



FOCUS STUDY

Strategic Cost Management in the Supply Chain: A Purchasing and Supply Management Perspective

by

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Bebbling Professor of Business
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CAPS RESEARCH

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Preface

Nearly everyone in business today would agree that cost management is important. Cost management continues to increase in importance as the economy slows and sales decline. When research for this study began, the economy was entering a downswing that continued to build as the study progressed. The comments, practices, and attitudes reflected in this study are those of organizations under strong and growing financial pressure.

The goal of this study was to examine triads in the supply chain: units of three companies that work together in the supply chain, such as a manufacturer, one of its key suppliers, and a key customer. The research method was to begin with an extremely in-depth perspective of one of the companies, then use a snowball method (Kuzel, 1992) working with that core company to identify a key customer and a key supplier with whom that organization had worked effectively in cost management. The goal of the research was to report on best practices in supply chain cost management from the perspective of purchasing and supply management (PSM), rather than look at a typical case of effective cost management within an organization. The organizations studied were allowed to select what they viewed as their best practices in cost management. Best practices were self-defined by the companies based on where they believed they had been particularly effective in cost management. Despite numerous attempts of the researcher and core company to make contact with secondary companies and conduct research from this triadic perspective, it was not always possible, delaying the completion of the research. Part of the difficulty in engaging potential participants was the recession that took place during the time this case study research was being conducted. While none of the secondary companies contacted ever refused to participate in the research, meetings were cancelled and delayed, and people changed positions, were laid off, took early retirement, or changed companies. Thus, contacts were lost. In the interest of the timeliness of the research and maximizing the potential value of the extensive data provided by the participating companies, the researcher decided to complete the study, even though only dyadic data is provided in four of the five supply chains studied.

Cost management is a broad issue that cuts across all areas of the organization. Purchasing and supply management (PSM) are looked to by most organizations as a significant contributor to the organization's cost management approach, as cost of purchased goods and services makes up 50 percent or more of the cost of sales of most manufacturers today. The focus of this study was thus on manufacturing firms as the core company to be studied in depth. Previous research indicates that cost management of purchased items receives greater emphasis in manufacturing firms than it does in service firms, simply because manufacturing firms spend relatively

more on purchases. Nevertheless, cost management in and of itself is not enough to move organizations ahead in this competitive global economy. Recent studies indicate that CEOs are increasingly relying upon PSM as a source of innovation and economic value-added (A.T. Kearney, 2001). These measures have much broader strategic implications than simple cost management or the traditional price management focus. As a result, this study attempts to look at what PSM is doing in the arena of strategic cost management, going beyond the price mentality to understand the long-term value that PSM can bring to the organization.

In understanding cost management from a strategic perspective, this research explored issues such as who is involved in costs management efforts with PSM, how PSM engages suppliers in cost management efforts, and how PSM understands the customer value proposition that it is trying to support. Thus, many areas outside of PSM were interviewed to gain their perspectives. Organizational relationships and accountabilities were explored. It is the hope of the researcher that the reader will be able to take away a valuable perspective on how to successfully work with strategic cost management both within and outside of the borders of his or her organization.

Acknowledgments

The researcher thanks executives from all of the organizations that participated in this study for taking the time to share their perspectives and experiences, and for providing contacts and entrée into their own and other organizations. In the interest of confidentiality, the participating organizations are not listed here. The researcher also thanks those from industry and academia that shaped the ideas that went into this study. This includes members of the National Initiative for Supply Chain Integration, including Donna Edwards of Intel; Tom Hayman, now retired from Procter and Gamble; Jeff Trimmer, now retired from Chrysler Corporation; Dave Nelson of Delphi Corporation, formerly of Deere and Company; Paul Novak of the Institute for Supply Management; Gary Swinden and Donna Krandel of Amkor; and Mike Doyle from NISCI. From Arizona State University, I thank Baohong Liu, Ph.D. student, and Supply Chain Management staff members Helen Burns, Christina Brown, Jasmine Hemery, Nicole Junkins and Brian Pope, who helped in data entry and typing and formatting the study. The researcher also thanks the staff at CAPS Research, with special recognition to Phil Carter and Carol Ketchum for their patience and constructive feedback. Without the joint financial support of CAPS Research and NISCI, this study would not have been possible. I also thank my husband, Jeff Siferd, for his patience, support, and understanding during the many months that I spent gathering data and preparing this study. Finally, the researcher takes sole responsibility for any inadequacies or inaccuracies in this manuscript.

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Executive Summary

The purpose of this study was to explore best practices in strategic cost management among leading edge purchasing and supply management (PSM) organizations today. While PSM spends more money than any single group, and is held to a high level of accountability for spending, there has been limited literature explicitly linking strategic cost management with supply chain management in general, and with the role of supply management in particular. This study:

1. Identifies and studies a number of best practice organizations across several industries.
2. Explores both upstream and downstream strategic cost management issues and practices.
3. Synthesizes these best practices.
4. Develops a prescriptive model for world class cost management in the supply chain.

This is a broad and unstructured topic. It examines not only the practices that PSM uses to manage cost, but how PSM interfaces with others inside and outside the organization in delivering savings. Figure 1 provides a high level overview of the strategic cost management process.

Five organizations participated as core case studies for this research project. The strategic cost management processes were viewed from the perspective of the PSM organization, from inside the core firm. The researcher also studied one key supplier for each core organization, which the core organization identified as a supplier with which it had effectively engaged in cost management. The core companies included in this study were John Deere & Company, a manufacturer of farm and construction equipment, and home and commercial lawn care equipment; Chip, a major high technology electronic components and OEM manufacturer; LCP, a large consumer products manufacturer; Tele, a major regional telephone carrier; and Praxair, a large supplier of industrial gases and chemicals. All of these companies were large Fortune 500 manufacturers, with sales ranging

from around \$5 billion to nearly \$50 billion. Some of the key characteristics of these organizations relative to this study are shown in Table 1. Detailed case studies summarizing the strategic cost management practices of each of these organizations are included in Appendix A.

Overall Framework

In the course of this study, it became clear that effective strategic cost management has both strategic and tactical aspects that must be well executed in order to deliver results. The strategic framework and tactical elements of cost management as they affect PSM are shown in Figure 2, which also shows the soft and hard results of effective cost management as related to PSM. The actual processes in which cross-functional teams engage to support strategic cost management include many tactical elements. In most organizations studied, the strategic cost management process occurs as an integral part of the new product development process or the strategic sourcing process. It is not a “stand-alone activity,” but rather central part of supplier selection and supply base management. Some of the processes and tools that are part of the strategic cost management process are listed in Table 2, and presented in more depth in the body of the report.

A cross-disciplinary team of two or more individuals, including PSM, was the norm for carrying out strategic cost management in the five core organizations studied. Often, the cost management activities were part of another, larger process, such as a strategic sourcing event, a new product development process, or part of an on-going continuous improvement effort. In exploring Figure 1 in detail, it is clear that the cross-functional team that works on strategic cost management has numerous high-level issues that it must consider. First, the price and feature needs of the ultimate customer must be heavily weighted, or the result will be a product that customers cannot afford, that does not meet their needs, or both.

Figure 1
Strategic Cost Management Process

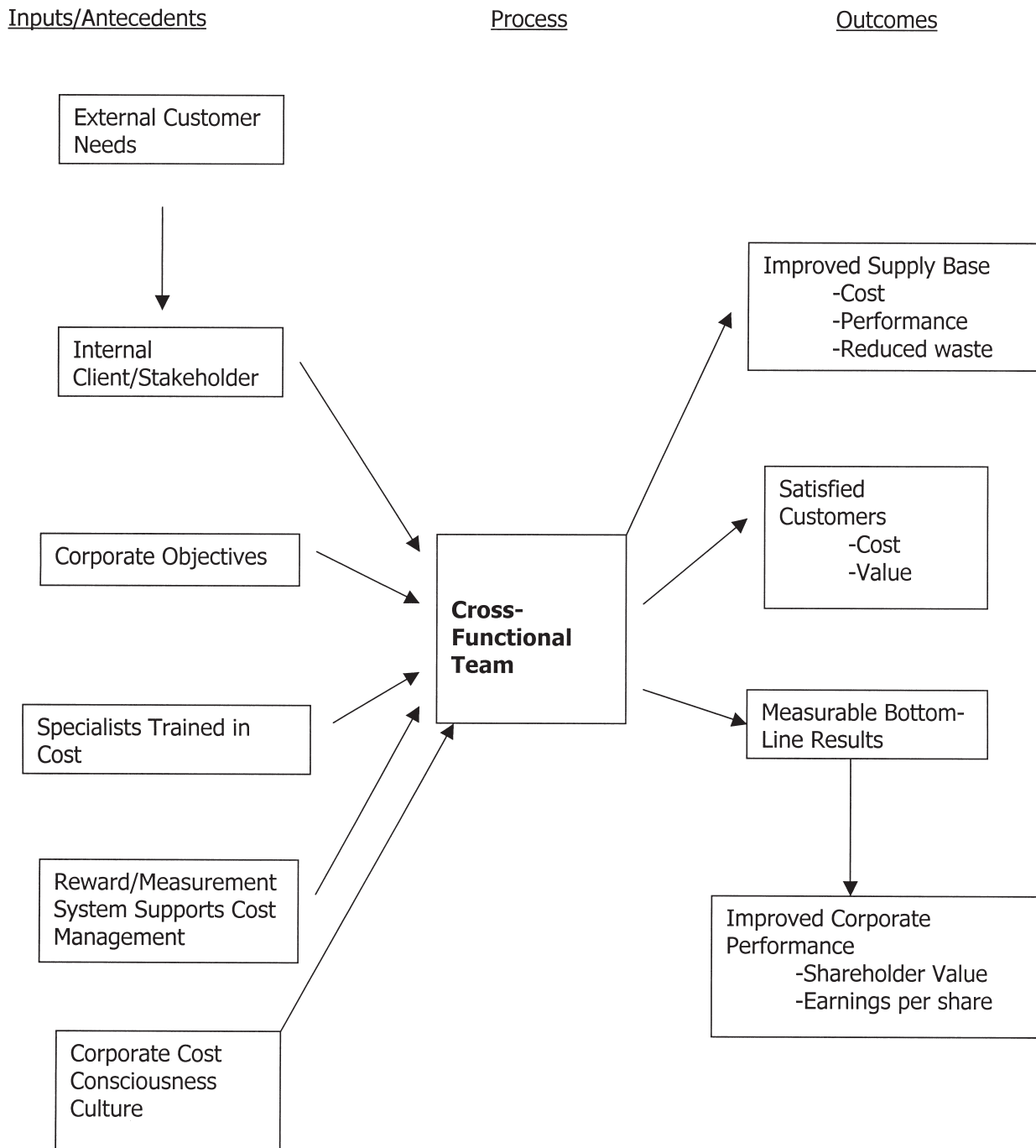


Figure 2
Strategic and Tactical Elements of Supply Chain Cost Management

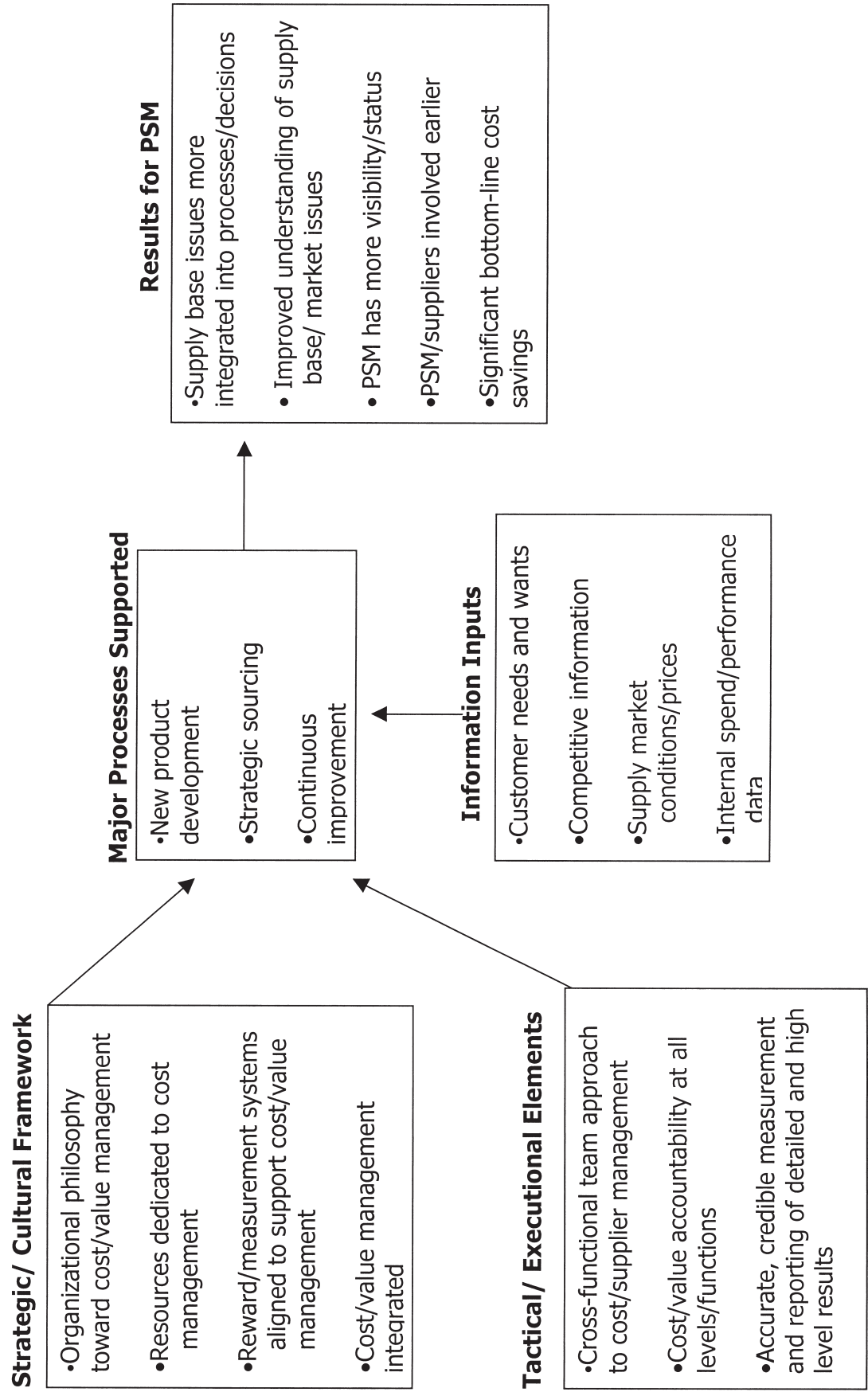


Table 1
Key Characteristics of Core Case Studies

Core Company	Industry	PSM Organizational Structure	Supplier Cost Analysis Supported By
Deere	Industrial and farm equipment	Mix of centralized and decentralized; primarily centralized	Cost specialists who report to PSM
Chip	Semiconductors and other electronic components	Centralized	Finance professionals who report to corporate finance
LCP	Household and personal products	Mix of centralized and decentralized; primarily centralized	Finance professionals who report to product supply or business unit
Tele	Telecommunications	Centralized	Cost/Finance specialists who report to PSM
Praxair	Chemicals	Centralized	Finance professionals who report to PSM

Table 2
Tools and Processes Supporting Strategic Cost Management

On-Line Auctions
 Total Cost of Ownership
 Should-Cost Analysis
 Target Costing
 Supplier Development
 Benchmarking
 Standardization
 Supply Base Rationalization
 Volume Leverage

The customer information comes to the team through a secondary source, often filtered through the eyes of marketing, sales, or a customer relationship manager. The corporate objectives regarding strategic cost management and cost savings goals must also be considered in terms of meeting the objectives of the team and the business unit or units that the team supports. Next, each organization utilized cost management specialists, for whom all or a major part of their jobs was to support cost analysis, help develop models, and ensure integrity in the data and the analysis results. In some cases, these individuals reported to PSM; in others, they reported to corporate or business unit finance. The key commonality across cost management specialists in these organizations was the expertise, credibility and charter to support supplier cost management. Even with the first three

direct inputs, a fourth is needed: a reward and measurement system that supports cost management. The extent to which such a system exists is a function of the corporation's cost consciousness culture. Is everyone in the organization held accountable for cost management? Is it part of their performance reviews, annual goal setting, and overall expectations? The stronger the cost-consciousness culture, the greater the support for the team and the commitment to its results.

In the center of Figure 1, the cross-functional team engages in activities designed to reduce the organization's cost, such as identifying cost drivers and changing processes using a total cost of ownership approach, engaging in on-line reverse auctions, or working with suppliers on development. The way that the organizations studied use these processes is detailed in the body of the report. Based on the strategic cost management processes, they aim to achieve a better supply base, defined as one that has a lower cost (sometimes only a lower price), and performs as well or better than it did before the strategic cost management process. The process should also support customer satisfaction by resulting in the same or lower prices for the same or better quality and service. This should in turn lead to measurable, bottom line savings, which should translate into higher profit, higher economic value-added for the firm, and higher earnings per share. In general, when PSM thinks about achieving results, the focus is still on bottom line cost savings rather than how its performance is reflected in the overall corporation's results.

Research Questions and Major Findings

With this framework in mind, we turn to the research questions that formed this study. Much more information to support each of these research questions is provided in the body of this study.

Research Question 1. How important is strategic cost management in the organizations studied, and why?

1. All of the core and supplier organizations that participated in this study indicated that cost consciousness is a way of life in their organizations. This philosophy is felt and lived from the chairman of the board to the administrative staff to the workers on the manufacturing floor.
2. Cost management is not a passing fad; it is a way of life that will continue, and perhaps grow even more important.
3. All of the core organizations studied believe that they have been very successful in supplier cost management, as shown by the significant, documented savings supplier cost management has contributed to the bottom line of the organization. All reported savings ranging from millions of dollars, to tens of millions of dollars per year, and savings ranging from about 5 percent to over 10 percent in annual expenditures.

Research Question 2. How are firms organized to effectively achieve strategic cost management?

1. All five of the core companies studied had centralized, or a mix of centralized and decentralized, purchasing organizations. There was widespread agreement among the firms studied that at least some degree of centralization was required to get visibility of purchases in order to gain leverage and properly manage the supplier relationships and cost issues.
2. Purchases that were unique to particular business units were managed at a business unit level in two of the five organizations studied.

Research Question 3. Who is responsible for conducting cost management in the organization, and who is accountable for delivering results?

This question has several, related answers.

1. PSM is held highly accountable for the delivery of cost savings in all of the organizations. It has specific goals for bottom line savings at functional,

commodity and individual levels. There may also be specific commitments made to support specific business units, certain product lines, or new products.

2. Cost management specialists, either from within the PSM organization or from the finance organization, are the focal point for supporting supplier cost analysis, building cost models and should-cost analysis, and validating results.
3. Everyone in the organization appears to have some level of accountability for, and commitment to, supporting strategic cost management and reducing the organization's cost. It is part of individual and functional performance appraisals and bonus calculations.
4. Strategic cost management is generally not conducted by a single individual. Depending on the magnitude of the analysis required, cost analysis may be performed by an individual in PSM and supported by a cost management specialist, or conducted by a cross-disciplinary team. When a team is involved, it generally becomes involved with strategic cost management in conjunction with other activities, such as developing a sourcing strategy, working on new product development, or continuous improvement initiatives. The cost models used by individuals within PSM or teams are developed and supported by cost management specialists, who may reside within purchasing or be part of the finance organization.

Research Question 4. How do organizations determine the focus of their cost management efforts?

1. All of the organizations studied stratify their purchases, considering factors such as the magnitude of the spend, market conditions, stage in product life cycle, and the importance of the supplier in selecting their approaches to strategic cost management. The approaches used vary among the organizations studied based on their product life cycles, the current market conditions, and internal resources available.
2. In considering the overall approach to strategic cost management, the organizations studied apply the following rules of thumb:
 - a. Always consider the potential cost versus the potential benefit of the cost/price analysis approach employed.
 - b. Stay in touch with the market and use pertinent market information in analyzing and negotiating costs and prices.

- c. Make sure that you have people with the right expertise involved in any sort of complex analysis. This generally means finance people or cost management specialists.
 - d. Cost management is an integral part of commodity management.
3. Cost management must be an integral part of supplier selection, commodity management, and ongoing planning in order for it to be effective. The organizations studied link strategic cost management efforts closely with their other supply management and new product development processes, to ensure that cost management is always in the forefront of supply decisions. Effective cost management is not a one-off approach that the company takes when it really needs to reduce its costs, but an ongoing expectation that is built into supplier relationships and the organization's reward and measurement system.

Research Question 5. What specific cost management tools do organizations use to support strategic cost management?

This question explored the major cost analysis tools that organizations use to support their strategic cost management efforts.

1. Benchmarking is used extensively for cost management purposes by all of the organizations studied. These organizations use two types of benchmarking: benchmarking prices and benchmarking processes. Benchmarking prices involves looking for sources of information available to corroborate pricing information. The other type of benchmarking centers on understanding cost structures and processes rather than prices. This process-centered benchmarking focuses on examining effective methods across the supply chain and in unrelated or competitive companies and industries to understand best practices. This knowledge is used to identify and implement opportunities for cost and process improvement, both internally and externally. Data from benchmarking supports virtually all the other cost analysis and management approaches that these organizations employ.
2. All of the companies studied use target costing to ensure that all of the functions involved in new product development understand the customer's needs as well as the cost and profitability goals, and are all aiming for the same objective. This is a strategic as well as a tactical approach. It is strategic in that it links all the functions within an organization to support a common goal for new product development or for capital acquisition. Target costing is also tactical in that it provides a specific framework for action and procedures for achieving goals and tracking progress towards those goals throughout the target costing cycle.
3. Should-cost analysis is a cost management methodology whereby the buying organization determines what a product, service, or piece of equipment should cost. This type of analysis is used for purchases of all types, from commodities to capital equipment and new products. The should-cost figure becomes a benchmark for whether a supplier quotation or bid is reasonable as well as for understanding potential improvement opportunities. Should-cost analysis is used in many ways within the organizations studied, such as to facilitate improvement both within the organization and with suppliers, to increase the organization's understanding of costs, as a tool to work more closely with suppliers, and to help support evaluation of other cost analysis approaches, external data, bids, and other items. It is a very rich approach, and one that the case study organizations are using more frequently today than in the past.
4. Total cost of ownership (TCO) is used by all the companies studied in some fashion in varying degrees. Total cost of ownership analysis is defined as an approach for understanding and managing the true costs of doing business with a particular supplier, of a particular process, or an outsourcing decision. It covers a whole gamut of situations, from strategic purchases such as outsourcing and capital equipment to tactical purchases such as indirect materials. TCO analysis is used to understand and improve upon both internal and external cost drivers. It is also used to look at the cost implications in very specific, isolated situations as well as cost implications across the supply chain.
5. The impact of information technology on cost management is also critical. The organizations participating in this study noted two information technology issues in particular that had significant impacts on their cost management and analysis approaches: The ability to access and understand spend data is a critical success factor, and information technology can be very helpful in analyzing/building cost models. Thus, information is definitely a facilitator of effective cost management. In addition, the organizations found that one e-technology in particular, the use of reverse, on-line auctions, was very helpful in reducing the prices paid on certain competitive commodities where they

would otherwise employ a bidding process. Savings occurred both due to process transparency and introduction of new players into the bidding process.

6. Organizations do use specific approaches to support specific types of purchases. Most of the discussion with the organizations studied focused on cost management and analysis of raw materials, because they are often the largest spend category and have the most mature cost management models. However, there was also extensive discussion on the management of capital, indirect materials/maintenance, repair and operating suppliers (MRO), and to a lesser extent on services. In the area of indirect purchases, the overall philosophy followed by these organizations is to standardize and reduce the number of transactions, focusing on TCO issues as much as on price. Services follow a similar approach in terms of understanding the value and taking a TCO perspective. For capital acquisition, TCO analysis is the key approach used. This includes understanding the net present value of all the costs associated with acquisition, start-up, use, maintenance, and ultimate disposal of a piece of equipment, including yield issues, volume capability, and down time. The levels of complexity and sophistication of these models vary in direct proportion to the levels of spend and complexity of the equipment purchased.
7. The organizations studied use a wide variety of internal and external data sources to support their analysis. The key to using data effectively is to triangulate, using multiple data sources to support the analysis.

Research Question 6. How are the results of cost management efforts reported?

1. The key issues related to reporting of cost savings were that the reporting must be done by someone who has credibility, and that those outside of supply management must agree to the reporting method. In addition, cost or price savings is never the singular goal of purchasing. Cost/price savings is always balanced by other important metrics such as quality, reliability, and so on.
2. All the organizations studied were very careful to separate hard cost savings that could be traced to the bottom line from other types of cost savings or efficiency improvement. In all cases, the hard savings are emphasized. In most cases, the soft savings are not reported outside of PSM in the same way as are the hard savings.
3. Renegade purchasing and getting internal clients to comply with contracts and use PSM's established

relationships was noted as an issue for all of the organizations studied, for a variety of reasons. The way this was managed varied among the organizations. Some focused on getting such good contracts and demonstrating so much savings that internal clients would want to use their contracts. In one case, the organization has a policy to reduce budgets based upon documented purchasing cost savings. In this organization, the business units welcome PSM's support, because they are held accountable for reducing their expenditures with or without the support of PSM.

Research Question 7. What other unique processes or organizational structures contribute to the success of strategic cost management efforts in the organization?

1. All the organizations studied utilize finance or cost management experts to support supplier cost analysis. These individuals might have supplier cost management as a significant part of their job functions, or might be dedicated exclusively to supporting supplier cost management and analysis. These cost management specialists participate on the cross-functional teams, and help develop and implement the cost models. They have general responsibility for helping to identify, measure and monitor cost-savings initiatives. There are two general approaches for the reporting relationships of the cost management specialists, as highlighted in Table 1. The cost specialists might report directly to the PSM group, either in a controllership function or as cost management specialists. The other approach is to have the cost management specialist report to the finance/controllership function of the business unit or the corporation. Neither approach appeared to have an advantage over the other, in that the cost specialists and their reporting and analysis were viewed as credible regardless of reporting relationship, and because the supplier cost management and analysis aspect of the job was viewed as important enough to receive a great deal of attention, regardless of the reporting relationships. The use of cost management specialists to support the analysis was viewed as very important, because in many cases, PSM specialists simply did not have the time to dedicate to the level of analysis that was needed. In other cases, they did not have the expertise. In still other cases, their results might be viewed as biased, since they were both executing the analysis and measuring the outcome.
2. One unique approach to cost management used by Tele was creation of an internal consulting group dedicated to supporting costs management and special project analysis for that organization. The

specific focus of this group was to view all of their project analysis from a TCO perspective. In addition, because members of the internal consulting group are not part of the project execution, they have an unbiased perspective.

- Deere also created an internal consulting group called “compare & share” to help understand and reduce parts proliferation and increase standardization. This team compares parts with similar features/functions among and within divisions to determine which part/supplier provides the best value, and educate engineering and other decision makers. The initial charter was for the group to be together for two years to accomplish this task.

Research Question 8. What impact do supplier relationships have on the organization’s cost management approaches?

This question views supplier relationship management from the perspective of the core, or buying organization.

- All of the core organizations studied agree that their suppliers, and the relationship with their suppliers, are becoming more important in general, as the organizations become more dependent on suppliers for a larger proportion of their cost of goods, as well as for improvement opportunities.
- The organizations studied rely heavily on long-term relationships with key suppliers. However, some of the organizations believe that they have excellent relationships with their suppliers, while others do not. In all cases, the buying organizations studied are very large players, and wield substantial purchase volume in some markets, putting them in a position of relative power over their suppliers. The two organizations whose products are sold primarily in consumer markets, or to OEMs that sell to consumers, Chip and LCP, seem to feel the greatest cost pressure and pass that along to their suppliers, even their key suppliers, most directly. These organizations admit the greatest strain in supplier relationships, although they are both working to improve those relationships. The other three cases, Deere, Tele, and Praxair appear to have better working relationships with their suppliers, in terms of a true continuous improvement approach, rather than an approach that borders on adversarial at times.
- All the organizations in this study engage in supplier development to varying degrees. Supplier development involves working with key suppliers to help the suppliers improve their performance. All of

the organizations expect their suppliers to continuously improve. Some have formal programs to support this, such as Deere’s supplier development and value improvement programs, and Praxair’s TARGET program. The other organizations approach supplier development on an ad hoc basis, devoting resources to suppliers when they can see a significant, generally immediate benefit. All of the supplier development efforts are focused on first tier suppliers.

- Despite all of the popular press, the concept of sharing cost savings with suppliers is not a common practice among the organizations studied. If the supplier contributes significantly to the development and execution of the cost saving approach, there is a higher probability that cost savings will be shared. In general, the organizations studied felt such an intense pressure to reduce costs that the cost savings was often passed along to the end customer, or retained to offset other cost increases.

Research Question 9. What is the supplier’s perspective on the organization’s cost management efforts?

Each of the participating core companies identified a supplier with which it believed it had worked effectively in managing costs and would also be willing to participate in this research. The perspectives of the suppliers are presented in response to this question. One of the factors that made the conversations with suppliers particularly interesting was the timing of the study, which occurred during difficult financial times for all of the companies involved.

- Customer cost management pressure has a direct and indirect effect on the suppliers. All of the suppliers acknowledged the importance of cost/price management, and the need to continuously perform in terms of price and value to maintain the business with this customer. With the downturn in the economy, the supplier to Chip and the supplier to LCP stated that they had felt a great deal of direct pressure to cut prices, without much support in terms of supplier development. This had caused strain on the buyer-supplier relationship.
- It is not the fact of asking for year-over-year price reductions that creates strain in itself. Rather, it is the supplier’s perception that the customer will not support it in achieving these price reductions, and is more concerned about getting a low price than reducing the underlying costs that support that price.
- The degree of direct customer influence on the supplier’s cost management effort varied. The

suppliers to Deere and Chip both indicated that they were emulating this customer's cost management and analysis approach. In both cases, the customer encouraged them to do so as a way of better managing their suppliers, who are second tier suppliers to Deere and Chip. Both Deere and Chip have sophisticated cost management approaches with a high level of resources dedicated to supplier cost management.

4. All of the suppliers studied also work with their suppliers in various ways on managing their supplier's costs. In general, all of the customers studied had more sophisticated cost management systems than did their suppliers. Each supplier indicated that supplier management is becoming more important to it, and that its organization is increasing the effort it expends on supplier cost and relationship management.

Research Question 10. What impact do customers have on the organization's cost management approaches?

1. In general, the PSM organizations studied did not have direct customer contact. As a result, PSM did not directly feel the influence of customer cost pressure. However, the indirect pressure is significant. In general, the customer viewpoint is communicated to PSM in PSM's role as a member of a cross-functional team.
2. In the cases of LCP and Chip, which both deal with very large and powerful customers that interact directly with consumers, standing customer service teams are in place to work with key customers to help manage and improve cost and performance. These customer service teams within Chip and LCP also develop deep understandings of their customers' cost structures. Chip uses this understanding to support negotiations and anticipate customer demands. LCP uses the data in this way, but also to help the customer manage its costs.
3. In the case of the only customer with whom the researcher had direct contact, a large retail customer of LCP, the customer indicated that LCP had been instrumental in shaping its cost management approaches, adding value, and demonstrating true partnership characteristics. This customer also indicated that it is rationalizing its supply base and working to form closer relationships with its remaining suppliers.

Research Question 11. Does the organization take a true supply chain management perspective of strategic cost management?

1. All of the organizations studied agreed that while they aspire to a true supply chain/supply network view of strategic cost management, they still have opportunity for improvement. They all had different approaches for improving their supply chain perspectives. Common themes were the need for early involvement in projects, and a more holistic view of the supply chain. Currently, issues directly related to the customer are communicated indirectly to PSM. As a result, critical customer issues may be missed.
2. Not surprisingly, PSM focuses on the upstream cost management aspects of the supply chain, related to the suppliers. It does a good job of understanding and managing the costs associated with the first tier suppliers. None of the organizations studied focus on suppliers beyond the first tier as a matter of course. Rather, second tier suppliers and beyond are dealt with on an exception basis, as problems and issues arise. The stated policy in all of the companies studied was to rely on the first tier suppliers to manage their own suppliers, the second tier suppliers to the core organization studied. However, it was acknowledged that there is great potential for improvement in the second tier suppliers, and that involvement with key second tier suppliers will likely increase in the future.

Research Question 12. What are the key success factors and barriers to strategic cost management?

Because overcoming the barriers to successful strategic cost management in the supply chain is closely related to success factors, these issues are discussed together.

1. High-level visibility and reporting relationships for PSM are important for PSM's initiatives to receive visibility and attention to support their success. Several of the organizations noted that they had undergone reorganizations that increased the visibility and reporting level of PSM at about the same time that they accelerated their strategic cost management efforts. They believed that the top management attention and support were important to their successful contributions to cost management.
2. The availability of trained, dedicated personnel to support supplier cost analysis is also important. Dedicating resources to supplier cost management not only shows management support, it also allows PSM to identify opportunities and deliver results.
3. Credibility in the numbers reported is also important to the success of strategic cost management. This

means that all key players agree on how the numbers are calculated. The numbers must also be determined and computed by a trustworthy source, with the emphasis on reporting numbers that can be traced to bottom line cost improvement.

4. Cost management must be viewed as an important priority throughout the organization. This should be reflected in performance expectations and the reward and measurement systems in the organization.
5. Strategic cost management is not one process, but rather a series of processes and tools that are coordinated to support organizational objectives. To be effective in strategic cost management, organizations need to have good sourcing and cost management tools and processes, such as cross-functional sourcing and new product development teams, strategic sourcing, target costing, should-cost analysis, and total cost of ownership analysis in place.
6. Organizations must have good information systems to gather the data needed to analyze spend patterns and monitor price and cost trends for strategic cost management.
7. PSM must deliver bottom line cost improvements in order to earn and retain its credibility and respect from top management.

Research Question 13. What is the future of strategic cost management in your organization?

1. Strategic cost management will continue to be emphasized, and even grow in its importance for the organizations studied.
2. Suppliers and supplier relationship management will grow in importance as sources of cost savings and improvement. There is a limit to the amount of year-over-year cost savings attainable from on-line reverse auctions. The long-term opportunities lie in working more closely with suppliers.
3. The emphasis on early PSM and supplier involvement will continue to grow as a source of cost savings and product improvement. The emphasis on customer value in cost management will grow and gain more visibility within PSM.

Implications of the Study

This study has several implications related to PSM's involvement in strategic cost management in the organization. They are closely related to the results of the research questions presented above.

Organizational Support at all Levels

While PSM is held to a high level of accountability for strategic cost management and delivering bottom-line savings, PSM cannot be successful without extensive support from others throughout the organization. First and foremost, top management support is critical. It sets the tone for the attitude that everyone in the organization has toward strategic cost management. Through the business unit and functional metrics, top management determines the nature and extent of cost management focus as an organizational priority. Based on this, PSM needs the support of other functional areas cooperating teams that have a primary or second goal of managing supplier costs. The participants on cross-functional teams need to be held accountable for the identification of opportunities and delivery of results.

