4	5	1	2	3	4	5
Developing, changing, and maintaining the appropriate organizational cultures within the critical partners of the supply chain.	1	2	3	4	5	1	2	3	4	5
Developing and maintaining appropriate communication and connectivity within the supply chain.	1	2	3	4	5	1	2	3	4	5
Developing trust between supply chain members.	1	2	3	4	5	1	2	3	4	5
Implementing appropriate technology to allow seamless exchange of information within the supply chain.	1	2	3	4	5	1	2	3	4	5
Managing the timely delivery of goods and services.	1	2	3	4	5	1	2	3	4	5

Identify any other issues that are critical in supply chain management TODAY, but have not been included in the list above.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Identify any other issues that will be critical FIVE YEARS FROM NOW in supply chain management, but have not been included in the list above.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Please return the completed form to:

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517-353-6381; melnyk@msu.edu

Appendix 2: Delphi Letter - Round 2

Identifying the Future Directions of Strategic Supply Chain Management

OVERVIEW

First of all, thank you again for participating in the first round of the Delphi Study on Strategic Supply Chain Management. We are now moving on to the second round. After you have finished reading this introduction, you will be directed to the Delphi Study itself. Please remember that you are being asked for your assessment – there is no right or wrong answer. Rather, there is only your answer. Please complete all portions. It is also important you provide any comments or insights you feel are appropriate in response to the questions. When you have completed the survey, the results will be reviewed by the project leaders and returned to you in summarized form for the SCM 2010 workshop that will take place in September at the Henry Center at Michigan State University, East Lansing, MI.

From the time this document has been sent out, you will have until August 11 to complete it. Should you have any questions, please feel free to contact Steven A. Melnyk (melnyk@msu.edu/517-353-6381). As always, all contributions will be anonymous in the in the summarized returns.

We look forward to receiving your responses.

Steven A. Melnyk, Ph.D.
Michigan State University

Rhonda Lummus, Ph.D.
Iowa State University

Robert J. Vokurka, Ph.D.
Texas A&M - Corpus Christi

PART THREE: ASSESSING THE IMPORTANCE OF SUPPLY CHAIN TRENDS AND DEVELOPMENTS

During Round 1, you evaluated each of the following issues on the importance in managing supply chains TODAY and FIVE YEARS FROM NOW. You are now asked to reevaluate each of these issues with consideration of the mean ratings from Round 1 participants. Please use the following scale:

1	2	3	4	5
Irrelevant	Minimal Importance	Some Importance	Important	Critical

ISSUE	IMPORTANCE NOW	ROUND 1 MEAN	IMPORTANCE IN 5 YEARS	ROUND 1 MEAN
Leadership within the supply chain.	1 2 3 4 5	4.00	1 2 3 4 5	4.38
Power relationships within the supply chain.	1 2 3 4 5	3.79	1 2 3 4 5	4.08
Supply chain disruptions and supply chain risk.	1 2 3 4 5	4.25	1 2 3 4 5	4.58
Rapid redesign of supply chains to meet changing customer needs.	1 2 3 4 5	3.67	1 2 3 4 5	4.21
Identifying and managing channel conflict	1 2 3 4 5	3.50	1 2 3 4 5	3.67
Governance within the supply chain (e.g., Sarbanes-Oxley).	1 2 3 4 5	3.33	1 2 3 4 5	3.58
Managing and structuring relationships within the supply chain.	1 2 3 4 5	3.92	1 2 3 4 5	4.20
Managing and improving environmental performance within the supply chain.	1 2 3 4 5	3.13	1 2 3 4 5	4.00
Developing and implementing Strategic segmentation/spend analysis on the supply side.	1 2 3 4 5	3.46	1 2 3 4 5	3.92
Developing and implementing strategic segmentation/spend analysis on the customer side of the supply chains.	1 2 3 4 5	3.46	1 2 3 4 5	3.96
Measuring performance across activities and partners within the supply chain.	1 2 3 4 5	3.58	1 2 3 4 5	4.33

ISSUE	IMPORTANCE NOW	ROUND 1 MEAN	IMPORTANCE IN 5 YEARS	ROUND 1 MEAN
Sharing rewards and financial risk within the supply chain.	1 2 3 4 5	3.13	1 2 3 4 5	4.00
Changing/re-aligning performance measurement across activities and partners within the supply chain.	1 2 3 4 5	3.50	1 2 3 4 5	4.08
Colocating key stakeholders within the supply chain.	1 2 3 4 5	3.00	1 2 3 4 5	3.25
Managing product innovation by drawing on the capabilities of the supply chain.	1 2 3 4 5	3.29	1 2 3 4 5	4.33
Responding to the “China Price” syndrome (i.e., a competitor who emphasizes and delivers low cost).	1 2 3 4 5	3.75	1 2 3 4 5	3.38
Managing confidentiality within the supply chain.	1 2 3 4 5	3.63	1 2 3 4 5	3.83
Protecting intellectual property within the supply chain.	1 2 3 4 5	3.75	1 2 3 4 5	4.29
Maintaining visibility and control within the supply chain.	1 2 3 4 5	3.88	1 2 3 4 5	4.29
Maintaining and protecting security within the supply chain.	1 2 3 4 5	3.63	1 2 3 4 5	4.17
Using the resources of the supply chain to identify new and unique solutions to existing and new problems.	1 2 3 4 5	3.17	1 2 3 4 5	4.13
Developing, changing, and maintaining the appropriate organizational cultures within the critical partners of the supply chain.	1 2 3 4 5	3.29	1 2 3 4 5	3.67
Developing and maintaining appropriate communication and connectivity within the supply chain.	1 2 3 4 5	3.75	1 2 3 4 5	4.25