PSM also needs specific support from cost management specialists, who are assigned to support PSM and cross-functional teams in supplier cost analysis. These individuals may be part of PSM or part of finance. The critical requirement is that they have the charter and the qualifications to effectively support supplier cost analysis and management. Supplier cost management must be viewed as one of, if not the most important aspect of their jobs. This focus is critical because supplier cost analysis is often specialized and time consuming. PSM and cross-functional teams need to know that there are internal experts upon whom they can call to support their supplier cost management efforts. Without such support, the analysis may be too complex and time consuming to be done as part of PSM's or the cross-functional team's regular activities.

Supplier Cost Management is a Good Investment

The suggested approach for dedicating resources to supplier cost management may seem cost prohibitive. However, the organizations studied unanimously agree that they receive extremely high returns on their investments in supplier cost management efforts. The money spent on supplier should-cost analysis, supplier development, and other tools and approaches pays for itself many times over in terms of reducing costs and bottom-line prices paid to suppliers. For large Fortune 500 companies, successful strategic cost management may mean the addition of dedicated personnel to focus on supplier cost management. For smaller organizations which might not have as great an on-going need, or as great an asset base, successful strategic cost management

may mean diverting resources from PSM and/or finance, and retraining one or more people to become internal experts on some of the cost management and analysis tools mentioned in this study.

Strategic Cost Management in the Supply Chain is a Process and a Philosophy

The organizations studied indicate that they live and breathe cost management. It is integrated into all aspects of their jobs and all dealings with suppliers. Top management and functional support is not enough to ensure the success of strategic cost management. Key internal processes, such as new product development and strategic sourcing, must also be designed in a manner that integrates an understanding of customer needs, and the creation of specific cost and profitability goals.

Credibility in Reporting Results

The savings that are attributed to supplier cost management must be believable, and traceable to the bottom line. It is important that there is consensus across the organization regarding how the numbers are calculated and reported. In general, finance reports these numbers to increase the credibility of the results. The focus is on reporting cost savings that can be traced to reduced spending within the organization.

Supply Chain Perspective

Taking a seamless view of strategic cost management across the supply chain is not yet a reality. In most cases, the inbound view of the supplier is handled by a different team/organization than the outbound supply chain view to the customer. It is critical that somewhere in the middle, the organizations dealing with the customers make sure that the customer value proposition is clearly communicated to the organization dealing with the supplier. It is essential that internal organization goals and objectives be aligned in order to align the goals and objectives of the supply chain.

Customer-Facing Supply Chain Perspective – In general, the supply chain managed by the organizations studied included only the first tier of suppliers and the immediate customer. A notable exception was two of the companies whose products are sold to consumers, either through a retail channel or after the product is used to produce another product. Both of these organizations had a very close watch on demands and vagaries of the end consumer, and aimed to anticipate shifts in consumer demand patterns in order to better serve their immediate customers. Who ultimately determines the demand for a product, the end customers or the immediate customers is an important determinant of where the producing organization should focus its attention.

Supplier-Facing Supply Chain Perspective – All of the studied organizations segment their supply bases and use different tools and approaches for managing different suppliers and purchases. It is critical to use a cost/benefit approach to supplier cost management to use the organization's limited resources wisely. In addition, all of the organizations studied focus their supplier management attention on their first tier suppliers. They also recognize that there is much possibility for improvement in the supply chain in the second tier, yet do not plan to focus on the second tier. There could be significant opportunity for supply chain improvement by working directly with critical suppliers in the second tier and beyond.

Supplier Perspective on Strategic Cost Management in the Supply Chain

The suppliers to the core organizations studied were quite aware of the importance of cost management and continuous improvement in retaining their business with the buying organizations. While all felt continual pressure to perform, some suppliers felt that the pressure was fair, and other suppliers felt that the pressure had become unreasonable. In order for buying organizations to retain good supplier relationships and the image of fairness in the face of continued cost pressure, they should:

1. Be concerned with the supplier's underlying cost structure and how they can support price reductions, instead of being concerned only with price.
2. Provide resources and ideas to support supplier's cost reduction efforts when requested by the supplier and it is reasonable to do so. If an organization is unable to support the supplier's cost reduction efforts, it should explain why.

Suppliers' Management of Their Suppliers

While all of the supplier organizations studied were working on managing the costs of their suppliers, none had a supplier cost management system as sophisticated and well-developed as did the core organizations which they supply. As a result, it might be a good investment for buying organizations to provide thorough cost management training to their suppliers, and help their first tier suppliers develop excellent cost management approaches, so that they, in turn, can do a better job of managing their suppliers. This is particularly critical since the core organizations do not want to get involved in the inbound supply chain beyond first tier suppliers.

Support for Strategic Cost Management Theory

As mentioned in the brief review of the literature below, strategic cost management theory embodies understanding and managing the organization's supply chain, the cost drivers and the customer value

proposition. It is a matter of simultaneously understanding and managing these elements in relation to each other. The organizations investigated do an excellent job of understanding and managing their internal cost drivers and supplier-facing cost drivers. Two of the organizations that have a strong management focus on customer relationships also do an excellent job of managing the customer-facing cost drivers.

It is not clear from the study how well these organizations understand the customers' value proposition and translate that across internal functions and to their suppliers. Except in the case of LCP, and to some extent Deere, the translation mechanism is indirect, through one or more functions that may have direct customer contact. This represents an opportunity for potential improvement.

Related to this, as mentioned in the section on supply chain perspective, most of the organizations studied do not generally have a seamless view of the supply chain from customer to supplier; the customer view and supplier view are still managed separately in different organizations, with some interface in the middle. Such coordination would be a complex undertaking, and might require a change in team structure. The organization that comes closest to embodying a true supply chain perspective is LCP, with its product supply structure. While the argument could be made that it is

more important for LCP to be close to its customers because it is a consumer products firm, all types of customers are becoming more demanding (Fawcett and Magnan, 2001). LCP's product supply structure has a Product Supply Vice President who reports into the Business Unit President. Also reporting to the VP of Product Supply are PSM, engineering, manufacturing, customer service/logistics, and finance. Deere has a similar structure, although there is a mix of direct and indirect reporting relationships.

Characteristics of Companies with Effective Supply Chain Strategic Cost Management Approaches

The key characteristics that organizations with effective strategic cost management systems should display are shown in Table 3. Table 3 was developed as a composite ideal of the best characteristics of the core supply chain organizations studied. It is not representative of any one organization. There are specific attributes related to way the organization understands and manages the relationship with the customer, its supplier, and related to their own internal organization. The key organizational characteristics have been divided into cultural/organizational issues, measurement issues, and information/communication issues.

Internal requirements/characteristics – Both the customer-facing and supplier-facing characteristics stem from inside

Table 3
Ideal Organizational Characteristics for Strategic Cost Management

Customer-Facing Knowledge	Internal Requirement/Characteristics	Supplier-Facing Knowledge/Characteristics
<i>Culture/Organization</i> <ul style="list-style-type: none"> • Work closely with immediate customer on supply chain design, cost and customer issues 	<i>Culture/Organization</i> <ul style="list-style-type: none"> • Top management support • Cross-function teams • Dedicated supplier cost management/analysis specialists • Cost management integral to all supplier-facing processes 	<i>Culture/Organization</i> <ul style="list-style-type: none"> • Continuous improvement focus • Support key suppliers with resources to facilitate continuous improvement • Early involvement of key suppliers • Train suppliers in supply chain cost management
<i>Measurement</i> <ul style="list-style-type: none"> • Understand end customer's wants/needs • Understand market trends 	<i>Measurement</i> <ul style="list-style-type: none"> • Metrics aligned with cost management/other goals • High level visibility/reporting of cost management results 	<i>Measurement</i> <ul style="list-style-type: none"> • Reward key suppliers with more business and/or sharing savings • Segment supply base to vary relationships and cost management techniques
<i>Information/Communication</i> <ul style="list-style-type: none"> • Recognize the importance of communicating customer needs throughout the organization 	<i>Information/Communication</i> <ul style="list-style-type: none"> • Excellent information systems • Seamless understanding and communication of customer needs 	<i>Information/Communication</i> <ul style="list-style-type: none"> • Clear communication of expectations to suppliers

the organization. The internal culture and organizational structure create the framework for effective supply chain cost management. Internally, an effective cost-management culture is characterized by top management support for cost management and a high level of cost and value consciousness throughout the company. In addition to dedicated resources to support supply chain cost management, cross-functional teams are used to identify and implement cost management approaches. Rather than an afterthought, cost management is an integral part of all key supplier processes.

The right type of reward and measurement systems is also critical to reinforce the cost management culture. It is critical that the organizations measure what they want to achieve, and the metrics are aligned throughout the organization, reflecting cost goals as well as customer value and supplier performance goals. Supply chain performance metrics and results must be published and receive high visibility throughout the organization. This requires excellent information systems and communication. Part of this communication includes awareness throughout the organization of customer needs and the organization's value proposition in serving the customer.

Customer-facing knowledge – Supply chain management is all about meeting the needs of customers better than the competition does. In terms of the organization's culture, the company needs to be customer centric, valuing its customers and working with them to meet their needs while improving the efficiency and effectiveness of the supply chain. From a measurement standpoint, the organization needs to understand the needs of the end customer as well as market trends, and respond to these proactively. From an information and communication perspective, it is critical that the customers' needs and the organization's plans for meeting those needs be communicated throughout the organization. This allows everyone in the organization to align his or her efforts around the customer.

Supplier facing knowledge/characteristics — Effective supply chain strategic cost management relies heavily on suppliers. Culturally, this means a continuous improvement focus on working with suppliers, including early supplier involvement. It also means supporting supplier's continuous improvement with resources and training. From a measurement and reward standpoint, the organization must properly segment its supply base to use the appropriate types of supplier relationships and cost management techniques. It also needs to measure supplier performance, and reward the suppliers who perform well. Clearly communicating expectations and needs to suppliers is essential.

The organizations studied in this research excel in the third column of Table 3: supplier-facing knowledge. They segment their supply bases, have dedicated supplier cost management resources, emphasize continuous improvement, and in many cases develop the suppliers by providing resources to support continuous improvement. They reward their top suppliers by sharing cost savings or giving them more business. They are working on improving communications and early supplier involvement. One strong recommendation is that they invest more resources in supplier training. In general, their first tier suppliers do not have as well-developed approaches to supplier cost management. Since these core organizations would prefer not to work on supplier cost management beyond their first tier suppliers, the first tier suppliers would likely be much more effective if they improved their cost management systems, and worked more closely with their suppliers.

Design of the Study

Much of the impetus for this study is driven by the timeliness of the topic and the lack of relevant research and literature in strategic cost management in the supply change from the PSM perspective, as presented in Appendix B: Research Proposal. This section presents a brief overview of the research design. A literature review that provides more insight into strategic cost management is included in Appendix F. A more comprehensive presentation of the research design is provided in Appendix G.

Design

This study was conducted using an in-depth case study research method. This method was chosen to support the broad and exploratory nature of the research questions of interest (Yin, 1994; Meredith, 1998). The input of PSM professionals was used to shape and modify the research design.

Sample Selection

The criteria for selecting companies to participate in the research study were as follows:

1. Active involvement in cost management efforts working with suppliers and/or customers to reduce supply chain costs.
2. Belief that some of your organization's cost management practices are leading edge/innovative.
3. Significant bottom line savings to the organization through supply chain cost management efforts.
4. Willingness to openly share thoughts and processes involved in supply chain cost management.
5. Willingness and ability of the initial contact to act as a liaison to provide the researcher with entrée to other members of the organization, the supply base, and customers.

Appendix C contains the interview protocols, cover letter and abbreviated research proposal used to engage the case study participants.

The number of people interviewed and their functions varied among the organizations. A summary of the representation of case study participants is shown in

Table 4
Case Study Participants

CASE	PSM	OTHER INTERNAL*	SUPPLIERS	CUSTOMERS	TOTAL
Deere	6	3	1	-	10
Chip	5	7	3	-	15
LCP	4	4	2	1	11
Tele	8	3	1	-	12
Praxair	4	1	2	-	7
Total	27	18	9	1	55

*Titles/positions of each participant are available in the appendices to this report at the end of each case study

Table 4. In all core cases, representatives from PSM and finance/accounting participated in the case studies. Individual cases summarizing the respondents' comments were prepared and e-mailed to the individual respondents for comments. These were very detailed, beyond the summary cases included in Appendix A. Participant feedback was incorporated and the case

modified. This increased the validity of the results. Other methods used to increase validity are shown in Table 5, and explained in more detail in Appendix G.

Table 5
Tactics Used to Increase Validity

Construct Validity	-External business executives review interview protocol research proposal
	-Use multiple sources of evidence as included in the case study database:
	• Multiple informants
	• Internal and external informants
	• Multiple sources of evidence including presentations, web-sites, published articles
	-Have key informants review case study draft report
Face Validity	-External business executives review
Internal Validity	-Pattern matching
	-Multiple informants from within the same company review study
	-Multiple informants from within the same company report on same phenomenon
External Validity	-Replication with five core companies and five suppliers
Reliability	-Use case study protocol
	-Develop case study database
	-Triangulation

Adapted from Yin, 1994; Ellram, and Siferd, 1998.

The Role of Purchasing and Supply in Strategic Cost Management in the Supply Chain

Introduction and Background

Strategic cost management in the supply chain is characterized as follows:

- It is purposeful: It supports the organization's strategy.
- It is boundary spanning: goes beyond supply management both within the organization and outside the organization (suppliers, customers).

This broad definition allows the researcher a great deal of latitude in identifying strategic cost management within and among organizations. This is consistent with the case study research method, which endeavors to provide discovery and new insights. The distinguishing feature of strategic cost management is that it considers cost management not as an end in itself, but as a means to support the goals of the larger corporation. Thus, it has a broader view and broader implications than simply getting a price that is a few pennies less.

The supply chain is defined here as a minimum of three links that work together to fulfill the needs of a common customer. While only one of the case studies include cases from people in three links of the supply chain, they all include the indirect perspective of three links by asking people within various organizations how they interface with other links in their supply chain. The overall objective of this study is to gain a perspective on PSM's participation in strategic cost management in the supply chain.

Discussion of the findings

Research Question 1. How Important is Strategic Cost Management in the Organizations Studied, and Why?

To set the stage for this research, the researcher began the interviewing process by asking the above question. Not surprisingly, all of the organizations studied identified cost management as extremely important and growing in importance within their organizations. The rationale for the growing importance of cost management varied

Table 6
Reasons for the Increasing Importance of Strategic Cost Management in the Organization

- Declining sales
- Declining margins
- Declining prices
- Decreased global competition
- Stated objective of mergers/acquisitions that must be monitored and realized
- Customer pressures to lower prices (mentioned both in the context of consumers and industrial customers)
- Market is price-oriented
- Increasing amount of total spend of company is spent on purchases from suppliers
- Capacity constraints/industry allocations create cost pressures elsewhere
- Need to improve profit margins
- Increased commoditization of products

among the firms studied. A list of some of the reasons that cost management is increasingly important today is shown in Table 6. For example, Deere noted that it has been subject to the economic swings, like the 1998 and 2000 downturns, and growing global competition. Simultaneously, it has been expanding to serve highly competitive world markets, which also creates a challenge in terms of cost efficiency. As a result of a combination of declining sales and the market's inability to support price increases, it has been under increasing pressure to reduce costs to help contribute to the corporation's bottom line.

Chip mentioned that it has always been in a cost-competitive and cost-focused environment, but recently, it has been feeling increased pressure from the market place, and the demands of the end consumer. The focus and attention on costs has increased substantially in the past five years or so, due to increased competition and the declining prices of PCs. As a result, the materials group, including purchasing, receives many top-down mandates for achieving cost goals. It is expected that there will continue to be a greater cost management emphasis due to where Chip is in the life cycle of its own product.

LCP also mentioned the increased commoditization of its products, and the growing size and power of its customers as factors contributing to increased pressure to manage cost. More effective purchasing and improved manufacturing reliability have been the primary sources of improved profits for LCP over the past 10 years. These positive results have added to the pressure to better manage costs. LCP tends to pass along the majority of its cost improvements to its customers in the form of lower pricing. This is important in keeping strong sales and consumer demand.

Tele has similar pressures, with the added complication of a large number of recent mergers and acquisitions. Everyone interviewed agreed that cost management is very important at Tele. One person mentioned, "The fact that an internal consulting group to support cost management and analysis even exists is an good indicator of the importance of cost management." All of those interviewed agreed that cost management is so important at both an enterprise-wide level and a purchasing level in particular that it would be difficult to further increase its importance. The recent mergers have heightened the visibility of cost issues. One of the goals of the mergers was to significantly increase procurement savings. That goal has been achieved and exceeded, as savings have been greater than planned.

Praxair's product has always been a commodity. It attributes the increased cost pressure that it is feeling to the weaker economy that is affecting some of the

industries that it supports, as well as to a growing internal recognition of the major impact supply has on the organization's bottom line.

During the interviewing process, it became clear that all of the organizations studied had cultures of cost consciousness, permeating from the top of the organization through all levels and functions of the organization, and touching their suppliers as well. This was seen in comments like that from Tele, "We spend the company's money like it is our own." As one person interviewed at Chip explained, "We have a frugality mentality." Thus, the emphasis on cost consciousness demonstrated by the organizations studied is a philosophy or way of doing business, rather than an isolated initiative.

Research Question 2. How Are Firms Organized Effectively to Achieve Strategic Cost Management?

To answer this question, we look first at how the purchasing functions are organized within each firm, then more specifically at where the cost analysis and management activities occur. As shown in Table 7, all five of the primary companies studied had centralized, or a mix of centralized and decentralized purchasing organizations. There was widespread agreement among the firms studied that at least some degree of centralization was required to get visibility of purchases in order to gain leverage and properly manage the supplier relationships and cost issues. For example, in the past several years, Deere changed from a highly decentralized purchasing structure to one that was purchasing about 50 percent of the corporation's total spend at the corporate level. This includes virtually all indirect spending, and about 20 percent to 30 percent of the total direct materials. Most of the rest is now purchased at a more centralized divisional level, while only about 10 percent of the total spend now occurs at the factories. This represents a significant change for Deere, which always has operated as a highly decentralized organization.

Chip always has operated as a highly centralized purchasing organization with a direct reporting relationship to the manufacturing group. In this high-technology arena, there is realization that effective

Table 7
PSM Function Organization Structure

	Centralized	Decentralized	Mixed
Chip	X		
Tele	X		
Deere			X
LCP			X
Praxair	X		

purchasing and supplier relationship management are essential to manufacturing and new product support. Similarly, Tele recognizes the value of a centralized supply organization to support its business units and its new service development.

Likewise, Praxair moved from a more decentralized, ad hoc approach to purchasing in the late '90s to a highly centralized approach. Just like the change that was instituted by Deere, this change came about with top management support and the recognition that there was commonality across business units, and that leveraging that commonality in purchasing was critical for purchasing to support effective cost management and supplier relationship management.

LCP's purchasing has been a mix of a centralized and decentralized structure. It has recently shifted more responsibility away from the central corporate purchasing group back to the business units. It continues to have a centralized "service" organization that leverages the common indirect purchases. In downsizing the corporate group, it eliminated non-value activity. Today, there is also a centralized purchasing/supply chain group that acts as a global think tank, looking for innovative ideas and opportunities for supply chain improvement and feeding these ideas back to the business units. With the overall organizational structure in mind, it is helpful to think about how the case study firms are organized for strategic cost management.

Research Question 3. Who is Responsible for Conducting Cost Management in the Organization, and Who is Accountable for Delivering Results?

This question is answered by considering the role of PSM as well as others within the organization.

Supply Management's Responsibility for Delivering Supply Chain Cost Savings – At Deere, cost management and strategic sourcing share the goal of bringing savings to the organization through supporting the business units. Cost management helps evaluate supplier quotes, and supports and reports on the progress of strategic sourcing from a cost management perspective. The strategic sourcing manager at the business unit level drives the cost savings initiatives down to the strategic sourcing and commodity managers. Ultimately, strategic sourcing is completely responsible for executing and delivering cost savings. Cost management is part of the personal goal sheet for each person in supply management.

At Chip, purchasing has a very high level of accountability for cost management through the purchasing expenditure plan. PEP is a cost performance management program used within the materials group

and Chip to monitor and manage cost performance. The focus of PEP is on the current year's performance. Bonuses and pay are strongly influenced by individual and functional contribution to cost savings.

At LCP, the Purchasing Director for the business unit is responsible for the cost of materials and cost savings programs. These objectives, in turn, roll up to support the objectives of the Business Unit Vice President, and down to influence the goals of the Purchasing Director's reports.

Within procurement at Tele, cost management efforts for new or existing products or services are driven by Strategic Sourcing organization, which creates supplier contracts. Savings are monitored by evaluating the total cost of ownership for those goods/services, as well as suppliers' performances in the areas of on time delivery and cost of product or delivery non-conformance. This is a key part of how supply management is evaluated at Tele. The ICG, described above, is responsible for helping to identify savings opportunities, but has no responsibility for execution. In addition, supply management is responsible for achieving savings and supply chain process efficiency targets agreed to in merger contracts.

At Praxair, the specific accountability for cost savings in the PSM area includes operating profit impact, savings on capital expenditures, and contribution to cash flow via savings in cash and inventory. Each individual within supply management has specific accountability for achieving certain cost savings objectives.

Responsibility for conducting cost management in the organization – In general, the responsibility for conducting cost analysis and management activities is widespread throughout the organizations studied, as well as in purchasing specifically. Table 8 summarizes how responsibility for conducting cost management is spread within the core organizations studied. Each of the organizations has taken unique approaches to ensure that it has the cost analysis and cost modeling skills in place within its organization to support strategic decision

Table 8
Responsibility for Conducting Cost Management/Cost Analysis

	PSM	Finance-Controller	Internal Consulting	Special Team
Chip	X	X		
Tele	X	X	X	
Deere	X			X
LCP	X	X		
Praxair	X	X		X

making in purchasing decisions. The two general approaches are the use of experts who specifically focus on supplier/supply chain cost management, and the use of finance/accounting personnel to support/conduct various types of supplier cost management. Beyond relatively routine cost management within the organizations studied, PSM was not expected to conduct supplier cost management/cost analysis on its own. The underlying philosophy in the cost management processes used at all of these organizations was to develop and leverage cost management/cost analysis expertise. Some organization's also designated special teams, such as Deere's "compare and share" team, to specifically conduct supplier/supply chain cost analysis over a given time frame. The special approaches are discussed in a separate section under Research Question 7.

Deere's overall approach is to have in place in each business unit cost managers who can support all of the cost management/analysis needs of that unit. In the past several years, five cost managers have been put in place within the PSM organization, one for each division and one for corporate purchasing. These cost managers are highly trained and skilled specialists, many of whom have years of cost management/analysis experience with other companies. These cost managers all have small staffs that support them in providing cost analysis to their respective divisions. The cost managers also meet regularly as a team. The support that cost managers provide can take the form of conducting various types of cost analysis as well as supporting the efforts of other individuals in the business unit in conducting cost analysis.

At Chip, the finance organization views optimizing shareholder value as its mission. Finance is disbursed entirely throughout the organization, becoming involved in all key decisions. Finance has a big picture perspective, supported by the organization structure. Finance reports directly to corporate finance and has a dotted line to the business unit or functional area it supports. Finance supports cost management by working very closely with the PSM function, creating cost models, validating cost models, including visiting suppliers to gather data and get feedback on models created. Finance also facilitates the use of cost models, and supports model credibility. Thus, finance is key in supporting supplier cost management. Part of finance's charter is to help identify cost savings opportunities.

At LCP, the finance and accounting manager of the respective business unit leads cost savings efforts. This is supported by Product Supply and Marketing. The idea is to work as a cross-functional team and leverage the expertise of each area.

Tele also has a variation on supplier cost management. All the groups within supply management are more or less involved in strategic cost management. However, because of the diversity of participants, an internal cost management consulting group was formed to collect and analyze cost data for the entire procurement organization in a centralized manner, and then provide consulting service to the internal clients within procurement as well as clients throughout the enterprise. This Internal Consulting Group (ICG) was formed within procurement about five years ago when one of the purchasing managers approached the Vice President of Procurement with the idea that total cost of ownership analysis and doing a more thorough, complete analysis of purchases could reduce the company's costs significantly and improve decision-making. The Internal Consulting Group focuses on cost, process, and planning issues for internal clients. This group gets involved in a variety of projects, solely at the bidding of internal clients. There is no obligation to use their services, nor is there a direct charge for their services. ICG mainly serves internal clients within procurement. More detailed information about ICG is available in the Tele case study in Appendix A.

Praxair has a similar approach to Chip in leveraging the expertise of finance. However, at Praxair there is a director-level controllership function in the global procurement group that reports to the Vice President of Procurement, along with the three other procurement directors. This function was added for a number of reasons when the procurement organization was re-engineered in the late 1990s. The reasons for adding the controllership function include:

- Helping to determine the savings potential of projects.
- Developing appropriate mechanisms for tracking cost savings.
- Tracking the actual savings potential of projects.
- Obtaining business unit buy-in to the actual project savings.

Thus, the controllership function at Praxair also plays a key role in supporting supplier cost management and supporting the analysis.

Given the predominance of finance and cost analysis specialists to support cost management and analysis, the question must be this: Who is held accountable for delivering cost savings results to the organization? The answer to this question is previewed in Table 9, and summarized below.

Accountability for strategic cost management through the organization – As mentioned previously, the accountability for cost savings and cost management is widespread

Table 9
Functions that are Primarily Responsible for Delivering Supplier Cost Savings*

	PSM	Finance/Cost Specialist	Product** Supply	Distribution	Production/Operations	Quality/Productivity	Engineering/Design
Chip	X	X		X	X		X
Tele	X			X			
Deere	X	X			X	X	X
LCP	X		X				
Praxair	X			X	X	X	

*The organizations studied may use different names for the similar functions.

**Product supply is a unique function that includes PSM, operations, finance, and customer service.

through all of the core organizations studied. For example, functions outside of cost management within Deere have felt some accountability for cost management. This has been spread to engineering, operations, accounting, and marketing so they will feel greater accountability for cost. Buy-in is improving. Twenty percent of each employee's bonus calculation is based on cost reduction, and there is no cap on the bonus. Return on investment is also a major factor, along with division specific objectives.

In the new product arena at Deere, the supply chain integration (SCI) manager is responsible for all new product programs. The SCI manager integrates strategic sourcing early into new product programs. Through strategic sourcing, suppliers may be co-located during the design phase of new product programs. Critical areas of design focus are large cost areas and those areas where there is a major design change. SCI managers ask cost management experts to evaluate the cost structure of the new designs. If there is a problem, strategic sourcing and supplier development may get involved. There may also be engineer swaps with the supplier in order to get more integration.

At Chip, a centralized organization carries out the operational aspects of purchasing, production, testing, and logistics. Purchasing/materials is part of that group and includes all aspects of material acquisition, purchasing, supply chain management, materials technology and a special projects/collaboration group. Cost management is co-owned by all functions. Engineering focuses on cost take out through design and development. Operations does the project schedules and implementation. Finance helps understand trade-offs, pulls data together, develops analysis tools, quantifies options, calculates savings and profitability, and folds these into overall strategy. Purchasing/commodity management focuses on ongoing cost reduction and performance issues. Logistics manages inventory and transportation. All are ultimately

responsible. They need cooperation, a team effort. Finance and operational owners/business units have to sign off on all key materials decisions. While all participants are held responsible for achieving the goals to which they commit, ultimately business units are accountable for achieving cost targets.

At LCP, the VP of Product Supply organizational structure provides one-person visibility of all key product supply costs and issues. This position ultimately has responsibility and accountability for processes and results. In addition, this role is designed to break down functional barriers and create a process focus with joint goals and responsibilities. The Vice President of Product Supply of the business unit is responsible for meeting the business unit cost target for the total delivered cost of the product. The accountability and total delivered cost breakdown averages as follows:

Category	%	Primary Owner of Costs
Materials	60%	BU Purchasing Director
Manufacturing Expense	20%	BU Manufacturing Sites
Logistics	10%	BU Sites
Product Supply Overhead	<u>10%</u>	BU and Corporate Overhead
	100%	

At Tele, the responsibility for managing costs is well distributed throughout functions and levels in the enterprise. Those with budget and/or revenue objectives, as well as the entire procurement organization feel cost pressure keenly. Cross-functional sourcing teams, comprised of purchasing, business unit representatives, and key stakeholders are held jointly and individually responsible for achieving cost objectives.

At Praxair, the focus is both internal, on operating spending, and external, on money spent with suppliers. Yearly financial objectives drive processes. The objectives are set based on savings translated in terms of earnings per share.

Each business is accountable for its own cost management. This includes:

- Business Units – each is responsible for the cost of industrial gas that it sells.
- Distribution group – is responsible for the cost of distribution of gas.
- Production/Operations – is responsible for the cost to run/maintain facilities.

No group can manage costs effectively without the help and support of procurement, because purchasing does the buying. Throughout Praxair, there is a strong accountability for both costs and budgets. This very high level of accountability for all spend raises awareness of budgetary issues and controls. In sales and marketing, the focus is on revenue growth and cost in terms of the budget. Seventy percent of internal costs are salaries/benefits.

There are also certain service groups in addition to global procurement, that have overall responsibility for cost management within the company:

- Productivity team looks at productivity initiatives throughout the organization, with a primary emphasis at the plant level productivity.
- Six sigma team/initiative looks at many projects and analyzes/creates solutions, to save the company

money. Many of the issues this team deals with are related to Praxair customer satisfaction, such as on-time delivery.

- Energy management group is a dedicated energy management team that has existed for more than 10 years. Because electricity is one of Praxair's largest costs of doing business, this focused team looks for continuous improvement opportunities.

All of the teams have the overarching goal of generating measurable cost improvements, efficiency, and value as well as focusing on customer satisfaction. Each is accountable for delivering major, traceable savings each year.

Cross-functional teams in cost management – As has been alluded to throughout this study, and is illustrated in Table 10, cross-functional teams prevail in organizational cost management. The membership on these teams varies depending upon the nature of the commodity studied and the breadth and depth of organizational impact. The table is not meant to provide an exhaustive list of all those who might participate in a team to support cost management, but rather presents examples of members mentioned in specific instances provided by the organizations studied. Common members include PSM, finance or some cost management representative and key stakeholders from various functions and at various levels within the organization.

Table 10
Cross-Functional Team Membership In Supplier Cost Management*

	Chip	Tele	Deere	LCP	Praxair
Purchasing	X	X	X	X	X
Finance/Accounting	X	X		X	X
Cost Management		X	X		
R&D				X	X
Engineering	X	X	X	X	X
Sales				X	X
Marketing	X		X	X	
Manufacturing			X	X	
Operations		X			X
Design			X		
Technology				X	
Logistics		X		X	
Transport		X			
Warehouse/Inventory		X			
General Management				X	
Contracting		X			
Project Management					X
Business Unit					X
Commodity Management	X				X
IT		X			

*The organizations studied may use different names for similar functions.

Tele provided an in-depth explanation of how its cross-functional sourcing teams support its commodity strategy/cost management process, as presented below. Tele calls its commodity strategy process a “client procurement plan.” The Client Procurement Plan (CPP) supports PSM’s internal clients, and achieves the following objectives:

- Clearly links the supply chain process to the client’s success.
- Provides an opportunity to dialogue with client and calibrate on its key objectives, creating buy-in at the officer team level.
- Proactively focuses supply line issues to create a significant competitive advantage and increase client satisfaction.
- Develops and prioritizes client list, reviews client priorities periodically.
- Schedules attendance at client staff meetings whenever possible to facilitate participation of key direct reports and ease scheduling difficulties.
- Schedules one formal meeting per year and uses follow-up appropriate to each client (e-mail, conference call).
- Integrates client procurement plan into Cross Functional Sourcing Team (CFST) process, taking advantage of established lines of communication and eliminating duplication of effort.
- Assesses program effectiveness from both client and procurement viewpoint.

The Cross Functional Sourcing Teams (CFST) consist of employees and suppliers, having diverse skills, functionality, and expertise, from multiple organizations working to achieve a common strategic sourcing purpose and specific goals including total cost of ownership (TCO) Savings.

The overall purpose of a CFST at Tele is to consolidate and streamline the purchasing activities of the organization — creating savings, efficiencies, quality, and ultimately, shareowner value.

This team of skilled professionals represents a variety of stakeholder organizations across Tele. It carefully considers specific procurement needs and financial concerns and then recommends a unified program that aligns with the organization’s supply-chain management goals. CFSTs actively collaborate with business units, exchanging ideas, sharing knowledge, and capturing issues that may impact the procurement process. Tele procurement is focused on delivering the value of best-in-class supply chain management throughout all Tele business units. CFSTs perform a critical role in ensuring that mission is successfully executed.

Fostering a healthy team environment is the key to success. A successful team exhibits:

- Effective team leadership and member participation.
- Optimum team size.
- Team cohesiveness.
- Effective use of organizational resources.
- Commitment to meeting or exceeding goals.
- Willingness to evaluate performance and recognize contributions.

Demonstrating these attributes will help ensure CFST meets or exceeds its financial targets.

CFSTs are empowered through the decision-making process to design high-quality, supply-line initiatives (within short cycle times) that conform to Tele’s Core Procurement Processes and Operating Practice 6 (OP-6) guidelines. Each team is dedicated toward:

- Ensuring cycle time reductions, especially with new products.
- Developing cross-boundary ownership.
- Promoting innovation and synergy.
- Reducing costs and total cost of ownership.
- Promoting the development and growth of individual team members.

Every CFST has an Executive Advocate who supports and empowers the team’s efforts, troubleshoots problem areas, and removes any roadblocks to success. A Team Lead (typically a procurement director or senior contract manager) guides and directs the team. This includes ensuring the team’s charter is developed and executed and member roles and responsibilities are effectively communicated. Team members participate in a variety of team activities, such as gathering appropriate information, sharing knowledge, and making decisions. The team also includes representatives from business units and, when applicable, supplier organizations.

Research Question 4. How Do Organizations Determine the Focus of Their Cost Management Efforts?

In analyzing the data from all the organizations that participated in this study, it is clear that the organizations all stratify their purchases for cost management. They use different tools and different levels of attention based on their perceived importance and ability to influence the costs of the item being purchased. The level and nature of attention also varies for new products versus existing products. None of these organizations had a formalized classification matching the type of purchase to the type of cost management tool. Rather, supplier classification seems to be part of the corporate culture. For example, everyone at Chip knows that total cost of ownership

analysis is used for capital acquisitions, and that the price of high technology raw materials and components must be constantly monitored, and renegotiated every one to six months, depending on market conditions. There appears to be some judgment and learning that occur in selecting the right approach to cost management. When selecting the right approach, all of the organizations studied had several key caveats:

1. Always consider the potential cost versus the potential benefit of the cost/price analysis approach employed.
2. Stay in touch with the market and use pertinent market information in analyzing and negotiating costs and prices.
3. Make sure to involve people with the right expertise in any sort of complex analysis. This generally means finance people or cost management specialists.
4. Cost management is an integral part of commodity management

Each of the core case studies' overall approaches to cost management is briefly presented below. More information is provided in the case studies.

At Deere, cost management is clearly just one integral part of the many initiatives that Deere is pursuing to achieve excellence in supply chain management. Its overall approach is to have in place in each business unit cost managers who can support all of the cost management/analysis needs of that unit either directly or in a support role. Some of the specific cost management initiatives that Deere has undertaken include:

- Benchmarking
- Deployment of Cost Managers in each division and at the corporate level.
- Development of cost models/should-cost.
- Target costing for new and existing products.
- Standardization through compare and share.
- Supplier Involvement in Value Improvement.
- JDCrop

Cost planning and management are part of the commodity management process at Deere, and are integrated in PSM's strategic plan. There are six people in cost management at the corporate level, supporting approximately 30 teams that cover common parts and all indirect spend. Thus, cost management is a team approach that occurs as the commodity strategy is set for common buys across the organization. In all, there are more than 60 people in cost management at Deere. About one-third of the 29 teams are covered by cost models. The remaining two-thirds use market-based pricing. The market-based pricing primarily involves commodities, so the team forecasts prices to decide

tactics. Team membership includes strategic supply, cost management, representatives from each of the business units and technical/engineering. On the indirect side, the teams try to look creatively at buys/costs, not using traditional cost models. Cost management helps teams understand cash flow issues, and try to get a better feel for total cost. They also try to get teams thinking long term on going from a "per piece" mentality to total spend/total cost of ownership perspective. Divisional level purchases are supported by the divisional cost management staff that has been deployed in each business unit. Suppliers also help provide direction for Deere's cost management efforts through suggestions made for cost improvement via Deere's JD Crop system. See the Deere case in Appendix A for more information.

Chip has a formal strategic long range planning (LRP) process. Each major organization within Chip prepares a strategic LRP. For PSM, the Purchasing Expenditure Plan (PEP) is part of the strategic LRP. The PEP is prepared annually and undergoes much scrutiny. The PEP examines where Chip plans to spend money, based on business unit forecasts. It compares the "do nothing" or status quo alternative to active approaches to manage costs. Both direct savings and indirect savings are considered.

The PEP is prepared by commodity, by buyer, considering volume and mix changes. The plans are rolled up as needed to provide high-level summaries. The PEP is precisely detailed in terms of cost-saving and value management approaches that the buyer will take with each of his or her commodities for the year, and is supported by a detailed commodity plan. The commodity plan includes:

- Key cost drivers.
- Detailed supplier information.
- Flagship products, with an emphasis on specific steps to achieve targets for flagship products.
- Benchmarking data related to costs (history, market, trends).
- Specific cost savings projects planned and under way.
- Shipment mode.
- Value enhancement projects.
- Contracts in place to limit downside liability (consider lowest possible lead time).
- Enhanced terms and conditions that are used for this commodity.

At LCP, managing supplier relations is a key role of purchasing throughout the whole life cycle, from finding suppliers, setting up the relationship, aligning LCP and supplier goals, and transitioning the relationship to phase out at the end of the product life. In the past, purchasing

was price oriented, and delivered price was viewed as the primary yardstick. However, price has been driven down in the past five years or so. Today, there is a shift to looking at costs holistically, from a total cost of ownership perspective (TCO), considering issues such as how a material actually runs and inventory requirements. This trend toward TCO will continue. Now, LCP is working to improve suppliers' manufacturing processes, and create synchronous manufacturing. This involves working more closely with suppliers on cost (e.g. target costing and cost modeling), sharing proprietary manufacturing technologies, and bringing in the supplier early in the development stage (not the black box syndrome). The goal is to streamline the whole supply chain. This is a gradual shift towards improvement/streamlining rather than just focusing on price. This is a more difficult process with commodity type items, where market pricing prevails.

At Praxair, the commodity management/strategic sourcing process is the heart of the approach to cost management. Commodity managers lead the cross-functional teams. The commodities under focus vary from year to year. In general, Praxair performs a complete commodity analysis on one to two major commodity categories per month. This involves understanding all aspects of the cost and value contribution of the commodity.

Supplier interaction on cost management occurs as part of the strategic sourcing process. After the sourcing team has internally developed a strategy for TCO improvement, and a formal sourcing strategy document, it involves the suppliers. It conducts individual supplier workshops with suppliers that it intends to invite to participate in the RFQ. Praxair shares with the suppliers one on one what the initiative is about, the goals, how they view the TCO elements and their magnitude. The supplier is then asked to answer questions about its best practices for cost management, delivery, and related issues so that it can build its case as a viable supplier. The suppliers receive the questions in advance, so they can be prepared. This meeting validates and enhances the sourcing process. Based on the workshops, there may be a reduced pool of suppliers invited to participate in the RFQ processes.

The cross-functional team assesses the suppliers' bids and selects the winner based on what it rated as important in the TCO model. Praxair asks suppliers for cost breakdowns, and creates its own as well. It presents its cost breakdowns to suppliers, and asks suppliers to tell them where Praxair is wrong. The more open suppliers are the ones Praxair wants to work with. This approach worked well on PCs, services, and with some construction contractors. They agree on profit margin, and share in the risk on costs. Travel is also managed in a

detailed way, in which the cost management process includes management of the entire overhead. After selection, Praxair negotiates with the supplier and develops/executes the contract and its terms and conditions, including performance commitments and year-over-year price reductions. To facilitate supplier process improvements, Praxair encourages suppliers to use Praxair's commodity management approaches with their suppliers (Praxair's second tier).

At Tele, cost management efforts for new or existing products or services are driven by the Strategic Sourcing organization (contracting) within PSM, and monitored by evaluating the total cost of ownership for those goods/services, as well as supplier performance in the areas of on-time delivery and cost of product or delivery non-conformance. As with the other organizations studied, cost management is built into the strategic sourcing process at Tele. It follows a guideline called "Procurement Operating Practice No. 6" ("OP6"). OP6 contains corporate policy and operating guidelines for contracting with suppliers. It describes how Tele's procurement process operates within the scope of the approved *Tele Corporate Procurement Principles* and is designed to support implementation of these principles for effective supplier management. It also provides a single "One Tele" contracting process that allows these purchasing requirements to be aggregated and coordinated across Tele for full leverage of the company's buying power.

First cost of product is still the major consideration. For example, PSM documents approximately 200 projects per year and only around 20 percent look at more than just the first cost of the product. Contract managers leverage high volume material purchases to obtain the lowest purchase price through a request for quote process (RFQ). Value added resellers (VARs) are used to reduce costs and improve efficiencies in non-core business activities (e.g. assembly, packaging, installation, etc). Tele has material planners who work with suppliers to communicate Tele's business requirements and material forecasts. The suppliers are required to reduce their prices year over year via their cost saving and quality improvement practices.

With all the Tele mergers, the primary emphasis has been to reduce first cost. Now that Tele is settling into a more stable environment and first costs associated with economies of scale have been achieved, it is expected that the total supply chain will be emphasized. Consequently, more research has been initiated to investigate the supply chain impact of alternatives, i.e., transportation elements embedded in a supply chain. Tele takes a total view of strategic cost management by focusing on a Total Cost of Ownership model. TCO is a specified methodology for

analyzing and reporting the value of first cost savings and other in process costs.

Thus, cost management must be an integral part of supplier selection, commodity management and ongoing planning in order to be effective. It should not be a one-off approach that the company takes when it really needs to reduce its costs, but an ongoing expectation that is built into the relationship with the supplier and the organization's reward and measurement system.

Research Question 5. What Specific Cost Management Tools Do Organizations Use to Support Strategic Cost Management?

Table 11 shows some of the specific cost management tools/approaches cited by the organizations studied. The organizations were not provided with a list of tools from which to choose. Thus, the fact that an organization is not listed as using a specific cost tool does not mean that it does not use it. Rather, it was not brought out in discussion. Some of the specific categories of cost management tools and their applications are presented in more detail below. As mentioned above, all of these companies have integrated their approaches to cost management into their sourcing strategy/commodity planning processes, so that cost analysis is not a stand-alone approach, but part of the organization's operating procedures. In addition, all of the companies studied vary the approaches to cost analysis based on the relative importance of the purchase to the organization, while also considering the market conditions and the supplier

relationship. There is a rank ordering of priorities, noted among the case studies as applying Pareto's law, cost/benefit analysis, or an ABC approach, to determine which purchases to analyze and the depth/nature of cost management approaches applied. Chip also specifically noted that the nature of its approaches to cost management, even for the same commodity, vary significantly over the short duration of its product life cycle. For example, Chip uses target costing during product development, supplemented by should-cost analysis. As the product matures, it focuses its cost management more on price analysis and supplier cost analysis by relying heavily on the negotiations process. Some of the reasons companies gave for using different cost management and analysis tools in different situations are listed in Table 12.

Benchmarking

Benchmarking was cited as a common cost-management method used among the organizations studied. In investigating the use of benchmarking in cost management, two general types of benchmarking are used, as shown in Table 13.

The first type of benchmarking is used to support price analysis and evaluation of supplier pricing. All of the firms studied do engage in supplier price analysis when the availability of data permits. This direct price benchmarking allows organizations to assess reasonableness of prices, assess price increase requests, and understand trends. The other type of benchmarking

Table 11
Types of Cost Management Tools Mentioned

	Chip	Tele	Deere	LCP	Praxair
Target costing	X	X	X	X	X
TCO	X	X	X	X	X
Benchmark	X	X	X	X	X
Should-cost	X	X	X	X	X
Supplier cost breakdown	X	X	X	X	X
Cost driver analysis	X	X	X	X	
Design for cost	X				
Competitive bidding	X	X	X	X	X
Standardization	X	X	X		X
Standardized contracts	X	X			
Price analysis	X	X	X	X	X
Cost benefit analysis/	X	X			X
Contract Decision Matrix		X			
Operating Procedure 6		X			
Value improvement/Value Engineering	X		X		
Net present value analysis	X	X			
Online-reverse auction	X	X	X	X	X
E-biz/procurement	X	X	X	X	X
Data warehouse					X

Table 12
Factors Influencing the Type of
Cost Management Approach Used

- Time available
- Cost of the purchase
- Stage in life cycle
- Future impact of item purchased
- Relationship with supplier
- Market conditions/availability/competition
- Number of sources available
- Nature of the buy: capital, indirect, etc.
- Unique versus standard item

Table 13
Cost-Related Issues Firms Benchmark

Price-related

- Market price of similar/substitute products to gauge price reasonableness.
- Market prices.
- Historic price trends.
- Equipment prices/capabilities.
- Benchmark industry for commodity price.

Cost/Process related

- Outsourcing processes.
- Strategic sourcing process.
- Supplier improvement.
- Manufacturing processes.
- Terms and conditions.
- Adopt experience from other industries.

has more to do with understanding cost structures and processes rather than prices. This type focuses on examining effective processes across the supply chain to identify opportunities for cost and process improvement both internally and externally. This may involve looking at processes and best practices of non-competitors, customers, suppliers, acquired companies, and other business units.

In recognizing how important benchmarking is to their competitiveness, Tele recently developed a new position dedicated to gathering/coordinating all competitive intelligence on benchmarking. This represents a departure from the typical approach to random and non-standard industry benchmarking. The goal is to get Tele to the next level: institutionalization of routine industry benchmarking on a set of key metrics, since it is not possible (due to extreme resource constraints) to cover every aspect Tele tracks on its business plan. The objective is to develop consensus on its benchmarking strategy as it relates to industry performance and best practices.

The price and the cost/process benchmarking are used to support virtually all of the other approaches to cost management included in Table 11. For example, benchmark data are used to support target costing, should-cost analysis, supplier cost breakdown analysis, and total cost of ownership analysis.

Target Costing

All of the core organizations studied state that they use target costing as an important tool in managing their costs. While the definition of target costing varies in practice, in general, target costing is an approach whereby the organization gathers internally and from the market data regarding what a customer will reasonably pay for a product or service offering including specific features and/or functions. The producing organization then backs out its profit requirements, and the remaining amount becomes the total allowable cost. In order for this number to be meaningful, the allowable cost is apportioned among all of the organization's cost centers, including administrative costs, marketing, direct labor, and materials costs. From there, the allowable or target costs for specific materials and components are determined.

The companies studied all agree that target costing is a critical tool for linking all the functions within an organization to support a common goal for new product development. Target costing is a way to ensure that all of the functions involved in new product development understand the customer's needs as well as the cost goals, and are all aiming for the same target. In addition to using target costing for new product development, these firms also use target costing in a slightly different way for acquiring capital equipment. The purchasing, finance, and often engineering organizations work together to determine what the machine should cost based on its capabilities and the parts that go into the equipment. The targets for spend levels on capital are derived by considering the should-cost analysis as well as the required return on investment and project net present value based on the revenue streams and product costs associated with the purchase of that capital. The overall manner in which the companies studied indicate that they use target costing is summarized in the Table 14 below.

The use of target costing at Chip is highlighted here, because Chip has used the target costing process for a number of years, and identified target costing as a cornerstone to its strategic cost management efforts. As one person interviewed at Chip said, "The target costing process drives the direct materials cost management process at Chip." Historically, Chip's business units determine what something should cost to make the business' required profit for that item. Sales and marketing consider the total cost of Chip solution vs. a competitive solution. They push back on design to

Table 14
For Which Purchases and in Which Situations Do Companies Use Target Costing?

	Chip	Tele	Deere	LCP	Praxair
New product development	X	X	X	X	X
Early stages of PLC	X		X		
Assess price ranges for components	X	X	X		
Target cost by tool, total cost, cost per unit	X				
Capital equipment	X	X		X	X
New products	X		X		
Existing products	X	X	X		
Cost targets are always used by purchasing	X				
Support supply chain cost analysis	X	X		X	
Integrate internal cost management issues				X	
Drive direct material cost management	X		X		
Help design focus on cost	X				
Cost driver analysis	X	X	X		
Total delivered cost of the product				X	
Understand supplier's cost		X			
Understand consumer	X			X	
Supplier improvement		X		X	
Used by customer	X				
Cost reduction in commodity area		X			

control costs. At the business unit level, target costing is used to help the design group focus on costs. The PSM/manufacturing group at Chip has moved target costing to a higher level, to understanding the drivers and what aspects of cost can be affected commercially and what aspects can be affected by design. Thus, there is dual ownership for cost by procurement and design. The PSM and manufacturing group support the target profit model by achieving the target cost. Finance tries to ensure that the target cost approach works to achieve the desired goals and doesn't cause the wrong behavior, such as sacrificing customer value. Thus, target costing is truly an integrated, company-wide effort.

At times, the target cost is based primarily on the underlying technology and design. However, other times the target cost is based upon the target price required to be viable in today's extremely competitive market, even if it does not seem technically feasible to achieve that cost today. Having a firm goal/direction causes Chip to question design, technology, and related assumptions. There is immense cost pressure and challenge, and the goals are getting more rigorous. A key objective of target costing is to achieve the target cost in the design stage. If this can't be accomplished, there is even more pressure when the item is in production, where ongoing and rapid cost reduction is an expectation of the market place. That is why it is critical to continuously keep the target cost right in front of everyone involved in the new product development process as well as in the ongoing purchasing of materials and components used in production.

As mentioned above, target costing is used in new product development, as well as early in the product life cycle. Company wide, Chip identifies four or five flagship products at any given time. Every part on the flagship products is targeted for cost improvement. These flagship items get frequent review and high visibility to hit targets both in materials and at the business unit level. Once a product is in the sustaining mode, target costing and should-cost modeling are less relevant. Chip focuses more on negotiations.

Commodity managers have cost targets. They are given target costs for new products, and can agree or disagree with the target cost, and can challenge the targets. The targets come from business unit finance. Each business unit has its own should-cost model that it uses to develop the targets for specific commodities. These targets must sum up to support the overall target cost for the organization.

Should-Cost Analysis

Should-cost analysis is a cost management approach in which the buying organization determines what a product, service, or piece of equipment should cost. This is determined by looking at the elements that make up the cost of that purchase, and adding a reasonable margin for profit, administrative expenses, and reinvestment into the business. This becomes a benchmark for whether a supplier quotation/bid is reasonable. The should-cost figure is also frequently used, in conjunction with target cost, to determine a range for the target cost. In some

situations, the target cost allowable may be higher than the should-cost analysis indicates, in which case the company would use the lower should-cost figure. The types of purchase situations for which the companies studied use should-cost are listed below in Table 15. The reasons indicated for conducting a should-cost analysis are shown in Table 16.

Table 15
Purchases Supported by Should-Cost Analysis

- New Product Development (NPD).
- Sustaining products.
- Equipment.
- Commodities.
- Outsourcing.

Table 16
Why Organizations Perform Should-Cost Analysis

To Facilitate Improvement:

- Share design and improvement.
- Identify cost reduction area.
- Support SC cost management.
- Professionalize purchasing.

To Increase Understanding:

- Understand impact of design changes.
- Understand supplier costs.
- Manage supplier's profit (together with target margin).
- Applied to international suppliers.
- Part of target costing.
- Better understand cost issues.

To Involve Suppliers:

- Supplier involvement.
- Supplier cooperation.

To Support Evaluation:

- Help validate cost savings.
- Evaluate PSM's performance.
- Support NPV analysis.
- Evaluate submitted bids.
- Support competitive bidding.
- Support operations to realize cost savings.
- Determine the business model's required profit.

In addition, the organizations studied indicated that should-cost models are generally not used alone, but used to corroborate bids, e-auctions, and target costing, as mentioned above. Chip's and Deere's approaches to should-cost analysis are highlighted here to illustrate the richness and diversity of applying should-cost methods in practice.

At Chip, commodity managers are responsible for the development of should-cost models for the commodities they purchase. These are generally developed with the support of finance and other commodity team members. Should-cost models are based on key processes (as identified by the commodity manager and finance), and consider material, equipment, labor, and facility costs. Suppliers and Chip both develop should-cost models and work together to understand and recognize differences in approaches and assumptions.

In developing should-cost models for key commodity purchases, finance has visited suppliers and developed an understanding of all the suppliers' costs, such as materials, labor, capital, and depreciation. Some suppliers share this information in detail. Finance owns should-cost model development, and supports its use. One Commodity Manager noted that if Chip is fair with a supplier, and guarantees it volume and communicates well, the supplier is honest with Chip.

Should-cost models are very effective in new product development, early stages of product life for target costs, ensuring qualified suppliers are prepared at product launch, and in sharing design ideas and improvements. The goal is to drive most of the cost reduction activities early in the product development cycle, to challenge specifications and assumptions. Some specific examples include:

- Reducing the amount of precious metal used in a product.
- Relaxing product tolerances.
- Asking the supplier for ideas to improve manufacturability.

The use of should-cost models is a common practice at Chip. The development of the model helps in gaining a better understanding of costs while the results of the should-cost model provide a source of validation for evaluating submitted bids. Additionally, actual costs that deviate from the should-cost model help identify areas of focus for cost reduction efforts. As an example, the logistics group maintains should-cost models for ground transportation services.

Historically, should-cost models have been valuable at Chip, but they do have limitations. To better enable decision making, finance incorporates target margins into should-cost models. It uses these margins to manage total supplier profit over time. Chip creates supplier portfolios with target margins set for each product based on where the product/platform is in the life cycle. It uses these targets to negotiate and understand supplier's total margin and profitability. It provides a higher level check. It focuses on the big

picture over the product's life cycle, not on micromanaging pennies here and there.

Chip develops a should-cost for its capital equipment purchases. It actually creates a bill of materials explosion for equipment, using Pareto analysis to focus on the big items. It also considers margin, using supplier financials and looking at what is reasonable. For capital equipment purchases, the focus is on the impact of equipment cost and efficiency on the per unit TCO of product. This target is set by manufacturing, using inputs (cost targets) from the business unit. Working with marketing, finance develops a "must cost," what it takes to meet cost targets in terms of equipment depreciation to allow Chip to sell product affordably, and earn a reasonable margin. Chip may ask a supplier to reduce its price, and has a competitive bid process. Thus, should-cost analysis is a key element to support target costing, competitive bidding, and fact-based negotiations.

Chip views should-cost modeling as an evolution of TCO. It goes beyond TCO; to break out overhead elements in should-cost modeling, and to better break down the costs of supplier processes. Costs such as freight, pass through costs, and local support are included in should-cost models.

At Deere, the should-cost process is supported by cost management specialists housed within the purchasing area. Deere has also purchased cost modeling software to allow it to determine the process cost elements of a should-cost analysis, such as how much should a certain type of process should cost, and what yields are to be expected. Deere has also developed cost tables, which are models that can be used either to determine whether a supplier's quoted cost for a particular process is reasonable or to develop a should-cost estimate for new or existing products.

Deere develops two primary types of should-cost models: historical and theoretical.

Historical based cost models are derived from:

- Market-based information.
- Cost detail provided by supplier on quote form.
- Inputs from multiple suppliers.

Theoretical cost models build up the costs for a process from the ground up. They consider issues such as:

- Space a machine takes up (building, depreciation).
- Number of people on machine.
- Initial cost of the machine.
- Financing for the machine.

- Tooling.
- Maintenance.
- Efficiency for the machine.
- Other relevant costs and performance issues.

It is possible that the cost modeling software mentioned above could support either type of should-cost analysis. For existing products, historical based cost modeling is more common, and focuses heavily on comparing and understanding the differences among supplier-provided cost breakdowns.

Deere has developed a structured process for new product design. Underlying this approach is the philosophy that early involvement of critical suppliers and functions is key, and that target costs must be set up front. Should-cost analysis supports the target costing process and is often the first step of cost analysis in target costing. The should-cost and target costing processes are a team effort. For example, the design engineer checks the design cost based on the should-cost analysis developed by supply management and/or through a purchased cost modeling software or software developed/supported by the cost specialist. This result is compared to the supplier quote. If the supplier quote does not meet the design cost requirements, Deere uses the should-cost data to help identify whether the gap is due to design issues or supply cost issues. This process iterates with design changes and material modifications until agreement is achieved and the target cost can be met.

Total Cost of Ownership (TCO) Analysis

Total cost of ownership was used in some fashion by all the companies studied, by some more than others. Total cost of ownership analysis is defined as an approach for understanding and managing the true costs of doing business with a particular supplier, of a particular process, or an outsourcing decision. TCO includes price, administration, usage, training, and disposal costs that are often hidden at the time a purchase or process decision is made. Chip, Tele, and Praxair all emphasized that they use TCO extensively in certain types of situations. How these companies use TCO will be explained in more depth below. Deere and LCP indicated a lesser, but growing, extent of TCO analysis. Table 17 provides a list of the types of purchases for which the participants indicated they use TCO analysis. It covers a whole gamut of situations, from strategic purchases such as outsourcing and capital equipment to tactical purchases such as indirect materials. One consistency among the organizations studied is that TCO analysis must be done as a team in order to be effective. Team membership varies, but it needs to include a credible representative with a finance/cost analysis background.

Table 17
Type of Purchases Supported
by Total Cost of Ownership

- Capital equipment acquisition.
- New product development.
- Indirect expenditure.
- Outsourcing.
- Commodity sourcing.
- External goods/services.
- Sustaining product cost management.
- Existing product/services.

Total cost of ownership analysis also is used to explore a number of different issues within an organization, as illustrated in Table 18.

Table 18
How TCO is Used in the Organization

- To understand process costs.
- Part of target costing.
- Analyze/report cost savings.
- To assess and manage risk.
- Support a supply chain focus.
- Supply chain cost management.
- Strategic sourcing decisions.
- Supplier selection.
- To focus key supplier continuous improvement.
- Understand customer decisions.
- Understand supplier costs.

A recurring theme of TCO analysis is that it is an important tool to help get a true supply chain cost perspective. This comment came up in conjunction with TCO analysis more than with any other cost management approach mentioned. The reasoning behind this is that TCO takes a broad look at costs, both internally and externally, both specific to a situation as well as supply chain wide. This view of TCO is shown in the matrix in Table 19. Thus, while target costing is an excellent tool for understanding what the customer wants and producing at an internal cost that will support both the customer's desired price and the organization's desired profits, it does not inherently consider the process and other cost implications on the rest of the supply chain. Understanding the tertiary and hidden costs is the foundation of TCO analysis.

To illustrate the importance of TCO analysis to Tele, an internal consulting group (ICG) was formed within procurement about four years ago when one of the purchasing managers approached the Vice President of

Table 19
Total Cost of Ownership Decision Focus

<ul style="list-style-type: none"> • Supplier selection • Focus on key supplier continuous improvement • Understand supplier costs 	<ul style="list-style-type: none"> • Supply chain cost management • Understand customer decisions
<ul style="list-style-type: none"> • Understand process costs • Analyze/report cost savings 	<ul style="list-style-type: none"> • Support a supply chain focus • Part of target costing • Assess/manage risk • Strategic sourcing decisions

Procurement with the idea that total cost of ownership analysis and a more thorough, complete analysis of purchases could reduce the company's costs significantly, and improve decision-making. The internal consulting group focuses on cost, process and planning issues for internal clients.

Total cost of ownership analysis is one of the principal analysis approaches used by ICG. The goal of Tele is to take a supply chain focus in its analysis. ICG believes that using TCO analysis allows it to understand and factor in the impact of different alternatives on its suppliers and customers, as well as on its own performance. ICG tries to identify all direct effects, and many of the indirect effects associated with the situations it analyzes. This tool cuts across many of its projects. It is a primary tool used in analysis of process costs and make/buy or insource/outsource alternatives. Where long-term investments or multi-year projects are involved, ICG also uses net present value analysis. Some of the areas in which ICG conducts TCO include:

- Capital expenditure analysis.
- Outsourcing/make-buy analysis.
- Warehouse location decisions.
- Warehouse layout decisions.
- Information technology recommendations.
- Logistics network decisions, such as trans-shipment options, material visibility, equipment choice.
- Support of supplier selection.

TCO is viewed as so important at Tele that one participant responded, "Tele takes a total view of strategic cost management by focusing on a Total Cost of Ownership model." He further went on to elaborate that TCO is a specified methodology for analyzing and reporting the value of first cost savings and other in process costs, rather than focusing only on price.

Since Praxair reorganized, TCO has become a more important approach for managing cost over the past

several years. To Praxair, TCO is a primary approach for assessing spending on particular goods or service area. The use of procurement-led cross-functional sourcing teams is important in improving analysis and facilitating change in sourcing practices and execution. The primary purpose for creating a strategic sourcing team is to lower the TCO for the commodity studied while maintaining the level of service. Praxair also wants to increase the level of support and attention it gets from the suppliers, to get a higher allocation of the suppliers' resources. The sourcing teams stay together through the implementation and management of the chosen supplier.

All Praxair procurement members are taught to look beyond purchase price in assessing opportunities. As mentioned in the section related to overall cost management practices, supplier interaction on cost management occurs as part of the strategic sourcing process. Praxair tries to quantify all the key elements in the TCO model it develops for a commodity. For example, if it is sourcing cranes, Praxair will consider the cost for equipment and the operator, as well as the capability of the crane, and how long it will take the crane to get the required job done. In many cases, a fundamental strategy is to first standardize, then go to market. As part of the individual supplier workshops held prior to the RFQ process, Praxair asks the suppliers how they view the TCO elements and their magnitude, and how they could affect them.

The cross-functional team assesses the suppliers' bids based on what they rated as important in the TCO model. After selection, they negotiate with the supplier and develop/execute the contract and its terms and conditions.

There are situations where there is a conflict between TCO and price. Price is easy to track, so it may receive more weight than it should. Praxair is developing good methods for tracking TCO to overcome this potential conflict. Now, the best way to get people internally and externally to understand TCO principles is through education. Praxair conducts training with key suppliers, business unit contacts, and sourcing people on TCO principles. Because of this training, Praxair has set up pilot programs with teams to use TCO. This helps the understanding and use of TCO.

Praxair's concept of TCO is to look at all cost elements from design, supply chain, and usage perspectives, and drive costs out by coming up with better solutions. One success that Praxair could share was the use of TCO to significantly lower the cost of an imported product that it formerly brought in to a central location and distributed. Praxair has redesigned the supply chain, improving freight and using a third party to distribute. This was a

great TCO example of working with a supplier and considering the whole supply chain/processes.

At Chip, TCO has been institutionalized as a process for over 10 years, so that it is now second nature at Chip. Chip does not even call TCO analysis by that name in many cases. Should-cost modeling is an evolution of TCO, going beyond TCO, to break out overhead elements and the costs of supplier processes. Rather than performing detailed TCO analysis on all materials purchases, Chip's objective is to have quality requirements that all suppliers must meet, thereby reducing the need for TCO. One goal of TCO analysis is to explore and develop different alternatives/models to better understand how to manage the risk between Chip and its suppliers. Risk management involves analyzing alternative processes, and must be viewed from a TCO perspective. Examples of models for inventory management are Vendor Managed Inventory and Consignment. In exploring the alternatives and the cost from a TCO perspective, finance works with PSM to:

- Identify opportunities.
- Build financial models.
- Develop tradeoffs.
- Make recommendations.

The following is an example of the TCO process in action at Chip: The business unit brings a new product idea and target cost objectives (Internet terminal, for example) to the PSM/Manufacturing group. Information on costs for manufacturing, logistics, planning, and component materials are collected to create a cost profile for the product. In the past, this collection of cost information has been executed in a linear fashion (idea, materials, manufacturing, distribution, and planning) with each cost component optimized before moving to the next component. PSM/Manufacturing group is working to bring these elements together for simultaneous discussion and consideration to achieve the desired result of optimization in the cost structure as a whole rather than as optimization of independent components. The latter can result in sub-optimization of the final total cost profile or a lengthy iterative cost development process. Chip is looking at long-term supply chain design from a TCO standpoint, with more focus on design for high capacity and for low cost. Chip views the supply chain as a capacity problem. In designing the supply chain, depreciation on equipment is a big cost factor for Chip. Capital acquisition relies heavily on TCO analysis. In negotiation for capital, Chip focuses on an affordability goal. It has a target for TCO by tool, TCO for all of the capital combined, and TCO per unit.

There is a strong focus on revenue generation for the company as a whole. PSM/Manufacturing is starting to

ask more questions about business plan product goals, competitive strengths, etc., starting to shift its focus to delivering an efficient supply chain. In the past, there were more PSM TCO solutions than true supply chain TCO solutions. Today, supply chain TCO solutions must consider revenue generation.

The Impact of Information Technology on Cost Management

An entire study could be conducted to explore the impact of information technology on PSM. While the impact of information technology on PSM management was not the focus of this study, several recurring findings are worth mentioning.

The ability to access and understand spend data is critical – It is essential to be able to aggregate spend data in order to understand opportunities and achieve leverage. In addition, it is critical to be able to monitor actual spend patterns for compliance as well as trends in spend and pricing in order to provide feedback and encourage continuous improvement. This is also vital in order to report credible savings results.

E-Auctions are effective bidding tools – All of the organizations studied have used reverse on-line auctions in various ways. The consensus is that they apply to situations in which there is adequate competition and participation, where you might otherwise use a request for quotation or request for bid. Reverse e-auctions are essentially tools to create greater competition and transparency of competition, not a way to cut corners or do things more quickly. They require all of the due diligence of any effective RFQ/RFB process. There was also some questioning on the part of several of the organizations, particularly Praxair, regarding whether on-line auctions could continue to bring savings year-over-year. In some cases, Praxair uses/intends to use on-line auctions as a way to select and identify a supplier that it wants to work with in the long run, rather than reauctioning every year or two.

Information technology can help analyze/build cost models – All of the organizations studied rely heavily on

information technology of various types to help support their cost modeling and cost management efforts. There is a heavy reliance on the development of home grown models such as Deere's cost tables and Chip's TCO models for capital acquisition. Many of these models are reused in whole or in part from one cost analysis situation to another.

Approaches to Support Specific Types of Purchases

Much of the presentation related to cost tools focuses on raw material and component purchases, items that become part of the cost of good sold. However, the organizations studied all have specific approaches for managing indirect purchases, services and capital acquisitions as well. The approaches are summarized in Table 20. In the PSM organizations that are a mix of centralized and decentralized purchasing, indirect items and common services are likely to be purchased centrally.

Indirect purchases – The overall philosophy followed by these organizations is to standardize and reduce the number of transactions. For Deere, this means that corporate purchasing leads commodity teams to reduce the number of variations on a given item and standardize the remaining items across the corporation. For example, Deere was purchasing 220 styles of gloves. A team was able to reduce this to 25 styles/types, which resulting in savings of 20 percent to 30 percent. LCP has essentially outsourced all indirect purchases to a corporate buying group that acts as a service center. Chip's focus in the indirect arena is on TCO: reducing the total transaction cost of procuring, receiving, stocking, using, and managing spares and other high volume, high value indirect. It focuses on the cost of processes, and uses purchasing cards or on-line catalogues when it makes sense to do so, and supplier managed inventory in other cases. Praxair takes a similar approach in managing the cost of indirect purchases.

Service purchases – In addition to reducing the costs in the associated transaction costs, PSM also focuses on reducing consumption. Thus, instead of trying to find a cheaper airfare for a trip, the question becomes: Is the

Table 20
Approaches for Managing Specific Types of Purchases

Indirect	Services	Capital
<ul style="list-style-type: none"> - Standardize - Centralize/leverage at corporate level - Reduce transactions costs/ automate - TCO - Supplier managed inventory 	<ul style="list-style-type: none"> - Reduce transaction costs - Reduce consumption - Understand cost/value drivers - TCO 	<ul style="list-style-type: none"> - TCO - Net present value

trip even necessary? In service purchases, it is important to understand the key drivers of cost, value, and the necessary timing. A TCO approach is also likely here. In services, it is likely that PSM adds value by setting up the deal, and then getting out of the way so that the internal customer can directly manage the transaction.

Capital acquisition – TCO analysis is the key approach used for capital purchases: understanding the net present value of all the costs associated with acquisition, start-up, use, maintenance, and ultimate disposal of a piece of equipment, including yield issues, volume capability, and down time. Companies with more sophisticated approaches such as Chip and Praxair, where capital is a huge proportion of operating costs, also focus heavily on how the equipment interacts with other pieces of equipment. The level of sophistication and effort of analysis varies directly with the impact of the purchase on the organization.

Sources of Cost Information

Organizations use a wide range of sources to gather data to support strategic cost management. This is not surprising, given that all sources of data have relative strengths and weaknesses. The key to gathering cost data is that multiple sources are used to corroborate the results. The following table shows some of the sources of cost information identified by the case study firms. They have been organized into internal data sources and two types of external data sources. One type of external data is data that is publicly available and/or purchased, and is therefore more likely to be independent rather than positioned to win the bid. The other external source, external data that is potentially biased to favor the data provider, is an important and growing source of information. For example, companies like Deere and Praxair increasingly make full supplier cost disclosure a condition for consideration as a potential supplier. In these cases, the buying firms relied on corroboration from multiple suppliers as well as unbiased external data and their internal cost knowledge. All of the firms indicate that they use market data and external price/cost benchmarks whenever such data are available.

The firms studied were not prompted with specific examples, but rather volunteered their key data sources. Not surprisingly, several of the data sources, such as various forms of benchmarking, obtaining supplier quotes, and market price analysis were cited by all the organizations studied. Some of the specific means of gathering data are simultaneously data analysis approaches. These methods, such as should-cost analysis are presented in more depth in the section on specific cost tools used.

Table 21
Sources of Cost information

Internal data:

- Internal functions.*
- Internal consulting group.
- Information system/technology.
- Private data warehouse.
- Theoretical modeling.
- Should-cost model of suppliers.
- Benchmark data from acquired/merged companies.

External Data from Independent Source

- Benchmark data.
- Market price analysis.
- Competitive assessment by third party.

External Data from Potentially Biased Source

- Supplier site visit.
- Cooperative supplier of like items (should-cost).
- Inputs from multiple suppliers.
- Bill of Material from supplier.
- Bid/Quote from suppliers.
- Customer.
- Bill of Material from customers.