ISSUE	IMPORTANCE NOW					ROUND 1 MEAN	IMPORTANCE IN 5 YEARS					ROUND 1 MEAN
	1	2	3	4	5		1	2	3	4	5	
Developing trust between supply chain members.						3.92						4.42
Implementing appropriate technology to allow seamless exchange of information within the supply chain.						3.67						4.46
Managing the timely delivery of goods and services.						4.25						4.58

In addition, please evaluate the importance of the following issues suggested as important by Round 1 participants:

ISSUE	IMPORTANCE NOW						IMPORTANCE IN 5 YEARS					
	1	2	3	4	5		1	2	3	4	5	
Supply chain talent management including training, skill building, competency development, and career development.												
Managing supplier diversity.												
Managing environmental issues and recycling of materials.												
Alternate material identification and development.												
Development of new technologies that impact supply chain efficiency (e.g., RFID).												
Collaborative supply chain forecasting.												
Supply chain infrastructures world-wide (e.g., port, airports, highways, railroads).												
Managing fuel and transportation costs.												
Process improvements and waste reduction.												
Identification and development of alternate materials.												

Identify any other issues that are critical in supply chain management TODAY, but have not been included in the list above.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Identify any other issues that will be critical FIVE YEARS FROM NOW in supply chain management, but have not been in included in the list above.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Please return the completed form to:

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Appendix 3

Workshop Protocol

The following protocol is intended to be distributed before the September 21 workshop. It is also intended to be followed by the session facilitators for each of the three breakout sessions on September 21.

During the course of the September 21 workshop, all members of the organizing committee (everyone who is a member of the SCM 2010 group on ANGEL) will have access to the ANGEL site. This site will be used for the storage and transmittal of all data gathered during the workshop. Everyone is also expected to bring with them a portable computer, which they will use during the course of the workshop.

The participants will be organized into three groups. The session facilitators will be drawn from the organizing committee.

SESSION 1 - ESTABLISHING THE BASELINE

The first session has a very specific desired outcome – to describe the nature of Strategic Supply Chain Management in 2010 and beyond. To do this, the participants will be asked to first describe the characteristics they associate with supply chain management in today's environment. The term **characteristic** is used to denote any element, feature, behavior, structural element, or critical functionality is associated with SCM. Next, they will be asked to describe the characteristics they see as being associated with SCM 2010. For each characteristic, the participants should identify the following:

- What is the characteristic?
- Why is it important?
- Examples of this characteristic in practice?
- Implications of the characteristic (so what)?
- How would you measure this characteristic and its activity?

The intention of this session is simply brainstorming. The group is intended to generate as detailed a list of both the current state of SCM and the future state of strategic SCM. A recorder will record the results on a computer and transfer the results to the ANGEL site in the following format:

GROUP 1 BASELINE

When the session is over, the participants will be dismissed and the recorders will finish inputting the group's findings into the computers and uploading the files to ANGEL. There will be a 30-minute break between sessions during which this activity will be completed.

DEBRIEFING OF SESSION 1 FINDINGS - TOTAL GROUP DISCUSSION

At this point, the participants will reconvene in the large meeting room for a debriefing. The findings from each group will be printed and distributed to the participants. At this point, each group will discuss the list and the findings briefly (timing is critical). After all of the findings have been presented, the group will review the baseline (SCM today) and SCM 2010 to identify and flag any obvious duplicates. These will be eliminated. Next, using Nominal Group Technique, the group will vote on the factors pertaining to SCM 2010 to determine the rank order of the attributes. The result will be one list common to all three groups that lists in rank order the important features of SCM 2010. This list will form the starting point for the second session – Identifying Gaps.

SESSION 2 - IDENTIFYING GAPS

The main group will reconvene in the breakout rooms (using the same groups as established for Session 1). The major objective of this second session is to identify the major gaps that exist between the base-

line SCM (SCM 2006) and SCM 2010. These gaps can include any type of gap, in terms of such issues as:

- Knowledge gaps (knowledge/content that is necessary but currently missing).
- Technology gaps (technology that is needed but missing).
- Organizational gaps (changes in organizational structure/culture that is necessary but currently missing).
- Strategic gaps (changes in the strategic planning process).
- Measurement gaps (gaps pertaining to performance measurement).
- Practice gaps (gaps involving examples of strategic supply chain management that would be useful but are currently not available).
- Skills gaps (gaps involving management practices, tools, and procedures that are necessary for SCM 2010 but currently missing).
- Other gaps (anything else that the group can identify).