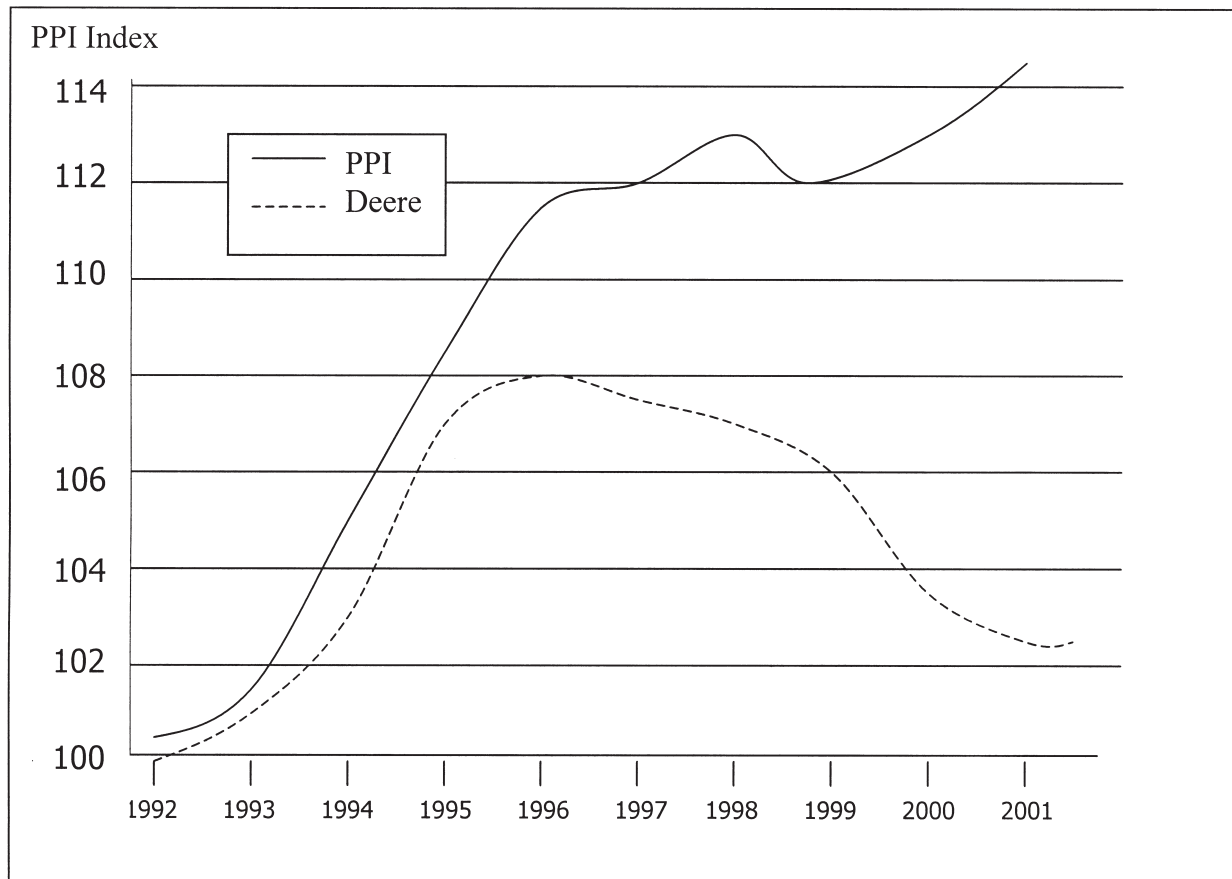
*Internal functions include operations, purchasing, logistics, finance, and many others.

Research Question 6. How are the Results Of Cost Management Efforts Reported?

A continuing question that comes up for those in PSM is, “What should we report and how should we report regarding PSM’s contribution to cost savings, so that PSM’s contribution is credible to those throughout the organization?” The way case study participants responded to that question is summarized below. There is a great deal of variance in the way that the numbers are tracked and reported. The key issues were that the reporting must be done by someone who has credibility, and that those outside of supply management must agree to the reporting method. In addition, cost or price savings is never the singular goal of purchasing. Cost/price savings is always balanced by other important metrics such as quality, reliability, and so on.

Deere approaches reporting its cost management results in several ways. First, it reports the savings that it achieves in terms of cost reduction on a price-to-price basis for individual commodities. This approach has credibility since cross-functional teams work on most of the cost savings projects, with the savings reported by the cost manager. In addition, at a very high level, Deere compares its performance to the market place using a representative, weighted market basket of goods that it

Figure 3
Reporting Cost Savings: A Deere Example



purchases. Based on the Producer's Price Index, Deere reports what it spends on those items versus a baseline year. It also has a line showing how the PPI for that basket of goods has changed during that time frame, as shown in Figure 3. This allows the purchasing group at Deere to get credit for doing better than the market if that is occurring, or to take the heat for not achieving the same level of savings as experienced by the market place. This translates the savings achieved into both a micro and a macro level.

However, it is not savings alone that Deere's supply management group measures and reports. Its other goals include:

1. Number 1 overall rank in A.T. Kearney Supply Management Benchmark Study.
2. 5 percent annual cost improvement.
3. 20 percent improvement in supply management productivity.
4. 50 percent annual improvement in cost of quality.
5. 90 percent of purchases covered by commodity strategies.
6. 100 percent on-time delivery of finished goods available to promise.

Thus, it cannot be accused of focusing on cost reduction at the expense of other critical goals. The goal is to bring value, not just price reductions, to the customers and the organization.

At Chip, Finance plays the major role in measuring and reporting cost savings. Company-wide, Chip identifies four to five flagship products at any given time. Every part on the flagship products is targeted for cost improvement. These flagship items get frequent review and high visibility to hit cost targets both in materials and at the business unit level. A product is typically identified as flagship when it is in the development phase. Once it has been in production six to 18 months, it is no longer considered a flagship product. Many of the objectives for flagship products are cross-functional. PSM's ability to

contribute to design for cost and cycle time reduction is viewed as critical by top management.

Metrics for cost management of sustaining products include:

- Direct cost savings: yield improvement, reduced piece part price, negotiations results.
- Indirect cost savings: total cost of ownership (TCO), freight, tooling.
- Design for cost: reduction over previous generations of products due to improvements in cost/functionality/yield of materials that are designed into a product.
- Cost avoidance: receives less weight than direct cost savings, but is considered primarily within the materials group.

The purchasing expenditure plan (PEP process) is the overall approach PSM uses to ensure it is purchasing in the most competitive manner. Savings plans are incorporated into PEP, and affect the employee's bonus. Finance measures and tracks savings, and owns the savings calculations to ensure they make sense. Finance tries to track true savings to the bottom line. Finance also considers PSM's impact on inventory and other balance sheet related items, and gives them credit for these savings. The savings are reported to top management, generally on a quarterly basis.

The specific initiatives in PEP vary from year to year. Examples of recent initiatives include:

- How much cost supply management can take out of the Bill of Materials versus the initial plan (every year).
- The number of Design for Cost projects.
- How much business is conducted through e-business.
- Percentage of dollars spend covered by favorable contract terms and conditions.
- Percentage of dollars spend covered by should-cost modeling.
- Percentage of dollars spend covered by most favorable customer pricing.
- Percentage of dollars spend covered by payment terms.
- Percentage of dollars spend covered by up/downside liability.
- Percentage of dollars spend covered by who pays freight.

Thus, there are a number of non-cost factors that indirectly affect costs for which PSM is held accountable. Top management receives a report on progress in the key PEP initiatives quarterly. Particular attention is paid to

new products, particularly PSM's progress on the designated flagship products.

Every Chip employee is eligible for bonuses. Part of the bonus of every employee is based on PSM performance and cost savings, as well as overall company performance and performance of the other key functions. Thus, each employee is encouraged to consider the impact of his or her activities on other functions and the organization as a whole.

Virtually all functions at LCP are heavily trained in cost management. The General Manager has responsibility for all sales, costs, and profits; in short, everything. The General Manager then delegates responsibility for total delivered cost and volume. The finance and accounting manager leads cost savings efforts at LCP, supported by product supply and marketing. Total delivered cost is key to the product supply manager.

LCP is trying to move away from rewarding behavior that doesn't make sense and looking more at the big picture. This is one of the reasons that the direct purchasing accountability has been returned to the business unit. At this level, purchasing can gain a much better understanding of specific business unit goals and objectives that may be sacrificed if the price focus is too high. In general, purchasing is measured and rewarded based on getting the best value, including price, supplier innovation, capital investment, and related factors. Finance helps provide measurement of savings. A multi-functional team runs each business. Performance of the BU and team members is rolled up into each member's performance appraisal. Finance supports creation and reporting of credible performance metrics for each member of the organization. In addition, because a cross-functional team runs the business, there is general understanding of agreement on both what is measured and how it is measured.

LCP gave a less detailed account of its measurement processes. Its reward system has recently been changed and broadened to look beyond profit, including such measures as:

- Total shareholder return, including cash, profit, stock price.
- Profit and loss, working capital, capital investment.
- Forecast accuracy.
- Working capital in terms of operating cash flow.

PSM's contribution to the organization is translated to the above metrics.

At Tele, cost management is one of the procurement group's four primary objectives, along with client

satisfaction, process improvement, and a winning team. Purchasing savings are given significant weight as part of individual performance appraisals in procurement. Team awards and recognition also are based on cost savings.

At Tele, goals and expectations for savings are specific and clearly laid out. There are specific rules as to what can and cannot be recognized as savings, and which savings need to be counted as hard or soft savings, and cost savings versus cost avoidance. In general, savings are calculated based on current year spend versus prior spend, adjusted for volume. However, Tele is constantly purchasing new items, and using new technology that has not been used before, with no prior spend history. In these cases, savings are tracked based on reduction in actual price paid versus the lowest bid received. This method is accepted by the organization because it is relatively objective. The overall value proposition of the procurement organization is measured by the bottom line savings the organization achieves when sourcing products. It has recently received much positive attention for the purchasing cost savings generated by the mergers.

Much of Tele's current internal reporting is aggregated information aimed at top management. For example, at a very high level, procurement performance is also measured by looking at cost of goods sold, less spend as a percentage of revenue. It is expected that this percentage figure should go down each year if procurement is doing a good job. The percentage has been going down in recent years.

At Praxair, the specific accountability for cost savings in the purchasing area and how the savings are tracked is summarized below. Measurement includes:

- Operating Profit impact: Purchasing has saved over \$100 million in the last three years. Praxair has a sophisticated database and tracking system to measure the impact of each initiative, comparing actual vs. planned savings. To date, most of the \$100 million savings is in expense items rather than cost of goods.
- Capital Goods: There is separate measure for variance on capital expenditures over previous buys. It is harder to identify savings on capital because Praxair buys different capital each year. One measure of savings is whether purchasing spends less than budgeted to achieve the business unit goals.
- Materials Management: This group concentrates on how to manage cash/inventory. The focus here is on reducing inventory without decreasing service. Consignment and/or supplier inventory are two favorite approaches for improving inventory management.

Praxair revealed a sophisticated and credible system for tracking purchasing savings, as calculated by the purchasing controller. To determine the amount of savings realized, Praxair compares past spend to current spend, adjusted for volume. It reports savings over a 12-month period. The initiative drops out of the savings calculation after a 12-month period. This provides consistent reporting of savings. While most contracts are two to three years in length, purchasing gets credit only for the first 12 months of savings.

When initiatives are identified, the purchasing controllership function presents the ideas to the businesses. If accepted, the business units build the savings into their business plans. Praxair captures specific, separate line items in reporting that show procurement related savings. These appear right next to sales in the internal reports. Purchasing savings are reported monthly, and must be consistent with what the business units report as purchasing savings.

Praxair PSM saves \$30 million to \$35 million per year on \$1.5 billion spend. To achieve this, purchasing focuses on specifics; they don't look at every spend category each year. The purchasing initiatives are managed like projects. They separate initiatives that generate profit from capitalized savings in property, plant, and equipment (P, P, & E).

The P, P, & E savings don't drop to income statement savings directly; they appear over time as lower depreciation. Praxair hasn't started to track these savings, in part because it would be a challenge to arrive at the correct and believable number. Each capital acquisition is different. Today, capital savings are tracked separately as cost avoidance, which is not explicitly part of PSM's bottom line contribution. In the future, Praxair will consider cost avoidance and segregate these costs. There is a significant contribution made here.

Individuals within PSM have specific goals, such as goals for country, by commodity, and by commodity manager. These focus on bottom line savings. Praxair uses a dashboard system that captures 27 measures. Different people and functions have responsibility for different measures.

How Can Compliance With Contracts Be Achieved? – Renegade buying is a problem that was mentioned by all of the companies interviewed. It is particularly common with indirect purchases. Deere mentioned that it is trying to stop "buying outside of contracts" by implementing an Ariba system that makes buying so much easier that people want to use it rather than purchase on their own. Chip identified this as a problem that is growing due to acquisitions, and acquired companies coming on board

with their own systems and approaches. Like Tele, Chip is trying to stop this by demonstrating that PSM can get a better deal. LCP does not really worry about this at the corporate level since ownership for cost of purchases rests in the business units. At the business unit level, there is such strong cost accountability that buying outside of contracts is discouraged at the top level within the business unit.

Praxair has a particularly interesting model. As mentioned above, purchasing savings are reported monthly, and must be consistent with what the business units report as purchasing savings. The focus is on income statement impact: Only savings that go to the bottom line, i.e. result in a lower level of expenditure/budget, are reported as savings. However, PSM also reports to the business unit spending that is not in compliance with contracts based on information from its data mart, and lets the business know how much savings were forfeited by not using corporate contracts. Praxair does not have a mandating corporate culture; people can choose whether or not to use negotiated agreements. When business unit management sees how much savings are forfeited, it generally questions why those within the business are not using corporate contracts, and encourages them to do so.

Likewise, Praxair was the only company that took savings in indirect or budgeted items out of the business unit's budget and directly to the bottom line. This is an acceptable part of the culture, because each business unit is directed by top management to reduce its expenses. Rather than viewing purchasing cost reductions as a negative because they result in budget cuts, business unit general managers welcome them as a way to achieve their objectives of lower operating costs. Improving and lowering the cost of internal operations is a strong focus across all disciplines at Praxair.

Praxair's PSM controller is accountable for reviewing savings calculations with businesses; PSM doesn't get to report savings unless business unit finance buys into the savings. The controller works with business unit finance to achieve buy-in to the savings calculations in advance. No savings are claimed until a new contract is in place and goods/services have been received, where savings are actually recognized on the books. The goals of the PSM group are to be world class in sourcing material and services and to generate business growth. As part of this, PSM must leverage what it spends with suppliers.

Tools are critical to help support reporting and determine savings, as well as to monitor compliance. A key tool is the spend data warehouse. This has given Praxair the ability to sort spending throughout the world, by region, by commodity, by supplier, and so on. There are also

systems to track progress on various initiatives. These systems are key to forecasting and planning current and future savings potential. To further improve the compliance and visibility of cost savings, PSM participates fully in monthly reviews with the office of the chairman, and presents its progress and plans like any other business unit. It has the opportunity to present cost savings initiatives and performance at the highest level within the organization. This further enhances the importance with which PSM contribution is viewed at Praxair.

Research Question 7: What Other Factors Contribute to the Success of Strategic Cost Management Efforts in the Organization?

This section presents some of the unique ways, not covered in other sections of this report, that organizations make strategic cost management a success.

The Potential Contribution of Finance or Cost Management Experts to Strategic Cost Management

In all of the organizations studied, it was important that PSM's contribution to savings was viewed as credible. Finance and cost management play the important role of measuring and reporting PSM's results. However, in several organizations, these groups do much more than simply report results. Finance and/or cost management are actively engaged in supporting the analysis, and sometimes identifying the potential opportunities for generating cost savings. The roles of finance or cost management at Deere, Chip, and Praxair are detailed below.

Deployment of Cost Managers – Deere followed a model from Honda of America Manufacturing in deploying specially trained cost managers in each business unit as well as at the corporate level. In the past two years, five cost managers have been put in place, one for each division and one for corporate purchasing. These cost managers are highly trained and skilled specialists, many of whom have years of cost management/analysis experience with other companies. Each of these cost managers has a small staff that supports providing cost analysis to their respective divisions. The cost managers also meet regularly as a team. They have agreed to:

- A process for cost model creation.
- A process for evaluating cost models.
- Where/how to post cost model information on their internal web site.

The cost managers put together cross-functional teams that work on the cost models. The teams include representatives from each division that uses the item in a significant way. There is a lead for each team. The overall

direction for the team comes from the cost manager with input from the lead. The team includes cost management, a supply management specialist, manufacturing, engineers, and representatives from the supplier's cost management and manufacturing areas. Cost management efforts often complement supplier development and value improvement initiatives. Deere has also purchased cost modeling software for theoretical costing on some of the basic processes that are common across a number of industries. This provides them with information on what it costs to run certain equipment. They relate these data to historical information. There is a trade-off between keeping the analysis simple and developing a good understanding of the process.

Cost management's focus is to be a resource to strategic sourcing for current and new products in terms of getting the right price. Saving money is the ultimate goal of cost management, and building the cost models is part of that. The cost management group is currently working on a number of cost models, including decals, injection molding, stamping, and casting. Cost management has to identify the market opportunities. Another goal of cost management is to avoid any unnecessary price increases. When increases are necessary and valid, Deere uses value improvement and supplier development approaches to find ways to reduce costs to offset the increase. These processes are presented in more detail in the Deere case in Appendix A.

To analyze cost increases for existing buys, cost managers use a cost table if available. These cost tables are developed by Deere cost management to show the expected relationship among various performance parameters and features and materials prices. Deere may perform a site visit to analyze supplier processes. It may also do an incremental look to see if the cost change is justified based on the functionality change. For example, one supplier of a \$17 part asked for increased price of \$25 for that part. After the analysis was complete, Deere ended up getting a 15 percent across-the-board decrease on all items from this supplier. Deere follows a systematic approach to cost management, and truly has a center of excellence in terms of cost management.

Use of Finance Personnel – Chip relies heavily on its finance/controllership organization to support purchasing in all aspects of PSM's cost saving efforts. Finance and operational owners have to sign off on all key PSM/materials decisions.

The controllership function supports PSM and other functions at both the functional and business unit levels. The finance/controllership function views optimizing shareholder value as its mission and finance is disbursed entirely throughout the organization, becoming involved

in all key decisions. Finance drives the accumulation of information across organizational boundaries and pulls operational partners onto the team as needed to appropriately assess proposed projects and drive data based decisions. Part of finance's charter is to help identify cost savings opportunities. Finance drives cost management at Chip by helping to structure problems. Finance helps understand trade-offs, gathers data, quantifies options, determines savings, and evaluates how various approaches support overall strategy. However, cost management is co-owned by all functions. Business units are ultimately accountable for cost management results.

The finance structure is such that cooperation across organizational boundaries is generally easier than in the operational structure of its business partners. Target costing, should-cost, and design for cost initiatives are driven by finance. Finance develops these models and enables the organization to use the models. Finance enables this through model creation, validation, and credibility. Finance helps with cost modeling by identifying key drivers in advance. For example, finance will create a pro forma bill of materials, showing proposed changes, and indicating on which areas to focus for the greatest opportunity. Finance also identifies different operating models/approaches that exist for performing a process, and determines which issues it wants to tackle for maximizing results, such as inventory, price, warranty, and obsolescence. Finance, working with marketing develops a must-cost, what it takes to meet cost targets per unit, per tool, depreciation as it is, and as it should be to allow Chip to sell product affordably and earn a reasonable margin. For example, finance has proliferated a tool to help determine how much inventory is needed for an item in various stages of its life cycle.

In addition, finance often plays a strong coordination role in getting a complete cost analysis done. The data for the analysis usually is owned by the operations partners, but is centralized and analyzed through financial modeling. Finance supports material cost analysis and understanding of supplier cost drivers. PSM often comes to finance to help quantify savings opportunities. For example, in one situation, design-for-cost models were developed by working with two key suppliers. Chip sent both finance and technical people to these manufacturers to corroborate the models. Capital procurement collaborates with suppliers on cost and capacity issues. Finance plays a key role in capital expenditure analysis as well.

At Praxair, the controller of the global PSM group is a director-level position, reporting to the Vice President of PSM, along with the three other PSM directors. One of the primary duties of the controller is to coordinate and ensure consistency in PSM's operating profit impact in terms of forecasts, actual reporting, and estimates.

As presented above in the section *How Can Compliance With Contracts Be Achieved?*, the controller plays a coordination role among global PSM, the global business units, and the financial services group. There is no real or perceived conflict regarding the controllership function's reporting relationship to PSM. The controllership area is data driven, provides credible numbers, and shares the basis of its calculations.

The controller works with everyone in the PSM organization. When PSM claims to have an operating profit impact, there is substance to it, as verified by the controller function. Savings are not counted for negotiated savings. The focus is on income statement impact: savings that drop to bottom line.

Praxair views purchasing like it views sales, as a way to grow the business, but with an emphasis on savings rather than sales. The reporting by the controller lends credibility to the savings calculations. The controller and his team report savings, provide direction, educate staff to help reduce operating costs within procurement, and monitor the budget. The controller function meets with analysts within business units to identify monthly spend patterns. It also works with purchasing to understand spend at the supplier and commodity levels. The controller function then goes back to internal clients at the business units to make sure that they are realizing the savings anticipated. The biggest reason for not achieving savings is spending that is out of compliance with negotiated agreements. Thus, the controller function has also educated business partners on lost opportunities because of using suppliers outside of procurement's contracts.

Special Approaches to Cost Management

Each of the organizations studied noted specific practices or approaches that are very effective in managing costs and delivering cost savings in their organizations. Some of the approaches are highlighted here. These approaches are not presented as a prescription for success in all cases. Rather, they are meant to be illustrative of some of the many creative ways that organizations have been able to improve upon their delivery of measurable, credible bottom-line purchasing cost savings. The creative ways that three of the companies rely upon finance/cost specialists to support and validate cost savings are presented above, so will not be discussed again here.

Internal Consulting Group at Tele – As already mentioned, an internal consulting group (ICG) was formed within PSM at Tele about four years ago when one of the purchasing managers approached the President of Procurement with the idea that total cost of ownership analysis and doing a more thorough, complete analysis of purchases could reduce the company's costs significantly,

and improve decision-making. The internal consulting group focuses on cost, process and planning issues for internal clients. This group gets involved in a variety of projects, solely at the bidding of internal clients. There is no obligation to use their services, nor is there a direct charge for their services. The procurement group at Tele, members of which are also the primary clients of ICG, includes sourcing/contracting, purchasing strategy and planning, systems and services, supplier diversity, and supply logistics. However, the group may service others within the enterprise, including engineering and marketing, either directly or indirectly.

The ICG is a service organization with a mission to support important decisions of all types within procurement, or somehow related to procurement. Virtually all of the decisions/analysis in which the ICG gets involved include some type of financial analysis/cost assessment. The members of this group have a variety of backgrounds, including many years of experience in finance, internal consulting in other areas in Tele, as well as purchasing and logistics experience. This broad base lends to the credibility of the group and ensures that they have the right expertise available for the job at hand. ICG also includes others on teams who are not directly part of the ICG as needed. For example, many of their projects look at various software options; ICG frequently works closely with the IT group.

Examples of projects – ICG is apt to get involved in analysis of projects of significant size and scope. It tends to participate in analysis of high visibility projects that are important to its clients. Many of the projects ICG has been involved in recently are logistics oriented and/or information technology (IT) focused. For example, on the logistics side, ICG has been looking at various software to run warehouse and inventory management systems. The type of projects that the internal consulting group (ICG) gets involved in vary greatly, but includes issues such as:

- Capital expenditure analysis.
- Outsourcing/make-buy analysis.
- Warehouse location decisions.
- Warehouse layout decisions.
- Information technology recommendations.
- Logistics network decisions, such as trans-shipment options, material visibility, equipment choice.
- Total Cost of Ownership (TCO) analysis to support supplier selection.
- Spend analysis.
- Benchmarking best practices.
- Assessment of recommendations/decisions made by external consultants.
- General decision support within procurement, much as an external consultant would provide.

Like an external consultant, ICG presents its clients with a thorough analysis and recommendations. It does not implement the project.

Deere's Compare and Share Initiative – Compare and share is an initiative specifically aimed at reducing parts proliferation and increasing standardization by comparing parts with similar features/functions among and within divisions to determine what provides the best value. Two supply management professionals are dedicated to this task for two years, and work with supply management specialists and engineers to identify, prioritize, and execute cost savings. Compare and share was initially another cost management initiative to create information to build cost models. Today, it is strategic. It explores:

- Supply base reduction
- Overall issues related to European vs. U.S. sourcing
- Who will be major suppliers in future?
- How to get engineering involved, engaged, and how to incorporate in design.

Compare and share is helping overcome some of the inefficiencies associated with decentralization. While each factory has its own design group, compare and share tries to coordinate and standardize design and components. Compare and share has yielded significant savings for Deere. For more detailed information, see Ellram, 2001a.

Research Question 8. What Impact Do Supplier Relationships Have on the Organization's Cost Management Approaches?

As the focus of this study is on cost management between organizations and their suppliers, this section explores the buyer-supplier relationships from the perspective of the buyer. All of the core organizations studied agree that their suppliers, and the relationship with their suppliers, are becoming more important in general. How this is demonstrated and executed varies among the organizations studied. This section looks primarily at relationship perceptions and overall approaches; the next examines supplier development and continuous improvement mechanisms.

General Approach to Supplier Relationships

Deere worked extensively throughout the 1990s to improve its relationships and trust levels with suppliers. One of the specific things that it has done is consolidate its supply base, which allows it to work more closely with the remaining suppliers. It also has emphasized to its suppliers that its cost reduction efforts are aimed at taking costs out of the supply chain, not squeezing supplier profits.

Chip has long-term, ongoing relationships with a large number of its suppliers. Its systems, processes, and

expectations are complex and stringent, so it tries to reuse current suppliers if possible. In addition, it can cost Chip \$250,000 to \$1 million to qualify new suppliers in some cases. Chip's relationship with its suppliers and contract manufacturers has been traditional, based on the existence of well-documented contractual relationships. There was a general agreement among those interviewed at Chip that while it says the right things about the supplier relationships, there is not enough concern about suppliers in general. Chip has developed an alliance program with its big suppliers, including guaranteed volume and guaranteed profit. However, when times get tough, relationship building is pushed aside. Chip looks to suppliers for big price cuts. Supplier relationships are a perpetual dilemma, going from good to bad to good; it is an ongoing cycle. Chip acknowledges the need for more long-term relationships with suppliers. There will be even more reliance on suppliers in the future. One challenge is Chip's huge volume requirements. It needs better relationships, to work closely with suppliers as real partners to meet huge capacity demands. Chip has tried to be market neutral rather than being opportunistic. It has tried to share the risks of price and volume fluctuations with suppliers. But everyone in this industry is opportunistic. When the market turns, whoever is in a position to do so will be opportunistic. It is difficult to negotiate and enforce a price volume contract with suppliers.

At LCP, managing supplier relations is a key role of purchasing throughout the whole life cycle, from finding suppliers, setting up the relationship, aligning LCP and supplier goals, and transitioning the relationship to phase out at the end of the product. This includes building trust, personal relationships, good communication, and sharing of benefits. All are seen as key elements to long-term supply/cost management success. LCP has not been focused on being a business partner with its suppliers. It has been internally focused, in line with its philosophy of competition. Its external focus has been on getting the best price from suppliers. About 10 years ago, it began to work more strategically with suppliers, including building relationships. In some cases, it has collaborative relationships with its key suppliers where there is value-added potential. In other cases, it uses competitive relationships, where the purchase is commoditized and there are good competitive sources. It also is aware of the need to transition from one relationship type to the other as the market and technologies change.

Tele recognizes that with industry restructuring and technology change, the competitive advantage lies in the supply chain. As a result, more emphasis is being placed on supplier base consolidation, and working more closely with suppliers. Tele is growing in the area of partnering with its first, second, and third tier suppliers helping

them identify where they can drive costs out of their operations and pass the savings to Tele.

Praxair considers supplier relationships as part of its strategic sourcing process. As a first step of the supplier segmentation process, Praxair segments its supply base based upon the criticality of the purchase and the supplier to Praxair. This is how Praxair determines suppliers with whom to collaborate, versus those where the focus can be more price-oriented. Praxair limits the number of suppliers with whom it will align to 65 to 100. Praxair also wants to increase the level of support and attention it gets from these suppliers, to get a higher allocation of these suppliers' resources. With this select group of suppliers, Praxair works very closely to collaborate on joint efforts for mutual benefit. Both parties can make changes to processes to save money. In turn, Praxair will be loyal to suppliers who perform well and add value.

Supplier Development

Supplier development is a process whereby an organization works with its supplier base to help selected suppliers improve their performances. This approach can take on a whole range of activities, from simply giving suppliers feedback about their performance so that they can improve, to providing the supplier with technical assistance, training, and process improvement support. Each of the core company's overall approaches to supplier development is presented below.

At Deere, the cost management group has done a good job of reducing internal cost. It has now shifted its focus externally, to work on supplier development and other value enhancement opportunities. Deere's value improvement program is designed to improve product quality and reduce product cost. The value improvement process is "a tool used to facilitate identification, implementation, and completion of projects that will maintain or increase quality while decreasing costs of specific parts, part families, and/or assemblies." It is a process whereby a Deere team and a supplier team get together for a day or more to brainstorm and quickly develop a number of ideas they can implement to take out costs and improve processes. Some of these ideas are selected for implementation, then monitored and supported to implementation. They might complement the supplier development process detailed below.

Deere has an extensive, dedicated supplier development staff made up of more than 70 engineers and PSM specialists, housed in each business unit, reporting to the director of supply chain management for that business unit. Deere defines supplier development as, "a Deere/Supplier process of shared resources and technology resulting in improved business and

manufacturing process efficiencies, reduced total costs, shared savings, and satisfied customers." One goal is to contribute to the differentiation that creates sustainable competitive advantage for Deere.

Deere's focus is on its first tier suppliers, and in some cases even critical second tier suppliers, in order to get a feel for the value improvement opportunity down the supply chain. Many second tier suppliers are smaller and need help. With the top suppliers, Deere does a value improvement and supply development process if it doesn't have the opportunity to bring in competition. Deere approaches supplier development in six steps:

1. Initiate a project with supplier, including definition of processes, assessment of needs, and gaining supplier support.
2. Map and measure the supplier processes, including baseline performance and process metrics.
3. Process development via creating and selecting solutions and implementation plans.
4. Achieve results by means of implementing the new process.
5. Control by establishing the control and feedback mechanisms.
6. Recognize teams through sharing best practices/lessons learned, and providing recognition.

These steps may involve a team of Deere supplier development specialists co-located with the supplier to help the supplier implement the changes to improve its results. Deere has countless supplier development success stories. With the permission of the cooperating supplier, Deere publishes and makes available these success stories. Between compare and share, supplier development, and value improvement processes, Deere saves about \$7 million to 8 million a year.

Chip also sees the value of selective supplier development. Chip may send a team to a supplier site to work through a yield improvement process, or other process that will reduce costs and otherwise improve supplier performance. One issue that Chip struggles with is how far back in the supply chain it should go to a try to manage its supplier's suppliers. For example, Chip had a tool that was made of aluminum. The higher the quality of aluminum used in the manufacturing of that tool, the better the performance and longer the life of that tool. The aluminum supplier actually became a constraint to Chip's quality and productivity. Even though the aluminum supplier was not a direct supplier to Chip, Chip worked with that supplier to deal with this constraint. The focus was on quality, cost, and gaining leverage with this supplier. Chip will only focus on the critical suppliers beyond the first tier of its supply chain. It is rare to work directly with a second tier supplier.

With second tier suppliers, the nature of involvement would more likely be to direct them to other good, cheaper supply sources.

LCP also works with key suppliers to improve suppliers' manufacturing processes, and create synchronous manufacturing. This involves working more closely with suppliers on cost (e.g. target costing and cost modeling), sharing proprietary manufacturing technologies, and bringing the supplier in early in the development stage (not the black box syndrome). The goal is to streamline the whole supply chain. For example, it recently had an excellent supplier development success by working collaboratively with the supplier of a specialized container on a new product development. LCP calls its supplier development process "Supplier Business Development." It uses this approach for new products and product innovations as well as for continuous improvement with a supplier. It involves sending in an LCP team of technical people, manufacturing people, and engineers to set up the process and work with the supplier to understand and improve upon cost elements, buffers, cycle time, quality, and communication.

Tele develops some of its key suppliers by involving them in cost management via training and quality programs. Suppliers are also trained on internet-based measurement tools to ensure the integrity of their performance metrics. Tele conducts ad hoc training in order to implement supplier performance metrics, relying heavily on documented, industry-standard quality methods. Key suppliers are invited to participate in cross-functional continuous improvement teams. Tele currently does not have a formal supplier training program for strategic cost management, but is considering developing such a program.

Praxair PSM works with some suppliers on development. Once the relationship is under way, Praxair has a program for supplier management that it uses with key suppliers. The process involves meeting with critical suppliers to identify key performance indicators such as price, technology, and service. Based on the indicators, it establishes a report card and works with cross-functional teams to get feedback from the various businesses on how the supplier is doing. In addition to doing a formal report card rating for each critical supplier, Praxair gets input from suppliers on Praxair's performance and how Praxair can improve as a customer. Praxair calls this the TARGET process, because the focus of continuous improvement revolves around a combination of the following elements:

- **TCO.**
- **Assurance of Supply.**
- **Responsiveness.**

- **Global reach.**
- **Environment and safety issues** (big for some suppliers).
- **Technology.**

Sharing Cost Savings

The idea of sharing cost savings is popular in some circles. It was made very popular by Chrysler's SCORE system in the 1990s, in which suppliers made improvement suggestions and shared in the savings that occurred if those improvements were successfully implemented. Sharing cost savings was not a universal policy among those organizations studied. While the organizations could also see the value of sharing cost savings, the reasons given for not sharing cost savings could be summed up as, "It was our idea and we did all the work, and the competition is so tough that we have to pass along all the savings to our customers in the form of lower prices."

At Deere, cost savings are shared based upon who initiates the idea and the level of effort/investment from both parties. Deere has a formal supplier suggestion program called JDCrop, modeled after Chrysler's SCORE system. Cost savings generated from this program are generally shared with the supplier, often evenly divided between Deere and the supplier. Cost savings may also be shared when the supplier initiates the idea. In other cases, the supplier is permitted to use the idea with other customers, and keep the benefit it gains in extra profit from those customers.

At Chip, sharing of cost savings with suppliers depends on the source of the savings.

- If supplier develops independently, there is no sharing with Chip.
- If supplier shares development, they share savings.
- If it is totally a Chip idea and process, with no supplier work involved, all savings go to Chip.

Cost savings are not shared with suppliers in the design phase, because all design changes are part of product cost. With value engineering, if Chip spends most of the time, and provides the idea, and the supplier evaluates, like a specification relaxation, Chip takes 100 percent of the savings. For supplier driven changes, optimization, they share, case-by-case, generally evenly. The impact of Yen valuation changes is shared. Traditionally, Chip tried to take advantage of the Yen change. Recently, they share it.

LCP noted that sharing cost savings with suppliers varies with the situation. In general, cost savings and other benefits are shared, based on various criteria. The key is that both parties will benefit as appropriate.

Sharing cost savings with suppliers is not a common practice at Tele. None of those interviewed had been involved in any projects where Tele shared cost savings with its suppliers. Tele is in a highly competitive industry; all cost take-outs are passed on to the end customer.

At Praxair, sharing of savings varies with the situation. In an ideal world, Praxair would like to make such improvements a win-win scenario and provide incentives to suppliers to improve performance. However, they stated that this not always possible due to cost reduction pressures. Praxair shared an example where it created a system to get a better load ratio on its trucks, then worked with the outsourced supplier of drivers and trained the drivers to use this improved system. The savings from carrying full loads have been shared with the supplier.

Research Question 9. What Is the Supplier's Perspective on the Organization's Cost Management Efforts?

All of the participating core companies identified a supplier that they believed they had worked with effectively in managing costs and which would be willing to participate in this research. The supplier cases for Metal, SC, Network, and McJunkin are summarized in Appendix E, and identified with the matching core company. Some top-line information on each of the five of the supplier cases is provided in Table 22 below. The responses from the suppliers varied in terms of the impact of the customer's cost management efforts on their relationship with the customer. The suppliers had these things in common:

- The supplier viewed the customer as an important customer.
- The supplier believed that they had to constantly win the customer's business by proving that they were the best supplier.
- The supplier believed that the customer was willing to help the supplier work on improvement efforts if the customer believed it was in its best interest to do so.
- Each of the suppliers viewed themselves as competing on value or a "total cost of ownership perspective." Although price was viewed as important, in all of the cases, each supplier believed that it really wins the business because of the unique value it provides above price.

One of the factors that made the discussions with suppliers particularly interesting was the timing of the study, which occurred during difficult financial times for all of the companies involved. This section explores how the suppliers' cost management efforts are influenced by these customers' cost management pressure, the nature of the relationships with the customer, and how the customer influences its cost management efforts with its own customers.

Impact of Customer Cost Management Pressure on Suppliers

This pressure had a direct and indirect effect on the suppliers. Metal, SC, and Packaging felt the most direct cost pressure. Deere develops cost targets and shares them with Metal most of the time. Sometimes Metal and Deere work together to actually establish cost targets (in the minority of situations). During the iterations of Deere's design, Metal provides multiple quotes for

Table 22
Buyer-Supplier Dyads

Customer	Industry	Supplier	Industry	Items sold to customer
Deere	Heavy equipment manufacturing	Metal	Precision plastic and metal parts	Precision metal parts
Chip	Semiconductors	SC	Subcontractor of custom integrated circuits and chips	Custom integrated circuits and chips
LCP	Consumer products	Packaging	High technology containers and packaging	High technology custom containers
Tele	Telecommunications	Network	Manufacturer of network equipment and software	Network equipment
Praxair	Industrial air products and chemicals	McJunkin	Pipe, valve, and fittings distributor	Integrated supplier of pipes, valves, and fittings

different designs for a certain product. Metal knows what cost it needs to achieve to satisfy Deere, based on Deere's target costing process.

SC noted that in the past 18 to 36 months, a shift in industry forces has created and supported a change in the cost management emphasis in this industry. Recently, the end consumers have gained much influence. They are demanding higher performance, more variety, and lower prices in high technology electronics. This is no longer a high volume, low product variety business. This new business model has created greater complexity and higher production cost. As a result, SC's customers, like Chip, are putting more cost/price pressure on SC. Much of its recent cost management effort has been influenced by the high degree of price pressure SC receives from its customers, such as Chip. Some of its customers, including Chip, have the same suppliers as SC. Thus, SC's suppliers were being pressured from multiple customers simultaneously.

Packaging has also noted a shift due to the economic downturn. Several years ago, Packaging and LCP had a formalized program to look at long-term issues in improvement. The focus was on quality, development, inventory reduction, and cost reduction. The goals were long-term, aimed at improving processes and taking costs out of both the supply chain and the products LCP purchases from Packaging. LCP and Packaging had an excellent alliance relationship three to five years ago. Packaging feels that LCP was well ahead of its other customers in its progressive thinking at that time. The focus of the relationship between Packaging and LCP has shifted.

Today, most of the discussions between LCP and Packaging have a strong cost/price focus, aimed at immediate results rather than long-term improvement. Packaging notes that LCP has been under greater price/cost pressure than in the past, and is in turn pressuring Packaging. Rather than helping Packaging seek long-term solutions, it is asking Packaging to reduce costs on its own, explaining that it does not have the resources to dedicate to support Packaging's efforts. It is applying this approach not only to Packaging, but also to its other suppliers.

Tele's influence on Network is more indirect. Network is extremely cost conscious, and has a whole team dedicated to cost management/continuous improvements.

The situation between McJunkin and Praxair is similar. McJunkin has brought many ideas to Praxair and learned much from Praxair as well in terms of identifying and implementing cost savings. Cost management is an integral part of the long-term relationship between

Praxair and McJunkin. McJunkin must continue to prove itself and earn its business. Praxair is tough but fair with McJunkin.

Customer Relationship

In general, all of the suppliers recognize that the price/cost pressure that they experience from their customers is a genuine reflection of the business environment. As SC explained, "As in any industry, the players here are all profit maximizers. There is a hesitancy to get too close and share too much. This creates a barrier to true collaboration." It was clear from talking to the suppliers that there was a fine line between what they perceived as reasonable and unreasonable cost pressure. Some of the key factors that distinguish whether the cost pressure was seen as reasonable or unreasonable by the suppliers include:

- The customer's willingness to work with the supplier on cost improvement initiatives. The more that the customer supported the efforts through resources and idea sharing, the more it was perceived as fair.
- The perceived attitude with which the cost reduction mandate was given also had an impact. This is something that truly is in the eye of the beholder. Did the supplier perceive that the customer was sharing its pain and had empathy, or that the customer really did not care about the supplier's situation and the supplier was expected to just do it.
- If the supplier expects the lowest price in the marketplace, but still wants value-added services, that is seen as unreasonable.
- Whether or not the relationship is a good relationship in other ways, in that the customer shares information and communicates key issues and changes, and treats the supplier with respect.
- Whether or not the supplier perceives that it receives a fair return on its investment in this relationship

Again, these are subjective factors, but important issues in order for the supplier to feel valued and dedicated to the relationship. There seems to be the greatest negative impact on supplier relationships when the supplier believes that the customer had acted in a supportive way in the past, and has withdrawn this support.

As mentioned above, all of the suppliers in this study wanted to have long-term, collaborative relationships with the customers in this study. Metal specifically noted, "The objective of Metal is to have a long-term relationship with Deere, to understand each other's business objectives. This is a competitive industry, and whoever excels benefits. Delivery and quality are mandates. Whoever has the low cost gets the business. Metal must perform. There is a healthy tension, and the failure to meet objectives is NOT acceptable; Metal must

be a low cost provider or it is out.” Deere’s understanding of Metal’s cost structures and associated issues is high. It asks many questions. It helps them better understand issues and where costs are coming from. They still struggle over price/cost, but there is more focus on cost, and reducing cost not just price. Metal stated that its relationship with Deere is characterized by a commitment on both sides to act as partners.

On the other hand, SC sticks with some of its powerful customers like Chip due to their large volumes and market presences. However, the customers’ relentless search for deep price cuts limits real alliance development. SC believes that it could actually accomplish more with Chip if Chip was more collaborative. Likewise, Packaging expressed its disappointment in LCP’s shift away from collaborating for improvement.

Network also noted that Tele’s approach to cost management affects its relationship. Cost is a constant issue. Network’s sales model is not to be the low price provider, but rather to sell based on value. It must make sure that customers get the service they expect. On a strict bidding war, Network loses. However, Network considers things like administrative costs and it brings the customers new ideas. Tele is willing to consider value versus merely price, because Tele sees the value. In the end, Network believes that Tele has gained a great deal from looking at the total cost perspective. Network and Tele have worked together for eight to 10 years. During that time, their relationship has strengthened considerably, and is now a close working relationship.

McJunkin is working very closely with Praxair on Praxair’s Six-Sigma teams. Some major goals of these teams are to reduce rework and increase contract compliance. Representatives from McJunkin have been accompanying Praxair purchasing people and others to site locations to educate users on the benefits of using McJunkin’s automated ordering system in terms of rework, order accuracy, quality, and cost. This improvement effort is viewed as a partnership. McJunkin believes that Praxair very much understands and embraces the total cost of ownership/value concept. McJunkin tries to establish relationships based on providing the best TCO/value to its customers. This approach is much more sustainable and mutually beneficial than only a first-price approach.

Each of these suppliers indicated that it is not the low-cost supplier, but focuses on value, providing a fair price and excellent service. They noted that, in general, the customers with whom they have the biggest problems are the ones that want considerable extra services/dedicated personnel, but don’t want to pay for them.

Customer Influences on its Cost Management Efforts

Metal and SC noted the most direct effects on their own cost management processes because of working with the customers identified in this study. Cost targets from Deere have encouraged Metal to look for more information from its suppliers than in past (it has learned from both Deere and another major customer). Metal is not as sophisticated at this process as are its key customers. Metal’s PSM group interacts directly with Deere, and understands Deere’s supplier management processes. As a result, Metal is now working on developing its own method for supply chain management, and consolidating its supply base to gain leverage.

SC also commented that much of its efforts in supplier cost management and its own internal cost management system have been influenced by the high degree of price pressure SC was receiving from its customers, such as Chip. Some of SC’s cost management processes influenced by Chip, include:

- Mapping processes.
- Breaking down and analyzing all that it knows about the supplier processes in terms of cost.
- Considering what the market will bear based on market research (target development).
- Developing detailed should-cost models.
- Estimating supplier’s cost structures.

One output of the should-cost effort was the development of generalized models for major cost categories. Another result was an understanding of the key cost drivers of various inputs. This helped SC develop price targets for suppliers and get a better understanding of cost issues over a product’s life cycle. In addition, SC has negotiated agreements with its customers such as Chip, making the customers responsible for a certain amount of inventory based on the customer’s demand forecasts, moving the whole supply chain closer to a make-to-order environment. SC has been able to reduce its inventory by about 80 percent since this approach was implemented. Its suppliers have had similar reductions, and are very enthusiastic about VMI.

While the other suppliers were certainly influenced to deliver savings to the suppliers identified, they did not necessarily emulate their customer’s processes.

Supplier Relationships with Their Suppliers

All of these suppliers also work with their own suppliers in various ways on cost management. SC is perhaps the furthest along in its supplier cost management efforts, as its suppliers have also been influenced by customers such as Chip. Metal is developing a very Deere-like process in managing its suppliers’ costs. It was more tactical in

dealing with suppliers in the past. It is moving toward strategic processes, benchmarking, and related processes. It is moving from many to few suppliers and developing cost models. Metal has established a core team to implement the process.

In addition to the cost management approaches mentioned in the previous section, SC has also worked with its suppliers on increased electronic information sharing. SC believes that its suppliers have been quicker to embrace the supply chain cost management efforts than have its customers. As mentioned earlier, this market is extremely price oriented. SC believes that most of its customers still have a price focus. Some customers, like Chip, have developed excellent tools for understanding the costs that drive price, which have helped SC's understanding of costs immensely. While price will always be important, SC believes it is not a sufficient focus for them if they hope to achieve significant improvements. Thus, SC has approached its customers on improving collaborative efforts.

SC is continuing to increase its focus on collaborating with suppliers, and moving into collaborating with and understanding the markets of second tier suppliers. Education has proved to be one of the most valuable tools in improving supply chain performance and cost management. SC has a goal of being a preferred customer to its suppliers. Relations with suppliers have not always been good, due at least in part to the continual price squeezes. While the price emphasis will never go away, SC is now working closely with its suppliers to facilitate improvement. SC is co-locating engineers at supplier locations, emphasizing process and technology innovations and improvements, and sharing the savings. SC is also benefiting from the efforts of competitors, who are working to improve the same supply base.

Packaging also looks at its external supply chain and internal operations regularly as a source of potential cost improvement. It would do this with or without the pressure from LCP. On the operations side, Packaging focuses on operating improvements, site location, changeover costs, and utilization. Due to of the strong pressure from LCP, Packaging goes back to its suppliers more often, and probably fights a bit harder for savings than it otherwise would. Marketing goes to purchasing and asks for help in maintaining margins, which in turn affects the suppliers. Purchasing is very aware of the price pressure from customers, and might use this as a bargaining chip with suppliers, pointing out that if it can't get price reductions, it might lose business, and the suppliers, in turn, might lose business.

Packaging has also reorganized its purchasing department to purchase globally from a smaller set of suppliers,

gaining leverage, price protection, and supply guarantees from global contracts. The goal is to drive costs out of the system. Purchasing, manufacturing, and R&D have ongoing programs with key suppliers.

Network has not had as great a focus on supplier relationships because it is very vertically integrated. Many of the raw materials that it purchases are commodities. However, the focus on suppliers, supplier relationships, and supplier cost management is growing as Network outsources more. It does work with some suppliers on helping the suppliers reduce costs. Network has a program for its top 20 to 25 preferred suppliers in which it works with some key suppliers as long-term partners.

McJunkin tends to have long-term supplier relationships, and relies a great deal on leverage over both time and quantity with these suppliers wherever possible. In much of the industry, pricing is based strictly on volume level. McJunkin is beginning to implement some strategic supplier initiatives, and supply base reduction to further focus its volume. It just re-examined its supply base for a certain type of valve, committing to the suppliers, asking for advantages in price and field support, to really form a partnership. If this is successful and provides advantage, McJunkin will spread this idea to other areas where it is beneficial. In general, the suppliers and McJunkin's interests are very well aligned.

In the main, the customers, or core cases, studied appear to have more sophisticated cost management approaches for dealing with suppliers than do these suppliers for dealing with their own suppliers. Each supplier indicated that it is doing more in the way of supplier cost and relationship management.

Research Question 10. What Impact Do Customers Have on the Organization's Cost Management Approaches?

This section focuses on how the customer affects PSM's cost and value management efforts. In general, PSM does not have direct interaction with its end customers. Instead, The value proposition and needs of the customer are communicated to PSM indirectly, through interacting with marketing, sales, customer service, or other similar functions that do have direct interaction with the customers. The exceptions to this scenario cases are presented below.

In general, the customer viewpoint is communicated to PSM in PSM's role as a member of a cross-functional team. This could be a team focused on target costing/new product development, on sourcing, or a similar issue. An example of the specific nature of a cross-functional sourcing team was provided above in the section on the use of teams in cost management. In this example, Tele

aims to serve its internal client and meet the internal client's needs, and in doing so, meet the needs of the end customer. In the organizations studied, this is a typical way in which purchasing develops an understanding of the external customer's needs. Many of Tele's end customers are consumers, rather than industrial customers, so the pressure to manage costs and reduce prices tends to come more from the market and competition than directly from the final customer. Price and service competition are high in this industry. PSM feels this pressure through internal clients, and responds accordingly.

The mission of Deere PSM is to establish a case for action and drive key cultural changes to create a fully integrated, worldwide, customer driven supply chain management process. The cost management specialists at Deere are involved with a team that interacts with manufacturing engineering, design engineering, marketing, suppliers, and the customers to understand the dealer and end user to understand feature/cost trade-offs. They do get some direct customer feedback through interaction with dealers. Again, it feels price and value pressure keenly.

Chip PSM/manufacturing receives its information on customer needs and expectations much the same way as supply management at Tele. It has customer service support staff that deals directly with and supports each of its key customers. Within the PSM/manufacturing group, there is a planning group that provides customer information to be used in engineering, design, and PSM/manufacturing decisions.

From the customer side, Chip gathers much data on how the customer makes its purchase decisions. Some end customers really look more at the TCO of Chip's products than at price. Chip develops an understanding of the customer/OEM's bill of materials (BOM) as well as how that customer prioritizes its costs. Chip also strives to understand how the OEMs it supplies make their decisions. It also develops an understanding of the decision making process of the OEM's customers. Chip's large OEM customers provide Chip their BOM to prove what they can afford to pay Chip for components. Thus, the negotiation begins with facts, based on what the market will support, the OEM's own targets, competitive pressure, and geography. However, Chip aims to stay enough ahead of the market and in tune with the final customer of the OEM's product so that it is prepared for price decreases by continually improving its own cost structure.

At LCP, PSM resides in the product supply group, which directly focuses on LCP's relationship with retailers, and attempts to take a supply chain perspective. The big

retailers consume most of the resources. These are strategic customers, tier one retailers like Wal-Mart, Target, K-Mart, etc. The LCP team develops an understanding of customers' cost drivers/operations, sometimes even beyond a customer's understanding. At some customers, LCP personnel are treated almost as employees of the customer. They have a great deal of influence. LCP personnel are frequently asked for advice and are included on project teams. While these teams generally do not include PSM as regular members, PSM may be called in to participate if there is a specific issue related to supply.

The customer teams help customers understand/manage category profitability as a whole, by category, and by store. They research how profitable LCP brands are to the customer and how purchases of LCP products influence other consumer purchases. The teams also understand how profitable the customer is for LCP, and how it drives LCP costs in areas such as:

- Backhaul performance.
- Unloading time.
- Cost of the operating team.

Thus, PSM is closer to the customer at LCP than most organizations simply because it is part of the business unit, and reports in to the Vice President of product supply. The Vice President of product supply is very close to the customer.

At Praxair, PSM focuses mainly on internal Praxair clients and plays a predominant role with suppliers. However, PSM does have an understanding of the external customer. Within purchasing, specific sourcing managers are aligned with specific businesses. They become integrated with the business team, which is where they develop their understanding of the needs of customers. This varies considerably by business. In the businesses that support the electronics industry, Praxair becomes very involved with some of its key customers. PSM always strives to understand the importance of the end customer. Some customers, especially in the electronics sector, are very concerned with Praxair quality, and look closely at Praxair systems and Praxair's interfaces with its suppliers. However, most of the customers' influence on Praxair's supplier relations and supplier cost/price reduction is indirect.

An exception to PSM's direct interaction with customers developed at the request of Praxair sales. Praxair PSM has met with a number of customers to explain some of the approaches that it takes to achieve improved savings and value in procurement and to help the customer develop savings ideas.

Thus, PSM gets most of its information on customer needs and value propositions indirectly, from those who interface directly with the customer. Nonetheless; through interaction with internal clients and participation on cross-functional teams, PSM is aware of and responsive to the cost and value demands that customers place upon it.

Impact of Customer on Cost Management

In four of the five case studies, PSM was unable for various reasons to provide access to a customer to discuss cost management. In Chip's case, the researcher was able to speak with one of Chip's customer relationship managers, who leads a team of seven in managing the relationship with one of Chip's key customers. This manager deals with all shipping, order management, invoicing, and relationship management issues. He interfaces directly with this customer's supply management people on cost and price issues. The field sales people conduct the price negotiations, with the relationship manager sitting in. This customer has a very efficient supply chain, so Chip can't provide it much support in improvement ideas. The customer also does not tell Chip how to run its business. Three to four years ago, Chip implemented a total cost of ownership initiative on the sales side. Chip started to work with its customers to understand how people make decisions for purchasing OEM technology. It tries to use a TCO/value approach rather than a price focus in selling to its customers.

A major discount retailer, MDR, provided information about its relationship with LCP. MDR feels that it has treated all but a few of its key suppliers as commodities in the past. It recognizes that true collaboration is required for both it and its suppliers to be successful. It is moving in that direction. It has also responded to suppliers' complaints that it was unresponsive to their questions and comments. MDR has recently instituted a supplier tracking system to ensure that 100 percent of the suppliers' issues are resolved.

Its overall supply chain direction related to suppliers includes:

1. Getting the basics of good supply chain management in place.
2. Rationalizing the supply base.
3. Increasing supplier partnerships.

It is working on several key initiatives aimed at taking costs out of the supply chain. Before MDR begins to proactively work directly with suppliers to reduce their costs, it is developing an understanding of the poor practices that it employs, and how these practices affect the supply chain and the costs of its suppliers. It is

moving more in the direction of supplier-managed inventory, and on improving its logistics operations, including quick unloading of trailers rather than using suppliers' trailers as temporary warehouses. It realizes that its own practices represent a large part of the supply chain cost savings opportunity.

MDR has had a very close working relationship with LCP, so much so that MDR has not historically beaten up LCP as it has many of its other suppliers. MDR credits LCP with taking the initiative to maintain that relationship. MDR notes that it is difficult to quantify all of the savings that LCP has generated for MDR. However, LCP has been instrumental in helping MDR think about and evaluate its supply chain philosophy, and recognize some of the opportunities to improve its supply chain. For example, LCP worked with MDR to set up a project to track causes for out-of-stock and overstock items, and help MDR really see the opportunities for supply chain improvement in its own behaviors. MDR sees LCP as a model supplier, and would like to replicate the type of relationship it has with LCP with other suppliers. This is a positive example of how a significant supplier can positively educate and influence a major customer's supply chain and cost management strategy.

Research Question 11. Does the Organization Take a True Supply Chain Management Perspective of Strategic Cost Management?

All of the organizations studied agreed that while they aspire to a true supply chain/supply network view of strategic cost management, they still had opportunity for improvement.

For example, at Deere, supply chain design and supply chain integration are two of PSM's top five initiatives, with the goal of making Deere's supply chain one of its sources of competitive advantage. Deere's supply chain definition includes production, supply and supplier relationships, logistics/order fulfillment, and customer service. It has made excellent progress in many of these areas, but has many additional goals for improvement.

Chip also does not take as strong a supply chain view as it would like to, but is moving in that direction.

Improving cost management with design for cost is a key program to support this effort. Chip has learned that it is not fair to expect the supplier to improve/lower costs on sub-optimal parts. Thus, Chip needs to design the parts properly in the first place. In addition, Chip is also fine-tuning its supply chain perspective. Historically, Chip was so powerful in the market and with its suppliers that it could dictate policy. This is changing, and Chip is discovering that it can often learn from its suppliers' and customers' perspectives and practices.

LCP is working on its supply chain perspective explicitly using the Vice President of Supply organization structure, where all of the functions that affect the supplier report to the same organization. In addition, the Corporate Supply Group has provided training and support to purchasing and others in each division regarding supply chain improvements and cost management. Today, true supply chain analyses are performed on an ad hoc or project basis rather than as a matter of routine. For example, LCP looked at the entire supply chain for one product. It looked at all losses and spent four weeks on a regimented, computerized, and intense analysis. Using information gathered on all losses in that supply chain, it was able to decide which losses to pursue in order to eliminate the largest cost drivers/areas of loss. Such analysis involves 1) plant operational analysis, understanding what happens within the walls of plant; and 2) comprehensive category/product level analysis across the entire supply chain. LCP found that one of the greatest areas of loss it had was lost time/lack of flexibility in the manufacturing of retail display units. It worked with the supplier of these retail display units, and within three months cut the process time in half, while increasing flexibility in the type of retail displays available.

The goal of Tele is to take a supply chain focus in its analysis. That is one of the reasons that the internal consulting group, ICG, tries to use a total cost of ownership perspective in its analysis whenever it is applicable. It tries to understand and factor in the impact of different alternatives on its suppliers and customers, as well as on its own performance. The reality of the situation is that many projects are complex and far-reaching, and may be analyzed in part by a number of different groups. Whereas ICG might look at the cost and operational issues associated with distribution center locations, marketing might look at customer service issues associated with the same decision. Thus, while ICG might focus more on supply side issues, other groups are investigating additional factors that affect the supply chain view.

The aspiration of Praxair PSM is to develop a supply chain view of cost management. This is seen in its extensive use of total cost of ownership. Praxair considers more than price. It also looks at supplier performance in areas such as quality and electronic capability. Total cost of ownership is also a key tool for capital acquisition. TCO also comes into play in managing internal cost/budgets. Today, Praxair doesn't see the entire supply chain within PSM. The Business Development function focuses more on the buy side, up to product delivery. The PSM group is not yet dealing directly with customers on a regular basis. The sales/marketing organization is protective of customer relationships, and PSM now has

plenty to do without direct customer involvement. The sourcing process is very integrated with the business units, so purchasing gets much front-end involvement. Today, PSM looks at all aspects that touch the supply chain from design to purchasing to strategy to payment, transport, and storage. PSM is really looking at all the key elements of the supply chain. The perspective is getting broader.

Thus, strategic cost management in the supply chain is still a vision rather than a reality in all of the companies studied. Each has made progress, but each sees the road to strategic cost management in the supply chain as a continuous improvement process rather than a static state to achieve.

Second Tier Suppliers

None of the organizations studied focus on suppliers beyond the first tier as a matter of course. Rather, second tier suppliers and beyond are dealt with on an exception basis, as problems and issues arise. This is not because the second tier is not viewed as important. It is because of resource limitations, and in general, the buying organizations would like their suppliers to manage their own suppliers effectively. It is likely that there will be greater involvement with second tier suppliers in the future. Deere commented, "Many second tier suppliers are smaller and need help."

Chip stated that it tries to stay out of supplier-supplier relationships wherever possible. It wants suppliers to own/drive/be responsible for their own supply chains. It may get involved for critical issues, such as to influence allocation and pricing from second tier suppliers by using Chip's volume. Chip recognizes that much of the supply chain risk is coming from second tier suppliers and beyond, and encourages first tier suppliers to train their own suppliers, but this is not yet a common practice.

Tele is increasingly looking at the cost structure for first, second and often third tier suppliers in order to examine ways to improve processes which may affect downstream costs. Many of their first tier suppliers use the same second tier suppliers, so the issues are transferable among supplier relationships. Tele is growing in the area of partnering with its first, second, and third tier suppliers to help them identify where they can drive costs out of their operations and pass them along to Tele.

Research Question 12. What Are the Key Success Factors and Barriers to Strategic Cost Management?

All of the organizations were asked about what difficulties they had to overcome on their roads to improving strategic cost management in the PSM organization.

Barriers

A number of barriers that organizations had to overcome, to be successful in strategic cost management, or are still working to overcome are listed in Table 23. The list of internal barriers outweighs the list of external barriers. Some of the barriers are presented in more detail below.

Deere noted several barriers to success in cost management. One was simply the economic swings. It is hard to gain leverage when the demand is constantly changing. In addition, Deere had many good ideas for years, but really did not get a chance to implement them because PSM reported in at too low a level in the organization.

Chip also commented that PSM is viewed by the business units as an executing arm rather than a strategic function. One barrier to better managing cost at Chip is that it intentionally over-designs its products virtually all the time. There is somewhat of a “not invented here” mentality for some specifications and requirements that are actually transparent to the customer. Likewise, where things give Chip a competitive advantage versus a commodity is not always clear.

LCP noted a number of barriers, including the idea of fragmentation or functional silos: individuals/functions are aware of their own issues and responsibilities but not

as aware and accountable for those of others. LCP tends to focus on how to win in LCP’s part of the supply chain without hurting the supply chain as a whole. Trying to find win-wins is a challenge. It is still difficult to get the customer/supplier to see a bigger picture. Also, LCP may not see direct and immediate benefits in price change from improved supplier information.

At Tele, PSM often simply did not have the time or expertise to get involved in the projects to the level that it would like to. Alternatively, like Praxair, it was not invited to be part of the internal customer’s decision-making process in the past. Prior to its reorganization, Praxair’s PSM group was viewed as the least favorable place to work in the organization. The focus on price to the exclusion of other factors, and non-involvement in many key purchases blocked PSM’s potential for success. In addition, it did not have information systems to consolidate, manage, and track spending.

Success Factors

The organizations studied made many changes, or are in the process of making changes, to support increased focus on and involvement in strategic cost management in the supply chain. Some of the key success factors and changes that have been made to overcome the barriers are shown in Table 24.

Table 23
Barriers to Successful Strategic Cost Management
in the Supply Chain

<i>Internal</i>
Reporting level of PSM
PSM viewed as a support group by other functions
Over-design of product
Lack of immediate benefits
Lack of compliance with contracts
Lack of credible savings numbers
Price only or first cost focus
Rapid growth
Large size of company
Lack of understanding of the concept
Focus on internal costs only
Lack of relevant measures
Lack of accountability
Lack of immediate benefits
Lack of information systems to support analysis and tracking
Lack of time
Lack of skills
<i>External</i>
Economic downturn
Inconsistency in treatment of suppliers; swing from alliances to adversaries
Customers unwilling to share information
Suppliers unwilling to share information

Table 24
Key Success Factors in Strategic Cost Management

PSM reports in at a level equal to other key functions
 Participates in top management strategy setting and other meetings
 Attends key management meetings with business units
 Has new PSM leadership
 Hired trained professionals where needed
 Implemented new processes, including:

- Total cost of ownership
- Target costing
- Should-cost analysis
- Cross-functional teaming
- Supplier development

Top management support
 Earlier involvement in new product development and other key decisions
 Has been successful in achieving savings
 Has support from outside financial experts in reporting credible savings numbers
 Made changes to the reward and measurement system to better support cost management
 Educates its suppliers and customers

Deere made several key changes to better support strategic cost management and raise the status of PSM. Deere benchmarked with leading organizations and built a business case that convinced senior management that PSM could make a significant contribution if only its level was elevated. In late 1997, it hired a Senior Supply Management officer at the VP level, the highest level ever in Deere. Throughout 1998, it created Supply Management leadership teams, defined its strategic processes with business process excellence teams, and developed hiring and training plans. PSM developed its first-ever strategic plan, and began to put new processes in place, saving the organization money, improving supplier performance and relationships. These new processes included supplier development, the use of cost management experts, target costing and on-line auctions, to name a few. To support these processes, it also hired experts in cost management, PSM engineering and other places that they were needed within PSM. For more detailed insight into Praxair's reorganization, see Leenders and Johnson, 2000 and 2002.

At Chip, PSM is viewed as important because materials are a bigger cost today. There is a focus and pressure on cost reduction. The reward and measurement process helps both within PSM and throughout the organization. As mentioned earlier, everyone in PSM has specific cost savings goals for which he/she is held accountable in terms of his/her performance appraisal, raises, and bonuses. In addition, part of the bonus for everyone in the organization, regardless of function, is based on PSM performance. However, probably the biggest evolution in the past several years is that PSM is getting involved

earlier in the new product development process, where it really can have an impact on taking cost out of the product before the first item is produced.

LCP noted many success factors supporting its approach. First, as mentioned earlier, the Vice President of Product Supply Structure provides one-person visibility of all key product supply costs and issues. This individual ultimately has responsibility and accountability for processes and results. This role was designed to break down functional barriers and create a process focus with joint goals and responsibilities. It has improved many processes to support strategic cost management, including training to support purchasing and others in each division regarding supply chain improvements and cost management. It has implemented target costing, supplier cost breakdowns/should-cost analysis, and is focusing more on value, not just price.

PSM is viewed as a key strategic function and is highly regarded at Tele. Over the last few years, PSM has been elevated and established as part of the core business of Tele. As such, its expenses are watched closely at the corporate level. The organization is involved in the planning and implementation of key company growth initiatives, and participates in high-level decisions on SCM direction and value propositions for the corporation. The overall value proposition of the PSM organization is measured by the total savings the organization achieves when sourcing products, and its contribution to bottom line business results. As presented at length in the Tele case, it formed an internal consulting group to help support its efforts.

Tele's PSM group must constantly prove that it adds value to processes and purchases. There is no requirement within the organization that other areas use purchasing. Those areas may circumvent the procurement organization if they feel it does not add value. However, given that PSM does handle a great deal of Tele's business, it is clear that some feel it is a value-added operation. It has recently received much positive attention for the purchasing cost savings generated by the mergers.

The changes in PSM at Praxair were made under the directive of and with the full support of the CEO and CFO, based upon recommendations from an outside consultant. Praxair brought a number of key people from sales into PSM; these people understood negotiations issues, sales, and market pressure from a different, but complementary, perspective. Personnel from R&D and finance were also mixed in with PSM professionals to create a stronger organization.

To rectify the lack of information available, Praxair implemented a data warehouse. PSM can now thoroughly analyze spending, transforming data to information in order to make decisions. The data warehouse also provides data to report contract compliance and savings results. Praxair learned the process of strategic sourcing from its outside consultant, and developed its own internal training programs so that everyone understands the strategic sourcing process. PSM continues to have very strong support and visibility from senior management leadership, especially the CEO and the Vice President of Finance at Praxair. PSM participates fully in monthly reviews with the office of the chairman, and presents its progress and plans like any other business unit.

Research Question 13. What Is the Future of Strategic Cost Management in Your Organization?

All of those interviewed concurred that the emphasis on strategic cost management would stay the same or grow, if possible. There was also a consensus that the impact of the supplier and having alliances with key suppliers would become more important as organizations increasingly rely on their suppliers for quality, technology, and new ideas, and as more is outsourced.

Other areas of emphasis in cost management included a continued emphasis on design for cost. Chip noted that the focus would shift to technologies, and how to achieve cost parity from one generation of technology to the next, rather than emphasizing the cost of an individual product. Chip also believes that the future cost management focus will incorporate customer value, as well as supply chain issues. Several of the cases also

noted that there must be a greater emphasis on relationships and collaboration with key suppliers in order to make significant cost progress in the future. There is also greater recognition of the importance of taking a supply chain perspective in cost management.

One concern expressed by one of the financial people interviewed was "the belief by senior leadership that procurement can deliver the same magnitude of results year after year. It can't be done. There is a limit. PSM must work to educate them on additional contributions that can be made beyond bottom line cost reduction."

Summary and Conclusions

Table 25, also shown as Table 3 above, illustrates the key characteristics and knowledge recommended for effective strategic cost management in the supply chain. Strategic cost management in the supply chain has both strategic elements and tactical elements, as shown in Figure 4. The strategic elements relate to understanding the bigger picture or organizational goals, customer needs, supply base segmentation, and market trends. The tactical elements relate to some of the execution and analysis, such as having cross-functional teams and reporting and rewarding cost management. The tactical and strategic elements, in turn, support major organizational processes and philosophies, such as continuous improvement, new product development, and strategic sourcing. These processes are supported by external and internal data. For PSM, this process results in greater understanding and integration of supply base issues throughout the organization, earlier involvement, greater visibility, and improved bottom-line contribution.

The following paragraphs rehash the sections, “Research Questions and Major Findings” and “Implications of the Study” presented in the Executive Summary at the beginning of this study.

Research Question 1. How important is strategic cost management in the organizations studied, and why?

1. All of the core and supplier organizations that participated in this study indicated that cost consciousness is a way of life in their organizations. This philosophy is felt and lived from the chairman of the board to the administrative staff to the workers on the manufacturing floor.
2. Cost management is not a passing fad; it is a way of life that will continue, and perhaps grow even more important.

3. All of the core organizations studied believe that they have been very successful in supplier cost management, as shown by the significant, documented savings supplier cost management has contributed to the bottom line of the organization. All reported savings ranging from millions of dollars, to tens of millions of dollars per year, and savings ranging from about 5 percent to over 10 percent in annual expenditures.

Research Question 2. How are firms organized to effectively achieve strategic cost management?

1. All five of the core companies studied had centralized, or a mix of centralized and decentralized, purchasing organizations. There was widespread agreement among the firms studied that at least some degree of centralization was required to get visibility of purchases in order to gain leverage and properly manage the supplier relationships and cost issues.
2. Purchases that were unique to particular business units were managed at a business unit level in two of the five organizations studied.

Research Question 3. Who is responsible for conducting cost management in the organization, and who is accountable for delivering results?