For each group, the group during its discussion is to provide the following information:

- What is the gap (a precise description of the gap)?
- Why the gap is important?
- What is needed to resolve the gap?
- What happens if the identified gap is not addressed?
- The importance of resolving/addressing the gap (using a simple A/B/C ranking system).

Again, a recorder will be responsible for recording the information. At the end of the session, the partici-

pants will be given a 30-minute break during which time the information generated from the second session will be recorded, uploaded to the ANGEL site, and subsequently downloaded and copies generated for the participants.

DEBRIEFING OF SESSION 2 FINDINGS - TOTAL GROUP DISCUSSION

Again, the participants will reconvene in the large meeting room for a debriefing. As with the debriefing session for the first session, the findings from each group will be printed and distributed to the participants. At this point, each group will discuss the list and the findings briefly (timing is critical). After all of the findings have been presented, the total group will review the lists of gaps, identify any duplicates (which will be eliminated), and generate a total list of gaps. Again, using Nominal Group Technique, the group will vote on the gaps in order to rank order them. The resulting ranked list will form the baseline for the third session – Addressing the Gaps.

SESSION 3 - ADDRESSING THE GAPS TO SCM 2010

The participants will reconvene again into three groups. There is a major difference at this point. Each group will focus on addressing and resolving the gaps from one of three distinctly different perspectives: practice, research, and knowledge dissemination. It is important to recognize that the final perspective – knowledge dissemination – includes more than simply academic education or teaching. It also includes professional education, teaching materials, and access to information (e.g., Web sites, a SCM 2010 portal similar to that provided by Mau's CIBER Center (which has developed a site for global business that receives some one million hits per month). One way that the perspectives can be assigned to the groups is through random

assignment – each facilitator draws a tag from a hat that identifies the perspective to be taken.

During this session, the participants will discuss how to best address the gaps. Ideally, each group will generate an action list of activities aimed at addressing/resolving the gaps.

The recorders will record the resulting findings and again upload them to the ANGEL site, from where they will be downloaded and printed for distribution to the participants.

Again, there will be a 30-minute gap between sessions.

DEBRIEFING OF SESSION 3 FINDINGS - TOTAL GROUP DISCUSSION

In this session, the findings of the various groups will be reviewed and discussed in the large group discussion. As with the other two debriefing sessions, each agenda will be voted on by the participants to determine the priority of action items for each of the three

lists. The participants will be also invited to comment on the various action items, with the goal of better defining and refining the list. The lists so refined and expanded during this session will form the foundation of the report generated from this workshop.

As this session winds down, we need to get input on the next steps for this initiative. This is an important step as the participants will be expecting some ongoing involvement in the overall activity. We also want to keep this group engaged as we implement some of the findings in various venues.

At the end of the workshop, I suggest that we have Joe Sandor add some concluding comments and give each participant a letter of appreciation from the APICS E&R Foundation and MSU. Finally, we should lay out the time line for what the participants can expect to have happen in the near future regarding SCM 2010 and Beyond.

Appendix 4: SCM 2010 On-Site Workshop Agenda

STRATEGIC SUPPLY CHAIN MANAGEMENT: 2010 AND BEYOND

Michigan State University and APICS E&R Foundation
Henry Center, Lansing, MI

AGENDA

Wednesday, September 20

6:00 p.m. - 9:00 p.m.

Reception and Dinner
Shibui Room

- Welcome by Bob Duncan, Bob Nason, Rhonda Lummus, Steve Melnyk, and Robert Vokurka
- Roundtable Introductions
- Remarks on Supply Chain Trends by Joe Sandor

Thursday, September 21

7:00 a.m. - 8:00 a.m.

Breakfast
Atrium

8:00 a.m. - 8:30 a.m.

Meeting Organization, Logistics, and Expectations
B120

- Steve Melnyk
- Review of Delphi Results & Agenda Review by Rhonda Lummus

8:30 a.m. - 9:30 a.m.

Session I Baseline Breakouts (small groups facilitated)
See Attached Group List and Rooms

9:30 a.m. - 10:30 a.m.

Session I Reports & Recap - Consensus on issues
(large group)
B120

10:30 a.m. - 11:30 a.m.

Session II Gap Identifications Breakouts (small groups facilitated)
See Attached Group List and Rooms

11:30 a.m. - 12:30 p.m.

Lunch
Atrium

12:30 p.m. - 1:30 p.m.

Session II Reports & Recap - Consensus on Issues
(large group)
B120

1:30 p.m. - 2:30 p.m.

Session III Gap Closure Breakouts (small groups facilitated)
See Attached Group List and Rooms

2:30 p.m. - 3:30 p.m.

Session III Reports & Recap - Consensus on Issues
(large group)
B120

3:30 p.m. - 5:00 p.m.

Summarize Results
Open Discussion/Feedback
Next Steps

Appendix 5: List of Participants

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