This question has several, related answers.

1. PSM is held highly accountable for the delivery of cost savings in all of the organizations. It has specific goals for bottom line savings at functional, commodity and individual levels. There may also be specific commitments made to support specific business units, certain product lines, or new products.

Table 25
Ideal Organizational Characteristics for Strategic Cost Management

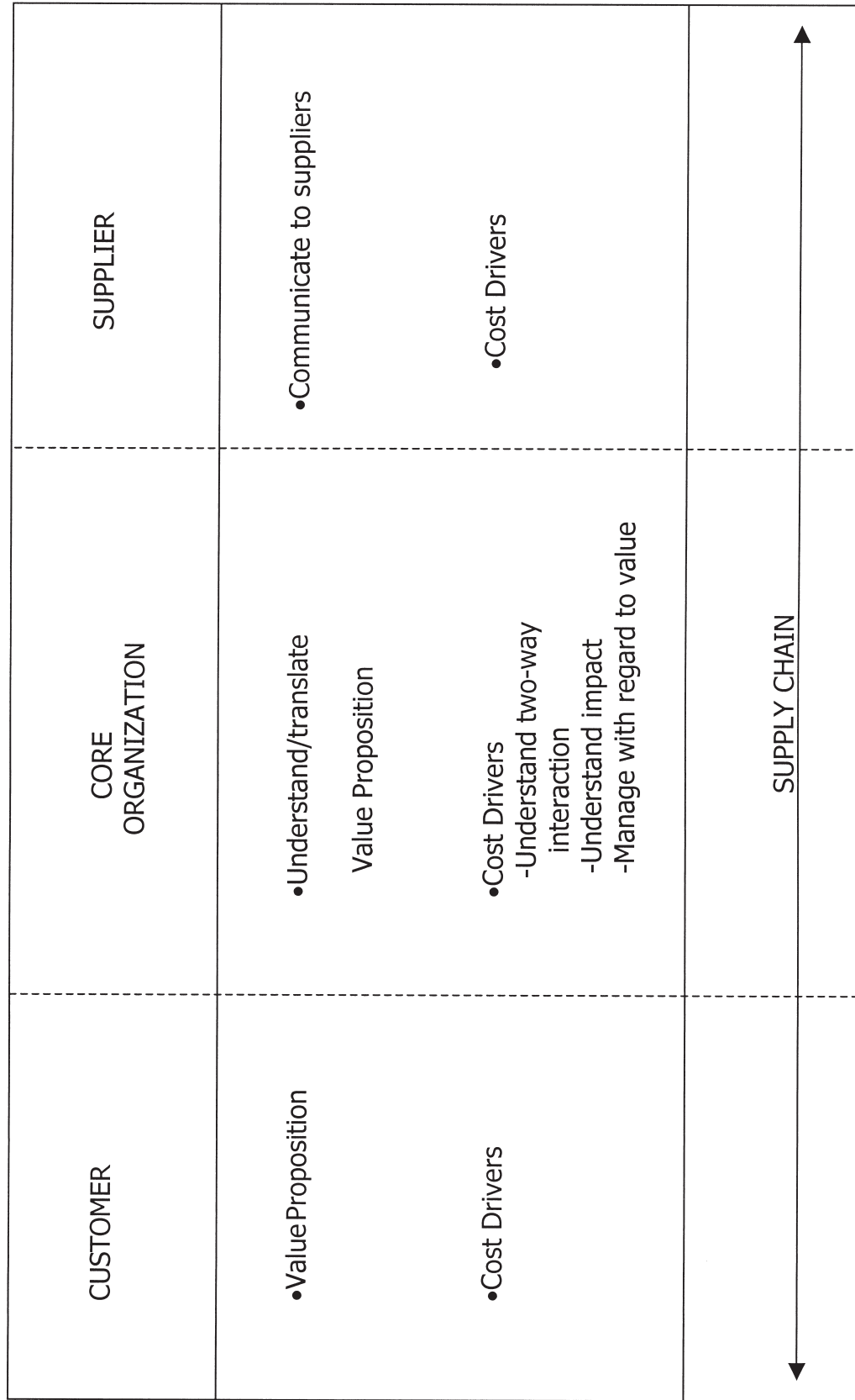
Customer-Facing Knowledge	Internal Requirement/Characteristics	Supplier-Facing Knowledge/Characteristics
<i>Culture/Organization</i> <ul style="list-style-type: none"> • Work closely with immediate customer on supply chain design, cost and customer issues 	<i>Culture/Organization</i> <ul style="list-style-type: none"> • Top management support • Cross-function teams • Dedicated supplier cost management/analysis specialists • Cost management integral to all supplier-facing processes 	<i>Culture/Organization</i> <ul style="list-style-type: none"> • Continuous improvement focus • Support key suppliers with resources to facilitate continuous improvement • Early involvement of key suppliers • Train suppliers in supply chain cost management
<i>Measurement</i> <ul style="list-style-type: none"> • Understand end customer's wants/needs • Understand market trends 	<i>Measurement</i> <ul style="list-style-type: none"> • Metrics aligned with cost management/other goals • High level visibility/reporting of cost management results 	<i>Measurement</i> <ul style="list-style-type: none"> • Reward key suppliers with more business and/or sharing savings • Segment supply base to vary relationships and cost management techniques
<i>Information/Communication</i> <ul style="list-style-type: none"> • Recognize the importance of communicating customer needs throughout the organization 	<i>Information/Communication</i> <ul style="list-style-type: none"> • Excellent information systems • Seamless understanding and communication of customer needs 	<i>Information/Communication</i> <ul style="list-style-type: none"> • Clear communication of expectations to suppliers

- Cost management specialists, either from within the PSM organization or from the finance organization, are the focal point for supporting supplier cost analysis, building cost models and should-cost analysis, and validating results.
- Everyone in the organization appears to have some level of accountability for, and commitment to, supporting strategic cost management and reducing the organization's cost. It is part of individual and functional performance appraisals and bonus calculations.
- Strategic cost management is generally not conducted by a single individual. Depending on the magnitude of the analysis required, cost analysis may be performed by an individual in PSM and supported by a cost management specialist, or conducted by a cross-disciplinary team. When a team is involved, it generally becomes involved with strategic cost management in conjunction with other activities, such as developing a sourcing strategy, working on new product development, or continuous improvement initiatives. The cost models used by individuals within PSM or teams are developed and supported by cost management specialists, who may reside within purchasing or be part of the finance organization.

Research Question 4. How do organizations determine the focus of their cost management efforts?

- All of the organizations studied stratify their purchases, considering factors such as the magnitude of the spend, market conditions, stage in product life cycle, and the importance of the supplier in selecting their approaches to strategic cost management. The approaches used vary among the organizations studied based on their product life cycles, the current market conditions, and internal resources available.
- In considering the overall approach to strategic cost management, the organizations studied apply the following rules of thumb:
 - Always consider the potential cost versus the potential benefit of the cost/price analysis approach employed.
 - Stay in touch with the market and use pertinent market information in analyzing and negotiating costs and prices.
 - Make sure that you have people with the right expertise involved in any sort of complex analysis. This generally means finance people or cost management specialists.
 - Cost management is an integral part of commodity management.

Figure 4
Strategic Cost Management Theory



Adapted from Shank and Govindarajan, 1993

3. Cost management must be an integral part of supplier selection, commodity management, and ongoing planning in order for it to be effective. The organizations studied link strategic cost management efforts closely with their other supply management and new product development processes, to ensure that cost management is always in the forefront of supply decisions. Effective cost management is not a one-off approach that the company takes when it really needs to reduce its costs, but an ongoing expectation that is built into supplier relationships and the organization's reward and measurement system.

Research Question 5. What specific cost management tools do organizations use to support strategic cost management?

This question explored the major cost analysis tools that organizations use to support their strategic cost management efforts.

1. Benchmarking is used extensively for cost management purposes by all of the organizations studied. There organizations use two types of benchmarking: benchmarking prices and benchmarking processes. Benchmarking prices involves looking for sources of information available to corroborate pricing information. The other type of benchmarking centers on understanding cost structures and processes rather than prices. This process-centered benchmarking focuses on examining effective methods across the supply chain and in unrelated or competitive companies and industries to understand best practices. This knowledge is used to identify and implement opportunities for cost and process improvement, both internally and externally. Data from benchmarking supports virtually all the other cost analysis and management approaches that these organizations employ.
2. All of the companies studies use target costing to ensure that all of the functions involved in new product development understand the customer's needs as well as the cost and profitability goals, and are all aiming for the same objective. This is a strategic as well as a tactical approach. It is strategic in that it links all the functions within an organization to support a common goal for new product development or for capital acquisition. Target costing is also tactical in that it provides a specific framework for action and procedures for achieving goals and tracking progress towards those goals throughout the target costing cycle.
3. Should-cost analysis is a cost management methodology whereby the buying organization determines what a product, service, or piece of equipment should cost. This type of analysis is used for purchases of all types, from commodities to capital equipment and new products. The should-cost figure becomes a benchmark for whether a supplier quotation or bid is reasonable as well as for understanding potential improvement opportunities. Should-cost analysis is used in many ways within the organizations studied, such as to facilitate improvement both within the organization and with suppliers, to increase the organization's understanding of costs, as a tool to work more closely with suppliers, and to help support evaluation of other cost analysis approaches, external data, bids, and other items. It is a very rich approach, and one that the case study organizations are using more frequently today than in the past.
4. Total cost of ownership (TCO) is used by all the companies studied in some fashion in varying degrees. Total cost of ownership analysis is defined as an approach for understanding and managing the true costs of doing business with a particular supplier, of a particular process, or an outsourcing decision. It covers a whole gamut of situations, from strategic purchases such as outsourcing and capital equipment to tactical purchases such as indirect materials. TCO analysis is used to understand and improve upon both internal and external cost drivers. It is also used to look at the cost implications in very specific, isolated situations as well as cost implications across the supply chain.
5. The impact of information technology on cost management is also critical. The organizations participating in this study noted two information technology issues in particular that had significant impacts on their cost management and analysis approaches: The ability to access and understand spend data is a critical success factor, and information technology can be very helpful in analyzing/building cost models. Thus, information is definitely a facilitator of effective cost management. In addition, the organizations found that one e-technology in particular, the use of reverse, on-line auctions, was very helpful in reducing the prices paid on certain competitive commodities where they would otherwise employ a bidding process. Savings occurred both due to process transparency and introduction of new players into the bidding process.
6. Organizations do use specific approaches to support specific types of purchases. Most of the discussion with the organizations studied focused on cost

management and analysis of raw materials, because they are often the largest spend category and have the most mature cost management models. However, there was also extensive discussion on the management of capital, indirect materials/maintenance, repair and operating suppliers (MRO), and to a lesser extent on services. In the area of indirect purchases, the overall philosophy followed by these organizations is to standardize and reduce the number of transactions, focusing on TCO issues as much as on price. Services follow a similar approach in terms of understanding the value and taking a TCO perspective. For capital acquisition, TCO analysis is the key approach used. This includes understanding the net present value of all the costs associated with acquisition, start-up, use, maintenance, and ultimate disposal of a piece of equipment, including yield issues, volume capability, and down time. The levels of complexity and sophistication of these models vary in direct proportion to the levels of spend and complexity of the equipment purchased.

7. The organizations studied use a wide variety of internal and external data sources to support their analysis. The key to using data effectively is to triangulate, using multiple data sources to support the analysis.

Research Question 6. How are the results of cost management efforts reported?

1. The key issues related to reporting of cost savings were that the reporting must be done by someone who has credibility, and that those outside of supply management must agree to the reporting method. In addition, cost or price savings is never the singular goal of purchasing. Cost/price savings is always balanced by other important metrics such as quality, reliability, and so on.
2. All the organizations studied were very careful to separate hard cost savings that could be traced to the bottom line from other types of cost savings or efficiency improvement. In all cases, the hard savings are emphasized. In most cases, the soft savings are not reported outside of PSM in the same way as are the hard savings.
3. Renegade purchasing and getting internal clients to comply with contracts and use PSM's established relationships was noted as an issue for all of the organizations studied, for a variety of reasons. The way this was managed varied among the organizations. Some focused on getting such good contracts and demonstrating so much savings that

internal clients would want to use their contracts. In one case, the organization has a policy to reduce budgets based upon documented purchasing cost savings. In this organization, the business units welcome PSM's support, because they are held accountable for reducing their expenditures with or without the support of PSM.

Research Question 7. What other unique processes or organizational structures contribute to the success of strategic cost management efforts in the organization?

1. All the organizations studied utilize finance or cost management experts to support supplier cost analysis. These individuals might have supplier cost management as a significant part of their job functions, or might be dedicated exclusively to supporting supplier cost management and analysis. These cost management specialists participate on the cross-functional teams, and help develop and implement the cost models. They have general responsibility for helping to identify, measure and monitor cost-savings initiatives. There are two general approaches for the reporting relationships of the cost management specialists, as highlighted in Table 1. The cost specialists might report directly to the PSM group, either in a controllership function or as cost management specialists. The other approach is to have the cost management specialist report to the finance/controllership function of the business unit or the corporation. Neither approach appeared to have an advantage over the other, in that the cost specialists and their reporting and analysis were viewed as credible regardless of reporting relationship, and because the supplier cost management and analysis aspect of the job was viewed as important enough to receive a great deal of attention, regardless of the reporting relationships. The use of cost management specialists to support the analysis was viewed as very important, because in many cases, PSM specialists simply did not have the time to dedicate to the level of analysis that was needed. In other cases, they did not have the expertise. In still other cases, their results might be viewed as biased, since they were both executing the analysis and measuring the outcome.
2. One unique approach to cost management used by Tele was creation of an internal consulting group dedicated to supporting costs management and special project analysis for that organization. The specific focus of this group was to view all of their project analysis from a TCO perspective. In addition, because members of the internal consulting group are not part of the project execution, they have an unbiased perspective.

- Deere also created an internal consulting group called “compare & share” to help understand and reduce parts proliferation and increase standardization. This team compares parts with similar features/functions among and within divisions to determine which part/supplier provides the best value, and educate engineering and other decision makers. The initial charter was for the group to be together for two years to accomplish this task.

Research Question 8. What impact do supplier relationships have on the organization’s cost management approaches?

This question views supplier relationship management from the perspective of the core, or buying organization.

- All of the core organizations studied agree that their suppliers, and the relationship with their suppliers, are becoming more important in general, as the organizations become more dependent on suppliers for a larger proportion of their cost of goods, as well as for improvement opportunities.
- The organizations studied rely heavily on long-term relationships with key suppliers. However, some of the organizations believe that they have excellent relationships with their suppliers, while others do not. In all cases, the buying organizations studied are very large players, and wield substantial purchase volume in some markets, putting them in a position of relative power over their suppliers. The two organizations whose products are sold primarily in consumer markets, or to OEMs that sell to consumers, Chip and LCP, seem to feel the greatest cost pressure and pass that along to their suppliers, even their key suppliers, most directly. These organizations admit the greatest strain in supplier relationships, although they are both working to improve those relationships. The other three cases, Deere, Tele, and Praxair appear to have better working relationships with their suppliers, in terms of a true continuous improvement approach, rather than an approach that borders on adversarial at times.
- All the organizations in this study engage in supplier development to varying degrees. Supplier development involves working with key suppliers to help the suppliers improve their performance. All of the organizations expect their suppliers to continuously improve. Some have formal programs to support this, such as Deere’s supplier development and value improvement programs, and Praxair’s TARGET program. The other organizations approach supplier development on an ad hoc basis, devoting resources to suppliers when they can see a significant,

generally immediate benefit. All of the supplier development efforts are focused on first tier suppliers.

- Despite all of the popular press, the concept of sharing cost savings with suppliers is not a common practice among the organizations studied. If the supplier contributes significantly to the development and execution of the cost saving approach, there is a higher probability that cost savings will be shared. In general, the organizations studied felt such an intense pressure to reduce costs that the cost savings was often passed along to the end customer, or retained to offset other cost increases.

Research Question 9. What is the supplier’s perspective on the organization’s cost management efforts?

Each of the participating core companies identified a supplier with which it believed it had worked effectively in managing costs and would also be willing to participate in this research. The perspectives of the suppliers are presented in response to this question. One of the factors that made the conversations with suppliers particularly interesting was the timing of the study, which occurred during difficult financial times for all of the companies involved.

- Customer cost management pressure has a direct and indirect effect on the suppliers. All of the suppliers acknowledged the importance of cost/price management, and the need to continuously perform in terms of price and value to maintain the business with this customer. With the downturn in the economy, the supplier to Chip and the supplier to LCP stated that they had felt a great deal of direct pressure to cut prices, without much support in terms of supplier development. This had caused strain on the buyer-supplier relationship.
- It is not the fact of asking for year-over-year price reductions that creates strain in itself. Rather, it is the supplier’s perception that the customer will not support it in achieving these price reductions, and is more concerned about getting a low price than reducing the underlying costs that support that price.
- The degree of direct customer influence on the supplier’s cost management effort varied. The suppliers to Deere and Chip both indicated that they were emulating this customer’s cost management and analysis approach. In both cases, the customer encouraged them to do so as a way of better managing their suppliers, who are second tier suppliers to Deere and Chip. Both Deere and Chip have sophisticated cost management approaches with a high level of resources dedicated to supplier cost management.

4. All of the suppliers studied also work with their suppliers in various ways on managing their supplier's costs. In general, all of the customers studied had more sophisticated cost management systems than did their suppliers. Each supplier indicated that supplier management is becoming more important to it, and that its organization is increasing the effort it expends on supplier cost and relationship management.

Research Question 10. What impact do customers have on the organization's cost management approaches?

1. In general, the PSM organizations studied did not have direct customer contact. As a result, PSM did not directly feel the influence of customer cost pressure. However, the indirect pressure is significant. In general, the customer viewpoint is communicated to PSM in PSM's role as a member of a cross functional team.
2. In the case of LCP and Chip, who both deal with very large and powerful customers that interact directly with consumers, standing customer service teams are in place to work with key customers to help manage and improve cost and performance. These customer service teams within Chip and LCP also develop a deep understanding of their customer's cost structure. Chip uses this understanding to support negotiations and anticipate customer demands. LCP uses the data in this way, but also to help the customer manage its costs.
3. In the case of the only customer with whom the researcher had direct contact, a large retail customer of LCP's, the customer indicated that LCP had been instrumental in shaping its cost management approaches, adding value, and demonstrating true partnership characteristics. This customer also indicated that it is rationalizing its supply base and working to form closer relationships with its remaining suppliers.

Research Question 11. Does the organization take a true supply chain management perspective of strategic cost management?

1. All of the organizations studied agreed that while they aspire to a true supply chain/supply network view of strategic cost management, they still have opportunity for improvement. They all had different approaches for improving their supply chain perspectives. Common themes were the need for early involvement in projects, and a more holistic view of the supply chain. Currently, issues directly related to the customer are communicated indirectly

to PSM. As a result, critical customer issues may be missed.

2. Not surprisingly, PSM focuses on the upstream cost management aspects of the supply chain, related to the suppliers. It does a good job of understanding and managing the costs associated with the first tier suppliers. None of the organizations studied focus on suppliers beyond the first tier as a matter of course. Rather, second tier suppliers and beyond are dealt with on an exception basis, as problems and issues arise. The stated policy in all of the companies studied was to rely on the first tier suppliers to manage their own suppliers, the second tier suppliers to the core organization studied. However, it was acknowledged that there is great potential for improvement in the second tier suppliers, and that involvement with key second tier suppliers will likely increase in the future.

Research Question 12. What are the key success factors and barriers to strategic cost management?

Because overcoming the barriers to successful strategic cost management in the supply chain is closely related to success factors, these issues are discussed together.

1. High-level visibility and reporting relationships for PSM are important for PSM's initiatives to receive visibility and attention to support their success. Several of the organizations noted that they had undergone reorganizations that increased the visibility and reporting level of PSM at about the same time that they accelerated their strategic cost management efforts. They believed that the top management attention and support were important to their successful contributions to cost management.
2. The availability of trained, dedicated personnel to support supplier cost analysis is also important. Dedicating resources to supplier cost management not only shows management support, it also allows PSM to identify opportunities and deliver results.
3. Credibility in the numbers reported is also important to the success of strategic cost management. This means that all key players agree on how the numbers are calculated. The numbers must also be determined and computed by a trustworthy source, with the emphasis on reporting numbers that can be traced to bottom line cost improvement.
4. Cost management must be viewed as an important priority throughout the organization. This should be reflected in performance expectations and the reward and measurement systems in the organization.

5. Strategic cost management is not one process, but rather a series of processes and tools that are coordinated to support organizational objectives. To be effective in strategic cost management, organizations need to have good sourcing and cost management tools and processes, such as cross-functional sourcing and new product development teams, strategic sourcing, target costing, should-cost analysis, and total cost of ownership analysis in place.
6. Organizations must have good information systems to gather the data needed to analyze spend patterns and monitor price and cost trends for strategic cost management.
7. PSM must deliver bottom line cost improvements in order to earn and retain its credibility and respect from top management.

Research Question 13. What is the future of strategic cost management in your organization?

1. Strategic cost management will continue to be emphasized, and even grow in its importance for the organizations studied.
2. Suppliers and supplier relationship management will grow in importance as sources of cost savings and improvement. There is a limit to the amount of year-over-year cost savings attainable from on-line reverse auctions. The long-term opportunities lie in working more closely with suppliers.
3. The emphasis on early PSM and supplier involvement will continue to grow as a source of cost savings and product improvement. The emphasis on customer value in cost management will grow and gain more visibility within PSM.

Implications of the Study

This study has several implications related to PSM's involvement in strategic cost management in the organization. They are closely related to the results of the research questions presented above.

Organizational Support at All Levels

While PSM is held to a high level of accountability for strategic cost management and delivering bottom-line savings, PSM cannot be successful without extensive support from others throughout the organization. First and foremost, top management support is critical. It sets the tone for the attitude that everyone in the organization has toward strategic cost management. Through the business unit and functional metrics, top management

determines the nature and extent of cost management focus as an organizational priority. Based on this, PSM needs the support of other functional areas cooperating on teams that have a primary or second goal of managing supplier costs. The participants on cross-functional teams need to be held accountable for the identification of opportunities and delivery of results.

PSM also needs specific support from cost management specialists, who are assigned to support PSM and cross-functional teams in supplier cost analysis. These individuals may be part of PSM or part of finance. The critical requirement is that they have the charter and the qualifications to effectively support supplier cost analysis and management. Supplier cost management must be viewed as one of, if not the most important aspect of their jobs. This focus is critical because supplier cost analysis is often specialized and time consuming. PSM and cross-functional teams need to know that there are internal experts upon whom they can call to support their supplier cost management efforts. Without such support, the analysis may be too complex and time consuming to be done as part of PSM's or the cross-functional team's regular activities.

Supplier Cost Management is a Good Investment

The suggested approach for dedicating resources to supplier cost management may seem cost prohibitive. However, the organizations studied unanimously agree that they receive extremely high returns on their investment in supplier cost management efforts. The money spent on supplier should-cost analysis, supplier development, and other tools and approaches pays for itself many times over in terms of reducing costs and bottom-line prices paid to suppliers. For large Fortune 500 companies, successful strategic cost management may mean the addition of dedicated personnel to focus on supplier cost management. For smaller organizations which might not have as great an on-going need, or as great an asset base, successful strategic cost management may mean diverting resources from PSM and/or finance, and retraining one or more people to become internal experts on some of the cost management and analysis tools mentioned in this study.

Strategic Cost Management in the Supply Chain is a Process and a Philosophy

The organizations studied indicate that they live and breathe cost management. It is integrated into all aspects of their jobs and all dealings with suppliers. Top management and functional support is not enough to ensure the success of strategic cost management. Key internal processes, such as new product development and strategic sourcing, must also be designed in a manner that integrates an understanding of customer needs, and the creation of specific cost and profitability goals.

Credibility in Reporting Results

The savings that are attributed to supplier cost management must be believable, and traceable to the bottom line. It is important that there is consensus across the organization regarding how the numbers are calculated and reported. In general, finance reports these numbers to increase the credibility of the results. The focus is on reporting cost savings that can be traced to reduced spending within the organization.

Supply Chain Perspective

Taking a seamless view of strategic cost management across the supply chain is not yet a reality. In most cases, the inbound view of the supplier is handled by a different team/organization than the outbound supply chain view to the customer. It is critical that somewhere in the middle, the organizations dealing with the customers make sure that the customer value proposition is clearly communicated to the organization dealing with the supplier. It is essential that internal organization goals and objectives be aligned in order to align the goals and objectives of the supply chain.

Customer-Facing Supply Chain Perspective – In general, the supply chain managed by the organizations studied included only the first tier of suppliers and the immediate customer. A notable exception was two of the companies whose products are sold to consumers, either through a retail channel or after the product is used as a component in another product. Both of these organizations had a very close watch on demands and vagaries of the end consumer, and aimed to anticipate shifts in consumer demand patterns in order to better serve their immediate customers. Who ultimately determines the demand for a product, the end customer or the immediate customer, is an important determinant of where the producing organization should focus its attention.

Supplier-Facing Supply Chain Perspective – All of the studied organizations segment their supply bases and use different tools and approaches for managing different suppliers and purchases. It is critical to employ a cost/benefit approach to supplier cost management to use the organization's limited resources wisely. In addition, all of the organizations studied focus their supplier management attention on their first tier suppliers. They also recognize that there is much possibility for improvement in the supply chain in the second tier, yet do not plan to focus on the second tier. There could be significant opportunity for supply chain improvement by working directly with critical suppliers in the second tier and beyond.

Supplier Perspective on Strategic Cost Management in the Supply Chain

The suppliers to the core organizations studied were quite aware of the importance of cost management and

continuous improvement in retaining their business with the buying organizations. While all felt continual pressure to perform, some suppliers felt that the pressure was fair, and other suppliers felt that the pressure had become unreasonable. In order for buying organizations to retain good supplier relationships and the image of fairness in the face of continued cost pressure, they should:

1. Be concerned with the supplier's underlying cost structure and how they can support price reductions, instead of being concerned only with price.
2. Provide resources and ideas to support supplier's cost reduction efforts when requested by the supplier and it is reasonable to do so. If an organization is unable to support the supplier's cost reduction efforts, it should explain why.

Suppliers' Management of Their Suppliers

While all of the supplier organizations studied were working on managing the costs of their suppliers, none had a supplier cost management system as sophisticated and well-developed as did the core organizations which they supply. As a result, it might be a good investment for buying organizations to provide thorough cost management training to their suppliers, and help their first tier suppliers develop excellent cost management approaches, so that they, in turn, can do a better job of managing their suppliers. This is particularly critical since the core organizations do not want to get involved in the inbound supply chain beyond first tier suppliers.

Support for Strategic Cost Management Theory

As mentioned in the brief review of the literature below, strategic cost management theory embodies understanding and managing the organization's supply chain, the cost drivers and the customer value proposition. It is a matter of simultaneously understanding and managing these elements in relation to each other. The organizations investigated do an excellent job of understanding and managing their internal cost drivers and supplier-facing cost drivers. Two of the organizations that have a strong management focus on customer relations also do an excellent job of managing the customer-facing cost drivers.

It is not clear from the study how well these organizations understand the customers' value proposition and translate that across internal functions and to their suppliers. Except in the case of LCP, and to some extent Deere, the translation mechanism is indirect, through one or more functions that may have direct customer contact. This represents an opportunity for potential improvement.

Related to this, as mentioned in the section on supply chain perspective, most of the organizations studied do not generally have a seamless view of the supply chain from customer to supplier; the customer view and supplier view are still managed separately in different organizations, with some interface in the middle. Such coordination would be a complex undertaking, and might require a change in team structure. The organization that comes closest to embodying a true supply chain perspective is LCP, with its product supply structure. While the argument could be made that it is more important for LCP to be close to its customers because it is a consumer products firm, all types of customers are becoming more demanding (Fawcett and Magnan, 2001). LCP's product supply structure has a Product Supply Vice President who reports into the Business Unit President. Also reporting to the VP of Product Supply are PSM, engineering, manufacturing, customer service/logistics, and finance. Deere has a similar structure, although there is a mix of direct and indirect reporting relationships.

Characteristics of Companies with Effective Supply Chain Strategic Cost Management Approaches

The key characteristics that organizations with effective strategic cost management systems should display are shown in Table 25. Table 25 was developed as a composite ideal of the best characteristics of the core supply chain organizations studied. It is not representative of any one organization. There are specific attributes related to way the organization understands and manages the relationship with the customer, its supplier, and related to their own internal organization. The key organizational characteristics have been divided into cultural/organizational issues, measurement issues, and information/communication issues.

Internal requirements/characteristics – Both the customer-facing and supplier-facing characteristics stem from inside the organization. The internal culture and organizational structure create the framework for effective supply chain cost management. Internally, an effective cost-management culture is characterized by top management support for cost management and a high level of cost and value consciousness throughout the company. In addition to dedicated resources to support supply chain cost management, cross-functional teams are used to identify and implement cost management approaches. Rather than an afterthought, cost management is an integral part of all key supplier processes.

The right type of reward and measurement systems are also critical to reinforce the cost management culture. It is critical that the organizations measure what they want to achieve, and the metrics are aligned throughout the organization, reflecting cost goals as well as customer value

and supplier performance goals. Supply chain performance metrics and results must be published and receive high visibility throughout the organization. This requires excellent information systems and communication. Part of this communication includes awareness throughout the organization of customer needs and the organization's value proposition in serving the customer.

Customer-facing knowledge – Supply chain management is all about meeting the needs of customers better than the competition does. In terms of the organization's culture, the company needs to be customer centric, valuing its customers and working with them to meet their needs while improving the efficiency and effectiveness of the supply chain. From a measurement standpoint, the organization needs to understand the needs of the end customer as well as market trends, and respond to these proactively. From an information and communication perspective, it is critical that the customers' needs and the organization's plans for meeting those needs be communicated throughout the organization. This allows everyone in the organization to align his or her efforts around the customer.

Supplier facing knowledge/characteristics — Effective supply chain strategic cost management relies heavily on suppliers. Culturally, this means a continuous improvement focus on working with suppliers, including early supplier involvement. It also means supporting suppliers' continuous improvement with resources and training. From a measurement and reward standpoint, the organization must properly segment its supply base to use the appropriate types of supplier relationships and cost management techniques. It also needs to measure supplier performance, and reward the suppliers who perform well. Clearly communicating expectations and needs to suppliers is essential.

The organizations studied in this research excel in the third column of Table 25: supplier-facing knowledge. They segment their supply bases, have dedicated supplier cost management resources, emphasize continuous improvement, and in many cases develop the suppliers by providing resources to support continuous improvement. They reward their top suppliers by sharing cost savings or giving them more business. They are working on improving communications and early supplier involvement. One strong recommendation is that they invest more resources in supplier training. In general, their first tier suppliers do not have as well-developed approaches to supplier cost management. Since these core organizations would prefer not to work on supplier cost management beyond their first tier suppliers, the first tier suppliers would likely be much more effective if they improved their cost management systems, and worked more closely with their suppliers.

Appendix A:

Core Company Case Studies

DEERE & COMPANY

Background

Deere and Company is a \$12 billion plus manufacturer of agricultural, construction, and commercial and consumer equipment. It employs approximately 38,000 people, and has about a \$6 billion spend on purchased goods and services. The supply management organization at Deere employs about 1,200 people in 50 to 60 operations around the world. The mission of Deere Purchasing is to establish a case for action and drive key cultural changes to create a fully integrated, worldwide, customer driven supply chain management process.

Recent changes - The supply organization at Deere has changed dramatically in the past four years. In the early '90s, Deere Supply Management concentrated on training and education of employees. Yet that did not have the big impact it desired.

Based on benchmarking it did in late 1996, it built a business case to convince senior management of the need for change, that supply could make a significant contribution if only its level was elevated. By midyear it held a workshop to define strategic processes, to identify gaps and to launch teams to focus on the key initiatives. By year-end it hired a Senior Supply Management officer at the VP level, the highest level ever in Deere. Throughout 1998, it created Supply Management leadership teams, defined its strategic processes with business process excellence teams, and developed hiring and training plans. It rolled out the new processes in January 1999, and continues to develop and refine these processes. The current organization is shown below.

With its reorganization, the Corporate Supply management organization went from 30 to 280 people. The largest addition to the group was the logistics function, consisting of 140 people. Of the remaining 140,

about 50 are working on systems and training issues, while the remainder work in strategic sourcing for both direct and indirect materials.

The strategic sourcing group at corporate manages about 50 percent of the corporation's total spend, including virtually all indirect and about 20 percent to 30 percent of the total direct materials. The factories purchase about 10 percent of the total spend, while the remaining items are contracted at a divisional level. This represents a big change for Deere, which has always operated as a highly decentralized organization. There is a problem with renegade buying of indirect materials, but corporate supply hopes to mitigate this with the implementation of Ariba and the use of on-line catalogs.

The focus of purchasing activities also has changed. Supply management now focuses on three complementary areas, each with dedicated resources at the corporate and divisional level:

- Strategic sourcing
- Supplier development
- Cost management

Deere saved over \$4 million in fiscal year 2000 due to these efforts. At a recent senior management meeting where the Supply Management Strategic plan was presented, one divisional president commented, "Supply Management is the driver of cultural change in this company. It is aligning itself around standardized business processes that cut across functions, divisions and plants."

Major Goals and Initiatives - As stated in Deere Supply Management's (SM) 2001 strategic plan, Deere SM has five key strategies supported by 29 key initiatives. They are:

Figure 5
Organizational Chart of Deere

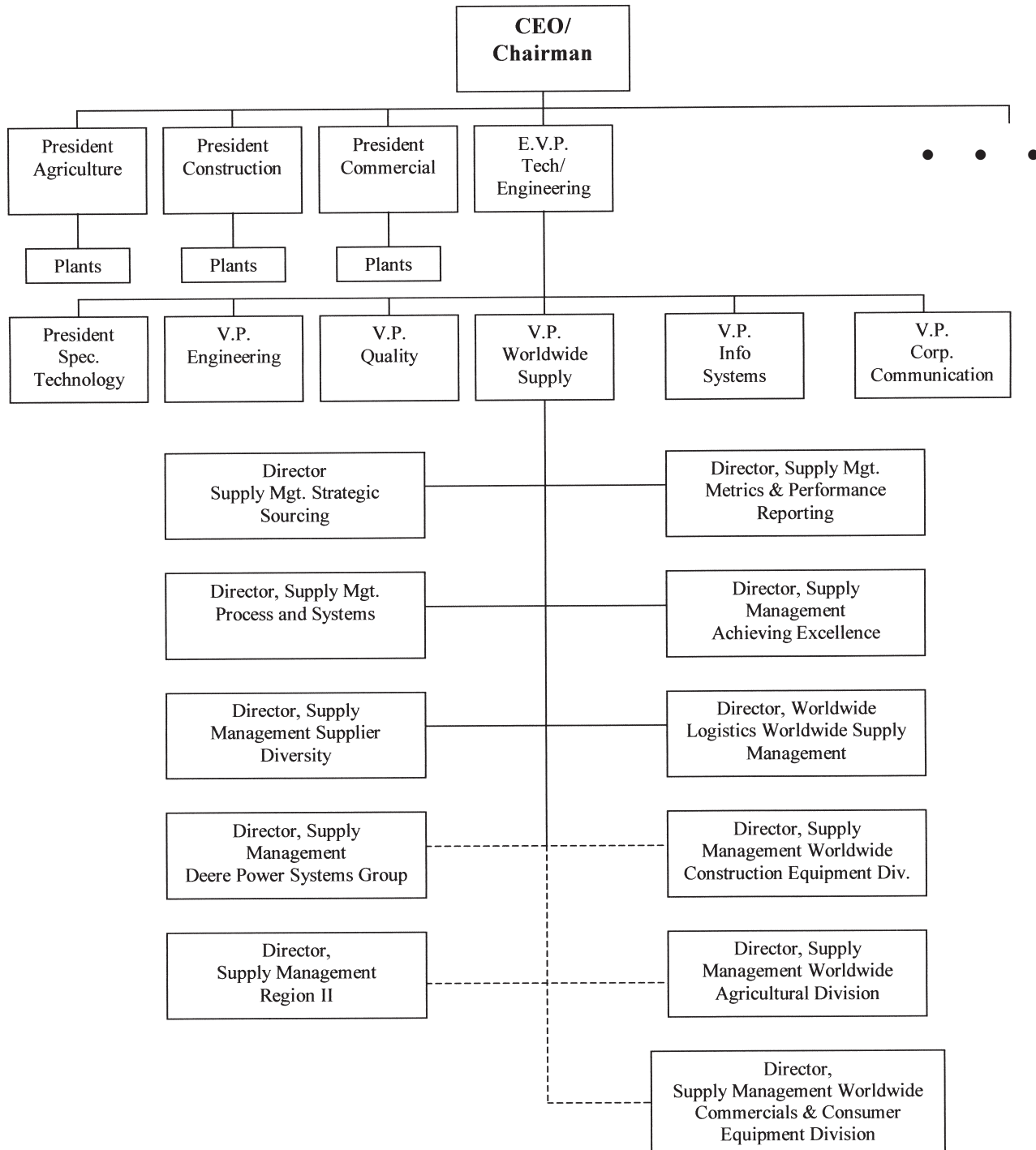
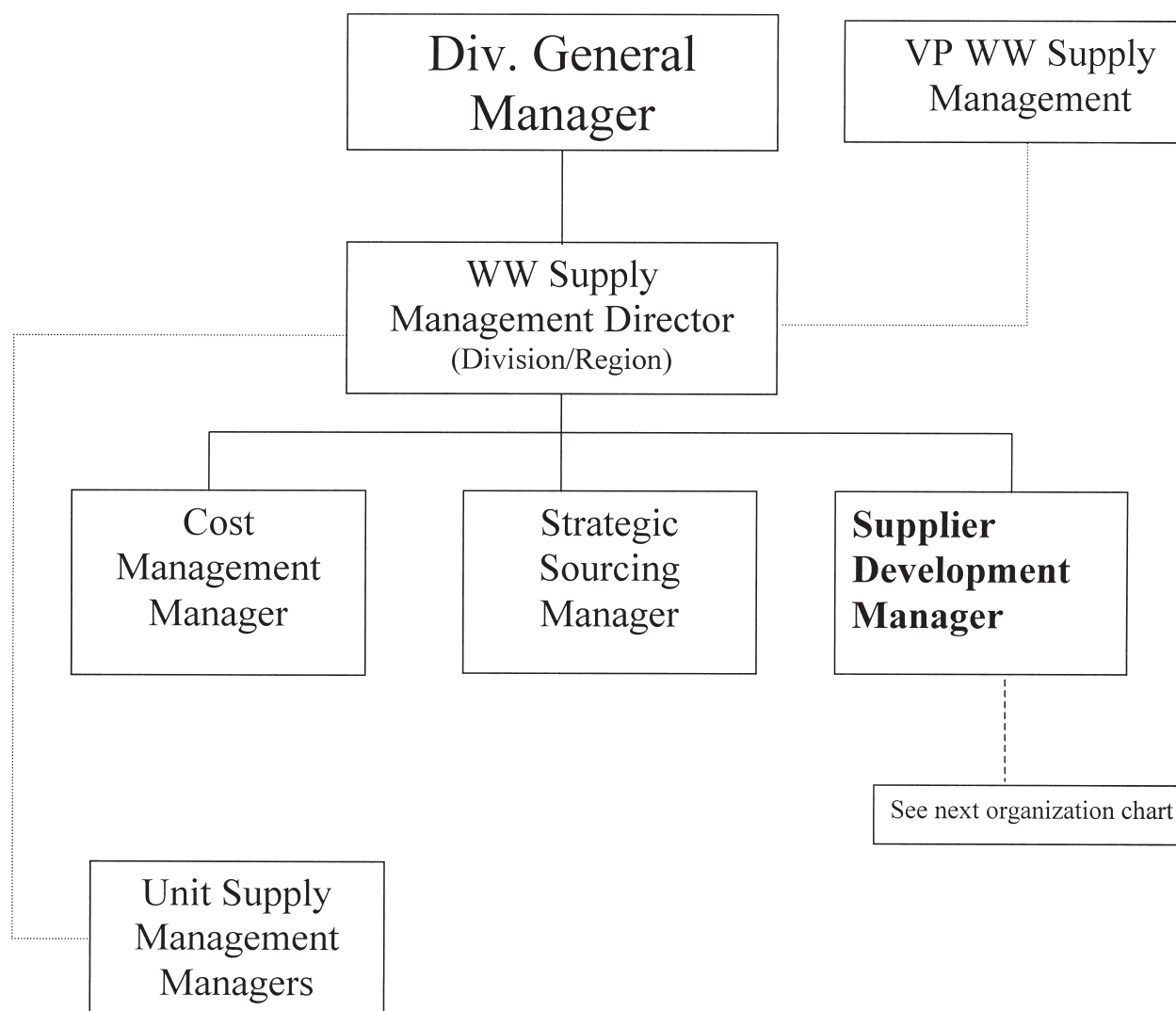


Figure 6
Divisional Organizational Structure



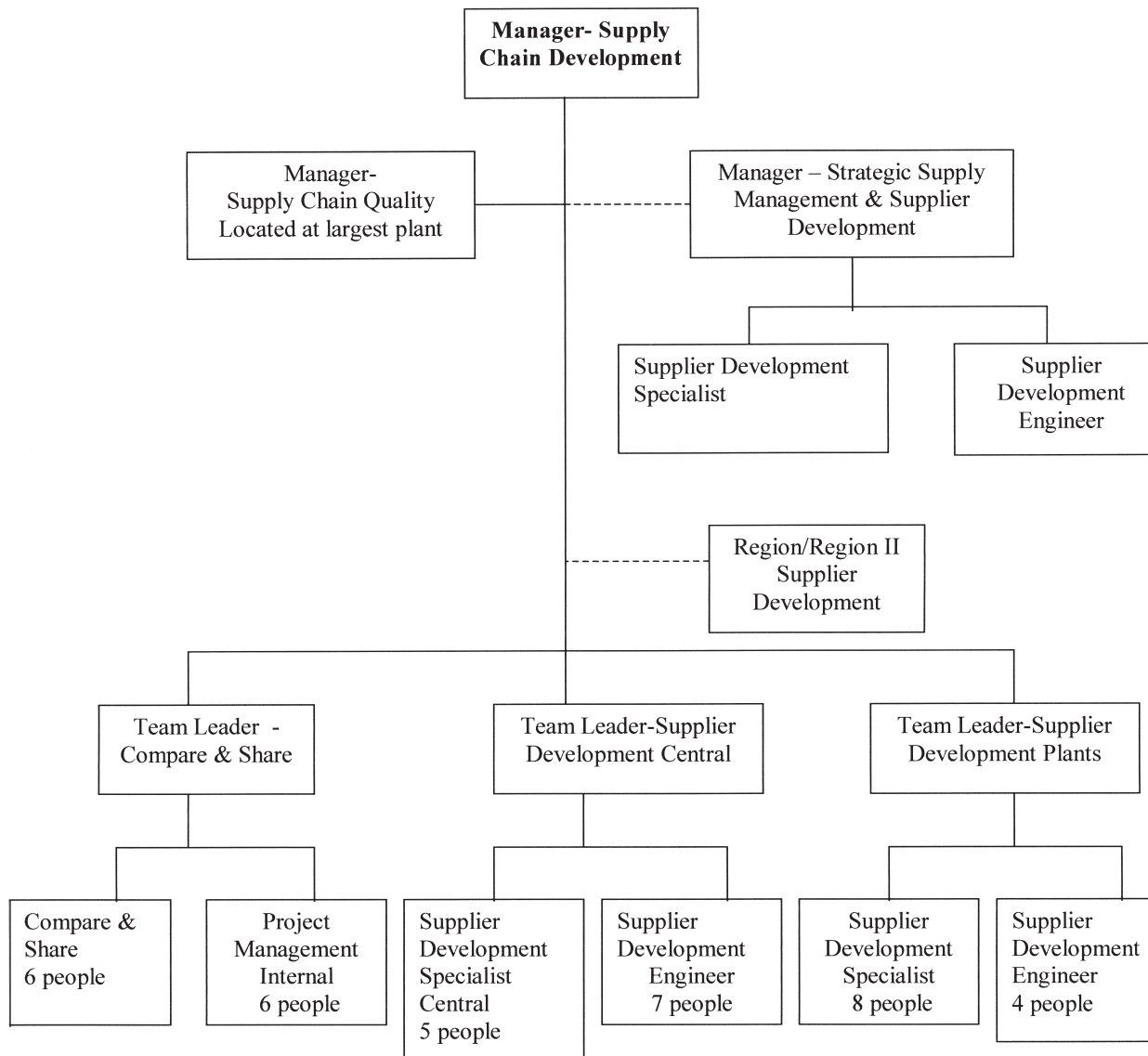
1. *Supply Chain Design*: Design a global supply chain to deliver unequaled global performance.
2. *Supplier Integration*: Achieve leading edge supply chain integration in each of the customer processes.
3. *E-Business and Geared to the Customer (GTTC)/SAP*: Create a comprehensive e-Business model that yields real-time, multi-tiered supply chain capabilities.
4. *Workforce Excellence*: Recruit and develop supply management professionals for the future.
5. *Innovation and Growth*: Create and enable new business opportunities through supply chain knowledge and innovation.

Thus, Supply Management sees its roles as continuing to evolve and grow. One key area of opportunity it recognizes is greater early involvement in new product/service development. While this is happening in some divisions and plants, it is not yet happening across the board.

Cost Management at Deere

Clearly, cost management is just one integral part of the many initiatives that Deere is pursuing to achieve excellence in supply chain management. Its overall approach is to have in place in each business unit cost managers who can support all of the cost management/analysis needs of that unit either directly or in a support role. Some of the specific cost management initiatives that Deere has undertaken include:

Figure 7
Divisional Supply Development Organization



- Benchmarking.
- Deployment of cost managers in each division and at the corporate level.
- Development of cost models and should-cost.
- Target costing for new and existing products.
- Standardization through compare and share.
- Supplier Involvement in value improvement.

Each of these initiatives is presented below in relation to Deere's overall cost management efforts.

Benchmarking - Deere merged best practice ideas from Honda of America, Ford, BMW, and others into its cost and supplier management approaches. It brought in people from these companies and incorporated their

ideas with those from meetings and seminars, feedback, industry trends, and networking. The basic premise of the cost management approach is that Deere can't train all buyers to do cost analysis well. It must have specialists.

Deployment of Cost Managers - In the past one to two years, five cost managers have been put in place, one for each division and one for corporate purchasing. These cost managers are highly trained and skilled specialists, many of who have years of cost management/analysis experience with other companies. All of these cost managers have small staffs that support them in providing cost analysis to their respective divisions. The cost managers also meet regularly as a team. They have agreed to:

Table 26
29 Supply Management Initiatives

Supply Chain Design

Expand *Strategic Sourcing*
Create an Efficient *Logistics* Network
Improve *Cost Management*
Improve *Supplier Diversity*
Increase *Supplier Development*
Create a *Business Partner Satisfaction Index*
Build on the *Strategic Supplier Relationship Model*
Expand Achieving Excellence

E-Business and GTTC-SAP

Develop Web-based applications to link suppliers with our business processes:

- Procurement
- Sourcing
- Technical and product delivery
- Customer support
- Order fulfillment
- Information management and communications

Innovation and Growth

Create a global supplier network
Expand and leverage web services
Develop distance learning capabilities
Create a supply chain marketplace
Actively support mergers and acquisitions to meet business goals

Supply Chain Integration

Use the Integration Roadmap to ensure supply chain integration throughout:

- The Technology Delivery Process
- The Product Delivery Process
- The Order Fulfillment, Logistics, and Production Planning Process
- The Customer Support Process

Workforce Excellence

Recruit the best candidates to fill entry-level and mid-career openings

- Provide global training opportunities
- Develop leadership from within John Deere
- Ensure clear employee performance goals
- Provide career development opportunities
- Ensure employee retention

- A process for cost model creation.
- A process for evaluating cost models.
- Where/how to post cost model information on their internal web site.

Should- Cost Models - Two primary types of should cost models are developed: historical and theoretical.

Historical based cost models are derived from:

- Market-based information.
- Cost detail provided by supplier on quote form.
- Inputs from multiple suppliers.

Theoretical cost models:

- “Build up” the costs for a process from the ground up.
- Consider issues such as:
 - Space a machine takes up (building depreciation).
 - Number of people on machine.
 - Initial cost of the machine.
 - Financing for the machine.
 - Tooling.
 - Maintenance.

- Efficiency of the machine.
- Other relevant costs and performance issues.

They also develop an understanding of market prices and conditions based on externally published data and historical quotes. They are currently working on a number of cost models, including decals, injection molding, stamping, and casting.

The cost managers put together teams that work on the cost models. The teams include representatives from each division that uses the item in a significant way. There is a lead for each team. The overall direction for the team comes from the cost manager with input from the lead control for guidance. The team includes cost management, a supply management specialist, manufacturing, engineers, and representatives from the supplier's cost management and manufacturing areas. Cost management efforts often complement supplier development and value improvement initiatives. Deere has also purchased cost modeling software for theoretical costing on some of the basic processes that are common across a number of industries. This provides information on what it costs to run certain equipment. Deere relates these data to historical information. There is a trade-off

between keeping the analysis simple and developing a good understanding of the process.

In terms of accountability, cost management and strategic sourcing share the goal of bringing savings to the organization. Cost management helps evaluate quotes and supports and reports on the progress of strategic sourcing from a cost management perspective. The strategic sourcing manager at the divisional level drives the cost savings initiatives down to the strategic sourcing and commodity managers. Ultimately, strategic sourcing is totally responsible for executing and bringing home the savings.

Cost management's focus is to be a resource to strategic sourcing for current and new products in terms of getting the right price. Saving money is the ultimate goal of cost management, and building the cost models is part of that. Cost management has to identify the market opportunities. Another goal is to avoid any unnecessary price increases. When increases are necessary and valid, Deere uses value improvement and supplier development approaches, which are presented below.

The supply chain integration (SCI) manager is responsible for all new product programs. The SCI manager integrates strategic sourcing early into new product programs. Through strategic sourcing, suppliers may be co-located during the design phase of new product programs. Critical areas of design focus are large cost areas and those areas where there is a major design change. SCI managers ask cost management to evaluate the cost structure of the new designs. If there is a problem, strategic sourcing and supplier development may get involved. There might also be engineer swaps with the supplier in order to get more integration.

Target Costing - Deere has developed a structured process for new product design. Underlying this approach is the philosophy that early involvement of critical suppliers and functions is key, and that target costs must be set up front.

First, the design engineer checks the design cost (tools/should-cost), which is compared to the supplier quote. If it does not meet the design cost requirements, Deere identifies design issues vs. supply cost issues. This process iterates with design changes and material modifications until agreement is achieved and the target cost can be met. Deere focuses on different parts of the vehicle during different parts of the cycle. Certain issues such as engines drive other cost and design issues. All of these activities are undertaken by a cross-functional team. The team divides the pie of target cost into materials; labor, overhead, and so on. There is a team assigned to each key vehicle module varying from four to 10 teams for a particular vehicle.

Today the focus is on getting good cost targets set up front. In addition, the teams focus on the big cost drivers to get the big benefits. Deere is developing a training class built around its approach to target costing for engineering and supply management people.

Cost Management for Existing Products - Cost management of existing products also follows a well-defined process.

1. Anything with an annual increase over \$10,000 from a supplier must be analyzed by the affiliated cost management group to see if the increase is justified. A cost manager or strategic sourcing manager can sign off on this.
2. For increases between \$10,000 and \$25,000, the materials manager must sign off on the increase (lead of plant purchasing).
3. If an increase is over \$25,000, it goes to the Director of Supply Management of that division.
4. Whenever a buyer requests help to challenge or understand an increase, cost management helps.

To analyze cost increases for existing buys, cost managers use a cost table if available. They may make a site visit to analyze supplier processes. They may also do an incremental look to see if the cost change is justified based on the functionality change. For example, one supplier of a \$17 part asked for \$25 for that part. After the analysis was complete, Deere ended up getting a 15 percent across the board decrease on all items from this supplier. Deere follows a systematic approach to cost management, and truly has a center of excellence in terms of cost management.

Supply management also tries to understand why suppliers do certain things, and add certain features. Is there a value added? Supply management questions whether features added for marketing or engineering truly create value, and challenges these. Can Deere justify the cost of adding a feature? It must consider both competition and the increased price to the customer. If the feature can be justified, how can Deere do it smarter? Purchasing strives to understand its markets better and approach things differently. Cost management is involved with a team that interacts with manufacturing engineering, design engineering, marketing, suppliers, and the customers to understand the dealer and end user to understand feature/cost trade offs. The trend is for cost management representatives from Deere to accompany Deere's sourcing person to explain Deere's cost position to the supplier. The cost management person often seems "tough."

Supplier Development - Cost management has done a good job with cost take-outs internally. Now, it is focusing on the outside with supplier development and other value improvement. Its focus is first tier suppliers, and in some

cases even critical second tier suppliers, in order to get a feel for the value improvement opportunity down the supply chain. Many second tier suppliers are smaller and need help.

To get focus on whom to bring into supplier development, Deere looks at gaps and opportunities. For example, its 50 top suppliers account for 80 percent of its spend. With the top suppliers, Deere does a value improvement and supply development process if it doesn't have the opportunity to bring in competition.

Accountability Through the Organization - Functions outside of cost management have felt some accountability for cost management. Cost management is part of the personal goal sheet for each person in supply management. This has been spread to engineering, operations, accounting, and marketing so they will feel greater accountability for cost. Buy-in is improving. Twenty percent of the bonus calculation is based on cost reduction, and there is no cap on the bonus. ROI is also a major factor, along with division-specific objectives.

Execution of Cost Management - Currently, there are six people in cost management at the corporate level, supporting 29 teams that cover common parts and all indirect spend. In all, there are 62 people in cost management at Deere. About a third of the 29 teams are covered by cost models. The remaining two-thirds use market-based pricing. The market-based pricing is primarily commodities, so the team forecasts prices to decide tactics. Teams include members from strategic supply, cost management, each of the divisions, and technical/engineering. On the indirect side, the teams try to look at buys/costs creatively, not using traditional cost models. Cost management helps teams understand cash flow issues, and tries to get a better feel for total cost. It also tries to get teams thinking long-term on going from a per piece mentality to total spend.

On the indirect side, non-standardization issues are big cost drivers; for example, Deere purchased 220 styles of gloves. It was able to reduce this to 25 styles/types, and saved 20 percent to 30 percent. The steps included in commodity analysis at Deere include:

1. Analyzing the industry.
2. Organizing in-house information.
3. Refining the analysis to narrow objectives.
4. Building a proposal to include cost data.
5. Evaluating the proposal.
6. Building a cost model before deal is completed.

There are still compliance issues with indirect purchasing. Ariba software is supposed to stop this, but currently can't support all stakeholders. On the direct spend side, the Enterprise group loads order information and

controls and sets up ordering. Deere can still do spot buys, but renegade purchasing is minimal. In setting up the contracts that cut across divisions, Deere gets a high level of buy-in; all key stakeholders are involved.

Commodity management works better if there is a long-term, ongoing team to help with compliance, ongoing supplier relationships, and performance monitoring.

Deere has undertaken additional - complementary initiatives to support its cost management approach: JDCrop, compare and share, and value improvement.

JDCrop - JDCrop stands for John Deere Cost Reduction Opportunity Process. The program was modeled after Chrysler's SCORE program in the mid to late 1990s. Under this program, suppliers submit cost savings ideas to Deere. If implemented, there is generally a sharing of savings between Deere and the supplier. In the past five to six years, Deere has received over \$100 million in cost reduction suggestions. This program complements and supports supplier development and other programs within Deere.

Compare and share is specifically aimed at reducing parts proliferation and increasing standardization by comparing parts with similar features/functions among and within divisions to determine what provides the best value. Two supply management professionals are dedicated to this task for two years, and work with supply management specialists and engineers to identify, prioritize, and execute cost savings. Compare and share is another cost management initiative to:

- Create information to build cost models (original purpose).
- Today, it is more strategic. It explores:
 - Supply base reduction.
 - Overall issues - Europe vs. U.S. sourcing.
 - Who will be major suppliers in future.
 - How to get engineering involved, engaged, and how to incorporate in design.

Compare and share is helping overcome decentralization inefficiencies. While each factory has its own design group, compare and share tries to coordinate and standardize design and components.

Value Improvement - is an approach to improve product quality and reduce product costs by getting different groups to talk together and then incorporating the best of their ideas. This is a team-based approach to brainstorm cost and value improvement ideas with suppliers. The ideas are evaluated, prioritized, selected, and implemented based on potential. Results are monitored and tracked. Potential ideas are retained for future implementation. JDCrop, compare and share and value improvement have yielded significant savings for Deere.

Events in past four to five years - Recently, Deere appointed a new CEO and chairman, only its eighth in its 164-year history. It has had a large number of acquisitions, the most recent of which was Timberline, a large logging equipment business. It has made a number of foreign acquisitions and equity investments. It has experienced some tough business cycles, with 1998 being a very bad year for the farming economy. And, as previously explained, it has completely reorganized and greatly expanded its supply management area.

Challenges - The farm economy in general is very cyclical. Deere has been subject to the economic swings, like the 1998 downturn. It is growing its construction and consumer/commercial business to offset this swing. Global competition and expanding to world markets are also a challenge for Deere, one that it is wholeheartedly embracing.

Metrics for Success - The key company metric is ROA. Everyone in the organization receives a bonus based on a combination of business unit/divisional and corporate ROA. For supply management specifically, the goals are:

1. No 1 overall rank in A.T. Kearney Supply Management Benchmark Study.
2. Five percent annual cost improvement.
3. Twenty percent improvement in supply management productivity.
4. Fifty percent annual improvement in cost of quality.
5. Ninety percent of purchases covered by commodity strategies.
6. One hundred percent on-time delivery of finished goods available to promise.

In the future, supply management will continue to grow in stature and importance to Deere. For more specific information on John Deere's purchasing and supply management processes, see <http://jdsupply.deere.com/>.

Case Study Participants:

Two Corporate Purchasing Directors
 Manager, Value Improvement
 Manager, Compare and Share
 Manager, Corporate Indirect Purchasing
 Corporate Purchasing Manager
 Manager, Supply Chain Development, Business Unit
 Two Managers, Supplier Cost Management, Business Unit

CHIP CASE STUDY

This case study overviews the processes used by Chip to manage its supply chain costs, with an emphasis on managing product life cycle costs and the costs of purchased inputs. While not all of the techniques mentioned below are used by all business units for all purchases, the breadth of techniques provides an overview of the extreme intensity and complexity of cost management at Chip. Before presenting the techniques and approaches, it is helpful to get a perspective of Chip's organizational structure.

Background and Organizational Structure

Chip has been a leader in developing technology enabling the computer and Internet revolution that has changed the world for over 30 years. Today, Chip supplies chips, boards, systems, software, networking and communications equipment, and services that compose the ingredients of computer architecture and the Internet. Chip's mission is to be the preeminent building block supplier to the worldwide Internet economy.¹

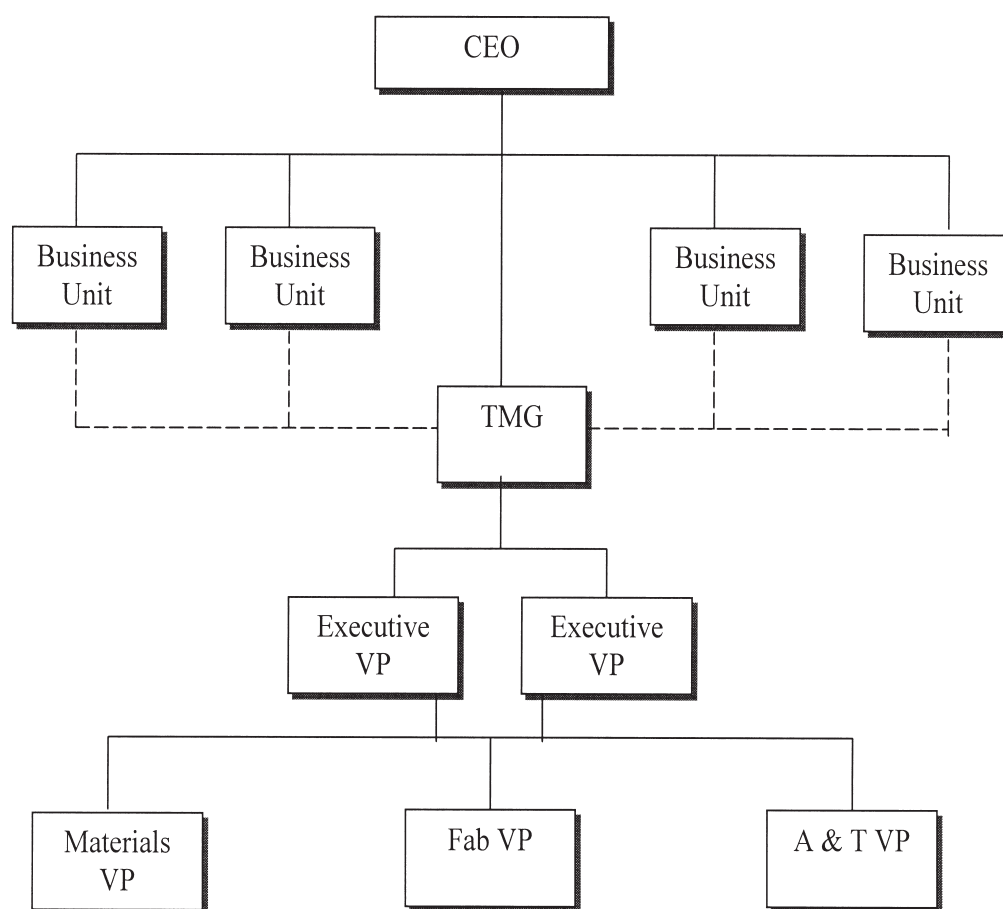
Corporate Structure - The technology-manufacturing group (TMG) is a centralized organization that carries out the operational aspects of purchasing, production, testing, and logistics for Chip. Within TMG there is a planning group that provides customer information to be used in engineering, design, and manufacturing decisions. Materials is a sub-unit of TMG and includes all aspects of material acquisition, purchasing, supply chain management, materials technology, and a special projects/collaboration group. Figures 8 and 9 provide an overview of Chip's total organization structure and the structure of TMG.

Purchasing is very centralized at Chip. Some buying does take place within other business units, because some newly acquired organizations have not been fully integrated into the centralized system. A majority of the supplier negotiations, contract development, and purchasing is performed by corporate purchasing.

Chip is organized around business units. The number, composition, and role of these business units change as the economy and market change. One of the interesting things about its corporate structure is that TMG (Technology Manufacturing Group) is treated as a business unit and is at the same reporting level as the other business units (see Figure 8). This type of reporting relationship between TMG and the other business units creates a unique matrix organization within Chip.

¹Chip's annual report

Figure 8
Chip's Corporate Structure



Chip credits its success in cost management to its culture. It is quite cost conscious at the top management level, for everything from facilities to the cost of travel. There is a frugal mentality. The finance organization views optimizing shareholder value as its mission, and finance is disbursed entirely throughout the organization, becoming involved in all key decisions. The organization structure, with finance reporting directly to corporate finance and having a dotted line to the business unit, supports finance's big picture perspective. Finance and operational owners have to sign off on all key TMG decisions. While Chip has always been cost conscious, the focus and attention on costs has increased substantially in the past five years or so, due to increased competition and the declining prices of PCs. TMG receives many top-down mandates for achieving cost goals.

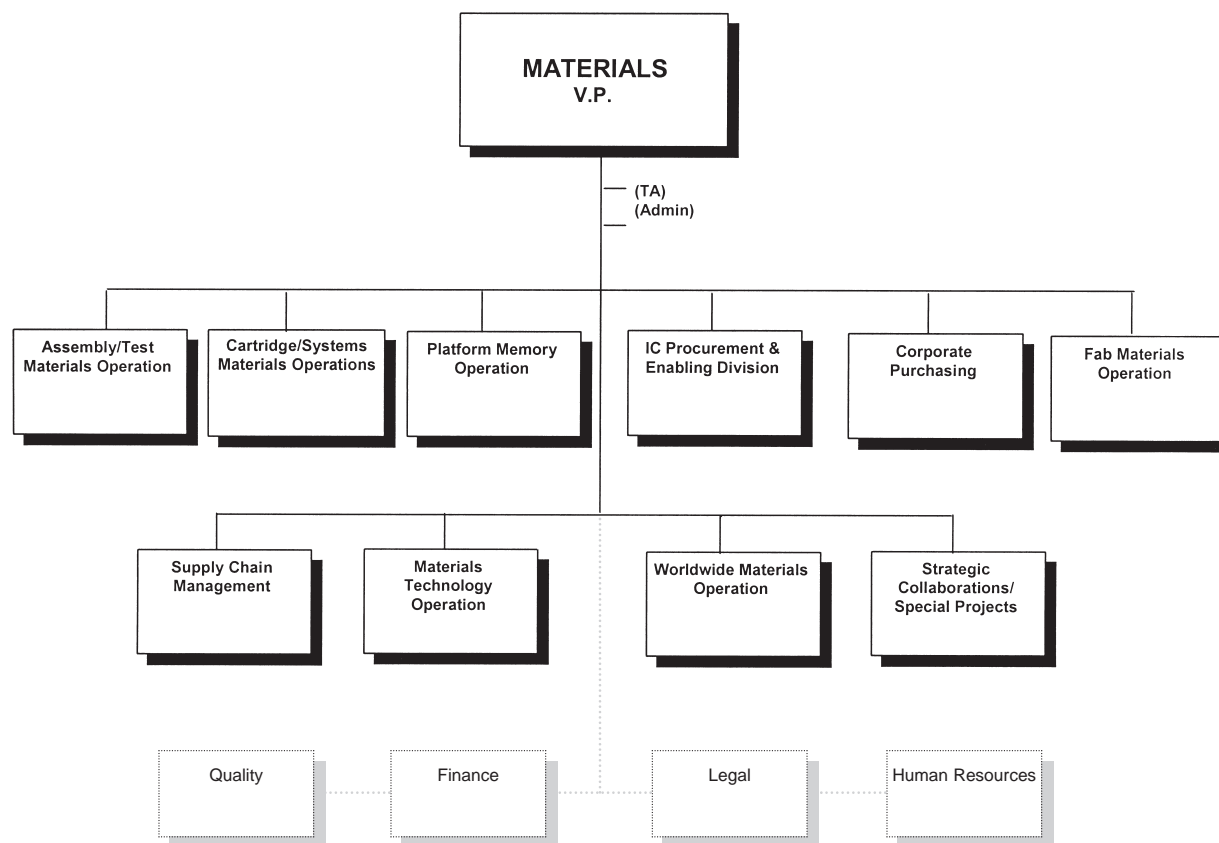
Overall Approach to Cost Management within Chip

The target costing process drives the direct materials cost management process at Chip. Historically, Chip's business

units determine what something should cost to make the business' required profit for that item. The TMG supports the profit model by achieving the target cost. Finance tries to ensure that the target cost approach works to achieve the desired goals and doesn't cause the wrong behavior. This task has become more complex due to product proliferation and the wide range of price points of the products/components it sells.

In general Chip always uses cost targets in purchasing. Sometimes, the target is based primarily on the underlying technology and design. However, other times the target cost is based upon the target price required to be viable in today's extremely competitive market. Having a firm goal/direction causes Chip to question design, technology, and related assumptions. There is immense cost pressure and challenge, and the goals are getting more rigorous. A key objective of target costing is to achieve the target cost in the design stage. If this can't be accomplished, there is even more pressure when the item is in production, where ongoing and rapid cost reduction

Figure 9
Chip's Materials Structure



is an expectation of the market place. That is why it is critical to continuously keep the target cost right in front of everyone involved in the new product development process as well as in the ongoing purchasing of materials and components used in production.

Target costing and design for cost - Business unit finance determines what is required in terms of target cost, to meet its price point and profit requirements. Finance then allocates the target cost among the various cost elements that make up a product, including materials, labor, and overhead. Today, TMG is trying to be more proactive in target cost participation. In the past, TMG received target information for one year into the future, which constrained its options for forward planning. TMG is now trying to be involved earlier. TMG, finance, development, and materials talk to business units about cost requirements and trade-offs two years into the future. Design for cost is a key initiative. Part of the design for cost initiative is to understand the cost of proposed products' real time through developing design for cost models, which include various cost trade-offs.

This early interaction helps to intercept cost issues before a design is firm, while trade-offs are still relatively easy.

Chip also uses target cost models as a way to assess cost ranges for components that will result in a viable product within the context of the total consumer product offering. (Can Chip make the component at a price that will fit with the other components of the product to create a product consumers will buy at a specified price point?) As the products' costs are developed, individual cost components (like freight costs) are evaluated resulting in specific cost reduction initiatives.

There is still substantial work that can be done at the bill of materials level to reduce the cost of a design. In the past four or five years, significant time has been invested in value engineering of products and processes to help reduce supplier's production cost without affecting product performance. But this is a reactive approach: design the product, and then fix it later. Today, the focus is on how to design less costly products, eliminate non-value features, and optimize the design to meet technical

requirements before the first unit of that product is manufactured. Value engineering is a critical initiative that complements cost management at Chip.

Other Cost Management Techniques

Other tools used to manage supply chain costs at Chip include:

- Benchmarking.
- Standardized contracts.
- Cost driver analysis.
- Total cost of ownership.
- Should-cost modeling.
- Competitive bidding.

Each of these tools and its application at Chip is presented briefly below.

Benchmarking - Chip benchmarks the market using similar/substitute products to get a feel for what a reasonable competitive price is. For example, it has benchmarked industry standard versus custom memory. The suppliers of custom memory didn't want to budge on price, saying the item was custom. Chip pointed out that the suppliers had only standard items to produce in order to utilize their capacity if they didn't produce Chip's products, and that it really was the relevant benchmark. As a result, the suppliers brought prices way down. Chip is also trying to develop option based pricing with subcontractors using the real options approach.

Standardizing contracts - Chip also established a common set of T&Cs to protect itself when the market goes up. It is trying to get volume neutral pricing – to get best price all the time, rather than get discounts with volume increases. Most favored customer clauses are also negotiated with all suppliers wherever possible. Some suppliers do business with Chip as good public relations to get other customers.

Chip measures and tracks the results of cost management initiatives, for reporting as well as for supporting the bonus structure. Chip looks at cost savings initiatives, and focuses on the initiative until it achieves it. Chip looks at both the overall impact of the initiatives on results as well as at the impact of individual initiatives where possible.

Cost driver analysis - In focusing on cost reduction management efforts, Chip tries to understand its key cost drivers. For example, Chip does use activity based costing (ABC) at the fabrication plants. The focus of ABC

at Chip is not on optimizing cost allocation to individual steps, but in understanding bigger picture cost drivers, and focusing its attention there.

Key cost drivers - Customer-related cost drivers are customization of products, logistics, and special programs. Cost drivers with suppliers vary among suppliers. Chip tries to consider the type of items supplied. When it has bleeding edge technology, Chip realizes it won't be the lowest price supplier. Chip makes a conscious trade-off to pay more to get leading edge technology quickly, gaining speed to market. For leading edge items, Chip develops a detailed should-cost model from the ground up. It includes both capital/other investments and bill of materials items. As it becomes industry standard, the price goes down. Chip wants all parties to:

- Cover all startup costs/investments.
- Maintain SG&A and reasonable margin.
- Continue to invest in new technology.

As discussed below, Chip determines the should cost price required to achieve a net present value of zero at the end of the product life with suppliers of leading edge technology products. For commoditized products, Chip takes a life cycle cost approach, considering where the item is in the life cycle. It negotiates cost based on that, considering that margin decreases over the life of a product.

Total Cost of Ownership modeling (TCO) - Chip does loosely factor total cost of ownership into its materials analysis as well. It is not at the level of detail of "one supplier is 2 cents more to use than another." The real goal is to have quality requirements that everyone must meet, so that TCO analysis is not needed. If a supplier doesn't meet them, corrective action occurs. Chip can take away volume, work to develop the supplier, or take other action. Thus for materials, Chip focuses on bigger cost drivers. For capital equipment purchases, which are substantial at Chip, a TCO or life cycle cost approach is taken.

Total Cost of Ownership is also called a complete cost approach at Chip. The complete cost approach is an employed, but still developing, approach to decision making. Its success is heavily dependent on teaming across organizational boundaries.

Due to its broad reach across organizational boundaries, finance often plays a strong coordination role in getting a complete cost analysis done. The data for the analysis is usually owned by the operation's partners, but is centralized and analyzed through financial modeling.

The following is an example of the TCO process in action:

The business unit brings a new product idea and target cost objectives (Internet terminal, for example) to TMG. Information on costs for manufacturing, logistics, planning, and component materials are collected to create a cost profile for the product. In the past, this collection of cost information has been executed in a linear fashion (idea→materials→manufacturing→distribution→planning) with each cost component optimized before moving to the next component. TMG is working to bring these elements together for simultaneous discussion and consideration to achieve the desired result of optimization in the cost structure as a whole rather than as optimization of independent components. The latter can result in sub-optimization of the final total cost profile or a lengthy iterative cost development process.

The optimized cost profile is then communicated back to the business unit, which, can proceed with the product analysis. Using market information, competitor assessments, and cost structure information, the business units are able to analyze the expected financial performance of their product/product lines and make business investment decisions. Thus, TCO is an integral element of the target costing process.

Supply chain issues/equipment issues - Chip is looking at long-term supply chain design from a TCO standpoint, with more focus on design for high capacity and for low cost. Chip views the supply chain as a capacity problem. TCO is one of many factors considered in capital and includes spares and service issues. In negotiation, Chip focuses on an affordability goal. It has a target for cost by tool, total cost, cost per unit and cost per wafer. Depreciation on equipment is a big cost factor for Chip.

Equipment cost management approaches include:

- Target cost/must-cost from the business units.
- should-cost TCO based on bill of materials plus usage.
- Lowest TCO – Suppliers' promises versus shortfalls in performance.
- Pre-positioning – what is a competitive total cost of ownership, how can we get there?
- Benchmark vs. other suppliers.

Should-cost modeling - Should-cost models tend to be situationally specific, while design for cost models are interactive, what-if type models. The use of should-cost models is a fairly common practice. The development of the model helps in gaining a better understanding of costs while the results of the should-cost model provide a source of validation for evaluating submitted bids. Additionally, actual cost results which deviate from the should-cost model help identify areas of focus for cost reduction efforts. As an example, the logistics group

maintains should-cost models for ground transportation services.

Target margins - Should-cost has historically been valuable, but does have limitations. To better enable decision-making, finance incorporates target margins into should-cost models. It uses these margins to manage total supplier profit over time. Chip creates supplier portfolios with target margins set for each product based on where the product/platform is in the life cycle. It uses these targets to negotiate and understand suppliers' total margins and profitability. It provides a higher-level check. It focuses on the big picture – not on micromanaging pennies here and there.

Chip uses this margin data internally to make negotiation trade-offs, considering where to concede price and other factors, versus what to go after to get the biggest impact. It is used for quarterly price reviews and to track ongoing reductions in price. Chip states its opinion on how much money Chip thinks its suppliers can and should make. It puts a lot of cost pressure on the suppliers. Some say Chip squeezes without regard to the supplier. The real intent is to get cost out of the system where it can. Chip may engage with a supplier to save costs – or a supplier itself might have to figure out how to cut costs. The goal is to balance competition and cooperation. Suppliers can and do say no to Chip's demands. Then Chip must either restate its position or find a different supplier.

Supplier cooperation - Cooperation with suppliers on cost models varies. Assembly subcontractors don't share should-cost information. They are more subject to market pressures. However unique or proprietary materials lend themselves well to a should-cost methodology. In case a supplier won't share information, Chip can use should-cost results of cooperative suppliers with other suppliers of like items. In one case, Chip created a should-cost model of a material class and found out that all materials in that class have a similar cost structure. Yet Chip was paying vastly different prices for items within this material class. The modeled supplier acknowledged that the cost structure in this material class varies little, and now Chip uses the model successfully in negotiating costs with other suppliers for that material.

Capital equipment - To develop costs for equipment, Chip does a should-cost for the equipment. It actually creates a bill of materials explosion for equipment, using Pareto analysis to focus on the big items. It also considers supplier profit margin, using supplier financials and looking at what is reasonable. The focus is on per-unit cost goals, set by manufacturing using inputs (cost targets) from the business unit. The business unit does all macro modeling for its products. Finance, working with Marketing develops a must cost, what it takes to meet

cost targets per unit, per die, depreciation as it is, and as it should be to allow Chip to sell product affordably and earn a reasonable margin. Chip requests a supplier to come down a certain amount, and has a competitive bid process. This approach may or may not achieve the target cost goal. Chip tries to use facts, share assumptions, and get information from suppliers. But this process is an art, not a science.

Inventory management - Chip is being smart about inventory and understanding what flexibility it needs. Inventory requirements change with the life cycle of a product. Finance has proliferated a tool to help determine how much inventory is needed for an item in various stages of its life cycle. The model provides a framework; individuals still manage the actual inventory levels.

Competitive bidding - Competitive bidding is employed as a way to get the economic impact of competition to benefit the pricing Chip can achieve. Competitive bidding is usually supported with a secondary method of understanding cost (such as should-cost modeling). To support competitive bidding, Chip strives to always have a second source for any item. If this is not possible initially, Chip works to develop a second source.

Supply Chain Linkages

There is a strong focus on revenue generation for the company as a whole. However, in TMG, the focus is still on cost because benefit side of the equation (revenue) is owned outside of TMG by the business units. As such, TMG is a service organization. However, it is starting to ask more questions about business plan product goals, competitive strengths, etc., starting to shift its focus to delivering an efficient supply chain. In the past, there were more *purchasing* TCO solutions than true supply chain TCO solutions. Supply chain TCO solutions must consider revenue generation.

Internally, TMG has grown tremendously, and as a result is not as coordinated as it used to be. There is a renewed focus on cross-functional teams delivering integrated solutions to business unit problems/requests. A newly organized supply chain group that cuts across TMG is positioning itself to lead the coordination of supply chain business process development for Chip.

Externally, Chip is working more closely with its customers and suppliers by tying signals into each other's systems (no POs). The more integrated interfaces allow for reduced delays in information, and better information is a key to improved supply chain performance. New technologies, such as the XML based RosettaNet standards, are critical to enabling better supply chain

information flow between partners with incompatible information technology infrastructures.

Supply Chain Modeling/Framework

The Supply Chain Operational Reference (SCOR) model metrics – plan-source-make-deliver – form the basis of the supply chain framework being used for supply chain design and evaluation at Chip.² Using an externally based approach is resulting in a better ability to benchmark with other companies. Also, Chip is working to take the standard framework and apply it more directly to the business. As an example, within Chip, the term “supply chain” has come to represent the beginning-to-end flow for a particular product while a new term, “supply network,” is used to represent the beginning-to-end flow for a range of products which share critical steps in the supply chain process.

Chip does not take as strong a supply chain view as it would like to, but is moving in that direction. Improving cost management with design for cost is a key initiative to support this effort. Chip has learned that it is not fair to expect the supplier to improve/lower costs on sub-optimal parts. Thus, Chip needs to design the parts properly in the first place.

Purchasing/Supplier Impact on Cost Management

A supply chain perspective is the key to cost management. In the past, Chip told suppliers what it wanted and gave them the design. The suppliers then supplied Chip according to contract. Previously, Chip had a major negotiation session with each of its suppliers once a year, taking three months to prepare its strategy for a two to three day meeting. This approach doesn't work well in many areas today. Now, there are more frequent meetings, quarterly, even monthly, to get price reductions.

Chip works extensively with suppliers because it doesn't always know the supplier cost impact of changes it proposes, in terms of yield, cost, etc. It communicates ideas to the supplier (for example, a material change) to find out how much the idea will cost, even on simple design issues. Chip also asks suppliers for cost savings ideas. The key suppliers visit Chip every three months from Japan. Because most of Chip's design and development work is performed in the United States, suppliers must locate and dedicate personnel locally. In addition, many Chip engineers live in Asia or visit regularly to help the suppliers develop capability.

Supplier relationships - Chip's relationship with its suppliers and contract manufacturers has been

²See <http://www.supply-chain.org/> for more information about the SCOR model.

traditional, based on the existence of well-documented contractual relationships. The importance of the supplier relationship is increasing and more outsourcing is likely in an effort to capture the benefits from outsourcing, such as less capital invested by Chip, better capabilities to support seasonal variability, and a strong focus on execution efficiency due to the survival/profit motive by the outsource provider. Although the supply chain group has taken steps in strengthening supplier relationships through allocating business on a performance, cost, and value enhancement idea submission basis, there is an opportunity for Chip to develop supplier relationships that are more flexible and open. Additionally, Chip needs to continue to work on defining clear expectations around performance and controls for its suppliers and then stepping back enough to let the suppliers execute.

Negotiations - Interestingly, Chip uses the opposite of a value approach in negotiating pricing on the procurement side. Chip looks at long-term trends, and has developed a “NPV O” (Net present value zero) idea. Under this concept, at the end of a project, everyone (suppliers, Chip, customers) recovers their costs, and customary profit margins, yet no one walks away with the unreasonable profit. OEM customer pressures are very visible at Chip.

Cost sharing - Price savings are generally shared with suppliers. Chip estimates what savings are worth in advance, which also helps set priorities for projects. How savings are shared is part of the negotiation process and depends on market conditions (currency exchange) and other trade-offs. Chip even looks at what its suppliers pay for raw materials on key items.

Finance supports material cost analysis and understanding of supplier cost drivers. Materials often comes to finance to help quantify savings opportunities. Sometimes, finance identifies opportunities. Part of finance's charter is to help identify cost savings opportunities.

Supplier development/communication - From a supply chain standpoint, Chip looks at a supplier's supplier when there is an issue that needs to be addressed. An example of that is lithography, which involves complex photo equipment. Chip is considering relations with sub-suppliers to diversify risk, get visibility, and stay more on the cutting edge of equipment. Chip fosters initiatives/consortiums for future technology. It is also looking at many more scenarios when planning for manufacturing facilities, planning how factories, people, and equipment come together. Chip tries to understand supplier's processes, and how Chip affects those processes. It collaborates on new technology and manufacturing processes. Chip requests suppliers to come down in costs by a certain percentage generation to generation. Chip looks at TCO for equipment usage as well as best price.

Chip no longer has to train suppliers in cost of ownership; it is institutionalized in the industry. Chip questions what suppliers do in terms of costs, at strategic level, but does not specifically tell them how to do things. Chip has breakout sessions dealing with cost issues as part of its annual supplier day. If an issue is important, Chip manages it by exception, trying to address it industry-wide. Chip may go directly to sub-tier suppliers to address cost issues, and to pre-position capacity availability to meet its projected needs.

Employee reward/motivation - The PEP process is the overall approach purchasing uses to ensure it is purchasing in the most competitive manner. Savings plans are incorporated into PEP, and since they impact the employee bonus goal, such plans are a big issue. Finance rolls up PEP, tracks savings, and owns the savings calculations to ensure they make sense. Finance tries to track true savings to the bottom line. Chip focuses on value engineering opportunities, identifying solo or joint activities to reduce cost. This is the same as design for cost; while the latter is done in design, the former is done once in production.

Role of finance - Chip's philosophy is that every business unit owns its own business. Finance's charter is to maximize shareholder return. Each person in the materials organization (TMG) owns cost management. Finance helps the materials organization identify issues that should be addressed. For example, in the area of total cost of ownership (TCO), what are the key cost drivers? In a given situation, inventory may be more important than price. Chip should focus its efforts accordingly. Finance also identifies different operating models/approaches that exist for performing a process, and determines which issues it wants to tackle, such as:

- Inventory.
- Price.
- Warranty.
- Obsolescence.

A goal of looking at and developing different alternatives/models is to better understand how to manage the risk between Chip and its suppliers. Examples of models for inventory management are Vendor Managed Inventory and Consignment. In exploring the alternatives and the cost from a TCO perspective, finance:

- Identifies opportunities.
- Builds financial models.
- Develops trade offs.
- Makes recommendations.

Ultimately operations is accountable for achieving cost targets. However, finance enables this process through

model creation, validation, facilitation of model use, and model credibility. These models/tools include target costing, should-cost, and design for cost. The goal is to have those in the organization use the models as integral parts of their work. While there has been some success in linking cost models to design tools, efforts continue to make design for cost tools more robust and proliferate their use throughout design organizations.

Customer Impact on Cost Management

From the customer side, Chip gathers much data on how the customer makes its purchase decisions. Some end customers really look more at the TCO of products than at price. Chip views its products from a platform level, and develops an understanding of the customer's bill of materials (BOM) as well as how that customer prioritizes its costs. Chip develops an understanding of how OEMs make their decisions – as well as the decision making process of the OEM's customers. Chip's large OEM customers provide Chip their BOM to prove what they can afford to pay Chip for CPUs. Thus, the negotiation begins with facts, based on what the market will support, the OEM's own targets, competitive pressure, and geography. Chip prefers to direct this discussion to value, and how much each component is worth. While the OEM customers want a BOM discussion, Chip wants a value discussion, not a cost-plus discussion. Customers do not always accept the value discussion brought up by Chip. The customers push back stating that a given target price is what the market will bear for a particular item.

Target costing - Customers do use a target-costing approach with Chip, and look at expected price declines over time. Customers look at key components and make the argument that they can only afford an item in a certain price range. Chip will challenge them on BOM assumptions, and perhaps on margin (which dropped throughout the industry and supply chain with introduction of a PC below \$1,000). Competitive issues are then raised in the buyer-seller discussion; issues such as branding, name recognition, quality, stability of platform, and the value of past cooperative efforts.

Customers share retail price targets as well as target prices for inputs. In some areas, Chip works with customers (perhaps on mother boards), discussing trade-offs, ways to reduce costs of Chip's components as well as the components of other suppliers. Chip has created custom parts for suppliers as a way to add value.

TCO - Three to four years ago, a total cost of ownership initiative was kicked off on the sales side. Chip started to work with its customers to understand how people make decisions for purchasing desktop technology. Chip found that acquisition cost was a small part of what concerned them. Customers were more concerned with:

- Lack of standardization – expensive.
- Installing software upgrades PC by PC rather than downloading from network.

Chip asked the customers, including both OEMs and end customers, how it could help. This resulted in:

- Industry spec “wired for management” built in elements valued by the customer, creating an overall benefit for the market.
- Network PC – fewer moving parts on the outside of the PC, use both network and individual users to configure some things, ability to manage network remotely by downloading some upgrades.

Cost savings ideas - It would be rare for a customer to give Chip value engineering ideas and opportunities, because most OEM customers are not technical experts in microprocessors. If customers would ask for fewer features, that would help reduce overall costs. Costs saving ideas are more likely to come from the supplier side than the customer. Some companies that Chip buys from also use similar technology to Chip in other arenas. So Chip may be able to help them. Chip does share breakthroughs with key suppliers, often with suppliers who have good technology but are not proven. In such cases, Chip has sent in a team to solve the problem, and fix the processes.

Industry Climate

Chip has tried to be market neutral rather than opportunistic. It has tried to share the risks of price and volume fluctuations with suppliers. But everyone in this industry is opportunistic. When the market turns, whoever is in a position to do so will be opportunistic. It is difficult to negotiate and enforce a price volume contract with suppliers. Logistics involvement takes on a much more TCO oriented approach. Decisions are based on shipping cost as well as damage, liability, tracking, responsiveness, time-price trade-offs, and flexibility/upside in certain regions.

Chip focuses heavily on motivating employees through its bonus system. Three goals for TMG for this year are:

- How much cost it can take out of the bill of materials versus the initial plan.
- The number of design for cost projects.
- How much business is conducted through e-business.

Opportunities for Improvement in Supply Chain Cost Management

Improvements that could be made to Chip's supply chain cost management approach include:

- Looking at critical areas in the supply chain that are long-term areas, considering whether Chip should take more ownership for some of these items. How does ownership change Chip's risk profile? What are the margin opportunities?
- Continuing to emphasize design for cost – focus on technologies technology generation – move to cost parity from one generation to next, rather than emphasizing the cost of an individual product.
- Investing is speculative technology for basic research to take advantage of technological breakthroughs in cost.
- Improving relationships with key suppliers.

Success Factors and Barriers to Cost Management

One barrier to better managing cost at Chip is that the company intentionally over-designs its products virtually all the time. There is somewhat of a “not invented here” mentality for some specifications and requirements that are actually transparent to the customer. Likewise, things that give Chip a competitive advantage versus a commodity are not always clear.

Purchasing/materials is viewed by the business units as an executing arm rather than a strategic function. That situation is improving. Finance has tried to help demonstrate the value added by both purchasing and finance activities. For example, when they get a target cost, they try to identify what is commercially viable versus what needs to be designed in or substituted.

There will continue to be a greater cost management emphasis due to where Chip is in the life cycle of its own product. The market is getting tighter, so there is a greater cost management emphasis, this will help elevate the purchasing function.

Challenges

Purchasing/materials is viewed as a support organization by most of Chip. The factory is technically a support organization, and the factory views purchasing as a support organization. The business unit views purchasing and the factory as support organizations. The goal is always to be world-class, but this proves difficult given the breadth of requirements of the various business units. Not all business units believe Chip's supply chain provides a competitive advantage for their business.

Overall, cost management gets high emphasis at Chip, and is expected to receive the same or more emphasis over time. The supply chain is viewed as important and, necessary, but probably not a savior to Chip.

Based on Interviews with:

- Four Controllers in TMG, including a Capital Controller, a Logistics Controller, a Financial Controller and a General Controller.
- A Business Unit Controller.
- Four Commodity Managers, including direct and indirect materials.
- A Business Unit Manager (in charge of subcontractors).
- A PSM Strategic Planning Manager.
- A Customer Relationship Manager.

LCP CASE STUDY

Background

This organization is a large consumer products (LCP) company organized around business units (BUs). Each business unit has a Product Supply Vice President who reports into the Business Unit President. Purchasing and supply management reside in Product Supply, with a direct reporting relationship to the VP of Product Supply. Also reporting to the VP of Product Supply are engineering, manufacturing, customer service/logistics, and finance. There are one or more finance/accounting representatives supporting each VP, with a direct reporting relationship to that VP and an indirect reporting relationship to the Business Unit VP of Finance. The primary goal of this form of organization is to move LCP away from a functional focus toward a supply chain focus.

This corporation also has a global business services group that manages processes that are transactional in nature and where efficiencies can be obtained from pooling of resources. This group handles IT, some routine finance and accounting such as payroll, and some MRO purchasing that is common across BUs.

LCP also has a corporate purchasing function. This recently was reorganized and downsized considerably. In downsizing, LCP eliminated non-value activity and returned some responsibilities to the BUs, with the MRO purchasing remaining in the global services organization. Today, this corporate purchasing and supply management function acts as a global think tank, looking for innovative ideas and opportunities for supply chain improvement and feeding these ideas back to the BUs.

The Product Supply VP for the BU is responsible for meeting the BU cost target for the total delivered cost of the product. The total delivered cost breakdown averages as follows:

More effective purchasing, combined with improved manufacturing reliability, have been the primary sources of improved profits for LCP over the past 10 years.

Table 27
Total Delivered Cost Breakdown

Category	%	Primary Owner of Costs
Materials	60%	BU Purchasing Director
Manufacturing Expense	20%	BU Manufacturing Sites
Logistics	10%	BU Sites
Product Supply Overhead	10%	BU and Corporate Overhead
	100%	

Supply Chain Cost Management Efforts

The success of supply chain cost management efforts across the organization has varied, but is improving. The barriers to an integrated approach to SC cost management include:

1. *Fragmentation*: Individuals/functions are aware of their own issues and responsibilities but not as aware and accountable for those of others.
2. *Complexity/Size*: Even with seven business units, the organization is extremely large and complex. It is difficult to make proactive changes and communicate issues.
3. Supply chain cost management is still a new idea. It is overwhelming right now because LCP has been functional/compartimentalized. The efforts are dependent on BU VP of Product Supply, and each VP's understanding varies greatly.
4. Customers are often reluctant to fully share forecast data and use collaborative planning and forecasting systems.
5. LCP tends to focus on how to win in LCP's part of the supply chain without hurting the supply chain as a whole. Trying to find win-wins is a challenge. It is still difficult to get the customer/supplier to see bigger picture. Also, LCP may not see direct and immediate benefits in price change from improved supplier information.
6. LCP optimizes its own costs. The question is, how does it optimize the supply chain from end to end, eliminating costs and inventory most effectively?
7. There is a lack of clarity regarding what measures should drive the supply chain. LCP has been very

cost driven. It tends to have high inventory levels. Priorities need to be set regarding where to drive inventory out of the system.

There are however, many positive aspects supporting LCP's approach.

1. VP of Product Supply Structure, providing one-person visibility of all key product supply costs and issues. This individual ultimately has responsibility and accountability for processes and results. In addition, this role is designed to break down functional barriers and create a process focus with joint goals and responsibilities.
2. Corporate Supply Group has provided training and support to purchasing and others in each division regarding supply chain improvements and cost management.
3. Target Costing is utilized by R&D, marketing and product supply to integrate internal product cost management issues.
4. Supplier cost breakdowns/should-cost analysis is used by LCP to better understand its cost drivers and where to focus its improvement efforts with suppliers. In addition, suppliers of a specialized container have successfully worked collaboratively with LCP to reduce underlying costs.
5. *Flexibility in Supply Chain configuration*: Products can be produced internally or externally depending on what is best for LCP
6. *Value*: Greater understanding of value, not just price, leading to systemic cost and operating improvements.

7. LCP has benchmarked best practices of other companies, particularly those in the automotive sector.
8. Very active, playing a leadership role in e-Business in its industry, working towards facilitating supply chain integration.

Examples of Successful Supplier Cost Management

The supply chain approach used in one business unit is provided as an example of a best practice at LCP. Product Supply gets involved early in the new product development cycle, participating fully in the target costing process with R&D and marketing. The target costing process begins with a suggested retail-selling price. The total delivered cost target is communicated as a percentage of the suggested retail price.

One example of a successful recent target costing/supply chain cost management effort was in the introduction of an innovative product that was packaged in a specialized container. The specialized container was the largest single cost element of the product, and was well over the allowable target cost. LCP worked with the specialized container supplier on what it calls "Supplier Business Development." This is an approach it uses for new products and product innovations as well as for continuous improvement with a supplier.

The supplier was able to reduce the price of the specialized container by around 35 percent by working with LCP. It showed LCP its economics for the product. LCP worked with the supplier, sending in a team of technical people, manufacturing people and engineers to set up the process and work with the supplier to understand and improve upon:

1. Cost elements.
2. Buffers.
3. Cycle time.
4. Quality.
5. Communication.

The specialized container supplier did not want to commit to making a capital investment for the project. Product Supply presented the entire LCP business plan for the product to the supplier, and the CEO of the supplier company then bought in.

A decision also had to be made regarding the number of specialized container filling machines overseas. LCP and the supplier looked at the total cost of alternatives. Beyond a certain number of machines, building construction would be required. LCP agreed to do more production in the U.S. to avoid the investment. LCP used

idle capacity in U.S., to save the supplier money. LCP shares in the savings.

Purchasing works with suppliers to ensure proper incentives to meet both party's business needs. For example, in exchange for agreeing to invest in another specialized container machine, the specialized container supplier received commitments about additional business in different regions. In providing this incentive, LCP worked to develop a solution that would meet the supplier's business needs as well as its own. The key is to focus on needs of LCP and its suppliers to create a win-win atmosphere.

To support production of the new specialized containers, the organization providing the specialized container manufacturing equipment mentioned above was given the promise that if it delivered on schedule, it would automatically get LCP's order for the next two machines without bidding. The key to LCP was to get the first machine out. Such needs can create goal conflict among functions. For example, the purchasing reward systems are focused on saving money. Purchasing needs to understand/not lose sight of strategic issues, critical supplies/sources. The VP of Product Supply is accountable for balancing the goals of timelines, availability, price, and other product-related goals. In the case of the equipment, time was critical. Thus, the equipment contract included incentives for employees of the equipment supplier, including a bonus schedule with milestones. The equipment supplier's employees got really involved/excited, and succeeded in meeting a very aggressive schedule. The supplier got a filling machine out in 12 months versus 18, giving LCP a significant jump on the market. Thus, a combination of factors and a number of suppliers were present to make this a successful project.

Within Product Supply, building trust, personal relationships, good communication, and sharing of benefits are key elements to long-term supply/cost management success. LCP has not been focused on being a business partner with its suppliers. It has been internally focused, in line with its philosophy of competition, externally focused on getting the best price from suppliers. About 10 years ago, it began to work more strategically with suppliers, including building relationships.

Today, the overriding goal of Product Supply is to provide the necessary capability to meet business needs. Product Supply's goal is to be seen as a source of capabilities and competencies, there to support marketing, and bring suppliers innovative ideas to R&D. Product Supply focuses its effort based on:

1. Cost opportunities.
 - a. Savings it generates are used by marketing for advertising, promotion, and research, to reduce prices consumers, and to enhance profits.
2. Supporting changes in supply chain processes, such as:
 - a. New product introduction.
 - b. New equipment technology.
3. Supplier relationships.
 - a. Collaborative relationships.
 - b. Competitive relationships.
 - c. Transitioning from one relationship type to the other.
4. New product launches.
 - a. Distribution center inventory builds (depending on method of launch).
 - b. Right buffer levels.
 - c. Proper alignment of reward systems across product supply and other areas of the company.
5. Manufacturing operations excellence.
 - a. Quality, cost, organization, capability, safety, etc.

The order of priority of these initiatives varies by business unit and from year to year.

The Director of Product Supply is rewarded based on performance in:

1. New product initiative timing (at affordable cost): setting up supply chains, pre-planning, stability tests, adequate capacity to support new products. This means affordable, not necessarily cost optimized, products at product introduction. Due to time to market issues, LCP worries about cost optimization when it makes sense and focuses on the 80/20 rule in terms of leveraging the key cost issues.
2. Cost, cost, cost: This means how to structure the supply chain to operate at lowest cost, considering the capabilities necessary to meet the business needs.

For example, LCP looked at the entire supply chain of one product. It looked at all losses. It took a very regimented, computerized approach, spending four weeks on an intense analysis. Using information gathered on all losses in that supply chain, it was able to decide which losses to pursue in order to eliminate the largest cost drivers/areas of loss. Such analysis involves two phases: 1) plant operational analysis, understanding what happens within the walls of plant; and 2) comprehensive category/product level analysis across the entire supply chain.

It found that one of the greatest areas of loss it had was lost time/lack of flexibility in the manufacturing of retail

display units. It worked with the supplier of these retail display units, and within three months cut the process time in half, while increasing flexibility in the type of retail displays available.

Insourcing/Outsourcing

LCP has long been a manufacturer – doing things in-house, without thoroughly analyzing other opportunities. That is changing. In the one particular business unit, LCP is:

- Changing what is manufactured by contract manufactures vs. internal manufacturing.
- Consolidating plants.
- Using internal/contract manufacturing seamlessly along with its own company plants.

In this BU, contract manufacturing is used primarily to expand capability. This BU uses 10 contract manufacturers, with which it has close-working relationships. Contract manufacturers are viewed as extensions of capability equal to an LCP-owned facility. Outsourcing is value-driven, exploring: “What am I holistically trying to achieve and is it within the target costing for product?” Supply chain flexibility is key to this BU, along with capability and R&D partnerships.

Supply Chain Redesign

LCP is undergoing some major initiatives aimed at supply chain redesign in order to reduce costs and increase value. These include reviews of all manufacturing operations for insourcing/outsourcing determination and training key personnel in supply chain design techniques.

Manufacturing Operations

All business units have been directed to look at all of their manufacturing operations, and understand all insourcing/outsourcing decisions. LCP manufacturing operations need to be cost competitive with outside contract manufacturers. It has great systems, but do they “overdo” these systems? In the last 10 to 15 years, LCP has developed simpler products. Yet it approaches these products like very complex systems/products. LCP fears it may lose advantage because of over engineering. All BUs understand where they add value and where they do not. Now they must review whether they should outsource what is not strategic.

LCP has developed a model based on benchmarking and research related to what should and should not be outsourced. It has trained personnel in each BU to use the model. Teams consisting of R&D, manufacturing, finance, purchasing, and general management have been formed in order to provide broad perspective. Each BU is looking at its own processes as a multifunctional team.

The insourcing/outsourcing evaluation is not confined to manufacturing. All processes/services are under review.

This represents a huge and painful cultural change. The BUs have up to six months to do this review process, develop buy-in to this approach, and come up with recommendations and transition plans to move LCP into more ideal supply chains. Each BU is formulating its own supply chain design and development.

Training by Product Supply Team

The philosophy of the Product Supply function is to create low cost, demand driven supply chains by trading information for inventory. As such, this group has undertaken a massive effort to train key people in all BUs on supply chain design and cost management techniques.

Although LCP declined to share the specific techniques, overall training includes:

1. Producing to demand: linking the supply chain.
2. Supply chain architecture, including information, material and cash flows.
3. Training tapes on supply chain theory, producing to demand, and initiative management.
4. Collaborative relationships with strategic suppliers.
5. Proprietary supply chain models and tools that work based on LCP's own experience.
6. The bullwhip effect.

The corporate supply team acts as internal consultants providing training, doing research, and testing theories at business units. The five or six core people on this team are connected to hundreds more, and have in-house experts in place in all business units.

Downstream Cost and Supply Chain Management

On the customer side, LCP is clearly focused on establishing long-term relationships with his customers. This emphasis began with a strong relationship with a leading retailer. LCP tends to pass along more of its cost improvements to its customers in the form of lower pricing than it keeps for itself. It has customer teams for all large customers to help customers determine optimal shelf spacing and layout. It provides research support to help customers fine tune or even determine strategy. LCP also provides this service to small customers, although those teams work with multiple customers. The customer focus makes sense, given that LCP ties rewards to businesses selling more and making more profit.

Product Supply – Globally, product supply focuses on LCP's relationship with retail customers. The big retailers

consume most of the resources. These are strategic customers, tier one retailers such as Wal-Mart, Target, and others. These fully dedicated product supply teams generally include sales, marketing, product supply, logistics, finance, accounting, and IT. Eighty percent of team members are non-sales people. Teams like this have been in place since 1990. They are well developed in North America and Western Europe.

The goal of these teams is to build business with customers through various functions and parts of the organization. For example, logistics works with the customer's logistics group to focus on cost, processes, availability, and other logistical issues. Prior to the team approach, all customer initiatives were handled through a sales person. Issues did not get resolved, as it was too much and too broad for one person. With the teams, many effective approaches have been implemented, including:

- Electronic payments/EFT.
- Vendor/supplier managed Inventory.
- Logistics programs – help optimize LCP's systems.
- Category management (multifunctional).
- Pricing, logistics, merchandising, and specific projects to increase sales.

LCP rarely negotiates retail price with retail customers. LCP treats all customers fairly/equally in terms of price. LCP teams may help customers by acting as consultants for projects and products that LCP doesn't even participate in or sell. The LCP team develops an understanding of customers' cost drivers/operations, sometimes even beyond the customer's understanding. At some customers, LCP personnel are treated almost as employees of the customer. They have a great deal of influence, are frequently asked for advice, and are included on project teams.

The teams help customers understand/manage category profitability as a whole, by category, and by store. They research how profitable LCP brands are to the customer and how purchases of LCP products influence other consumer purchases. The teams also understand how profitable the customer is for LCP, and how it drives LCP costs in areas such as:

- Backhaul performance.
- Unloading time.
- Cost of the operating team.

The team also works with customers on performance improvement. For example, one team developed the streamlined logistics incentive program. Elements included:

- A significant reduction in the time required to unload a truck.
- Quality EDI transmissions, so that LCP and customer map standards the same way.
- A customer installing a translator in its system so that its IT transmissions were seamlessly compatible to those of LCP.
- A drop and hook program, where LCP trades a full trailer for an empty.

Team members interface with whomever they need to – finance, IT, the retail store, merchant, and logistics - in order to get the job done. LCP's effort in this area has been massive. Overall, the goal with customers is to flip the supply chain around and become demand driven. The supply chain has to be subordinate to the end customer demand: Don't push product out, let the system pull.

According to LCP, retailers are overloaded with inventory. The whole industry needs to change. LCP is trying to change the industry as stores are starting to integrate retail store operations with distribution operations. LCP is trying to manage across organizational boundaries and into the supply chain. It is trying to understand what is actually driving the supply chain versus what should be driving it. LCP is focusing on the principle of differentiating and distributing its products as close to just in time as possible.

Role of Purchasing and Supply

Purchasing is in an evolving state – more involved in outsourcing and contract manufacturing as LCP moves into a greater outsourcing mode. In the past, purchasing helped manufacturing people see what supplier/supply options are available. This is developing into other areas. Today, purchasing helps to facilitate manufacturing strategy. This involves outsourcing more; people are coming to purchasing more frequently and see it as a facilitator instead of something that gets in the way, a much more exciting role for buyers. Purchasing is still not involved in some of the indirect service areas such as advertising, research and development, and so on.

Managing supplier relations is a key role of purchasing throughout the whole life cycle, from finding suppliers, setting up the relationship, aligning LCP and supplier goals, and transitioning the relationship to phase out at the end of the product life. In the past, purchasing was price oriented, and delivered price was viewed as the primary yardstick. But price has been driven down in the past five years or so. Today, there is a shift to looking at costs holistically, more like total cost of ownership (TCO), considering issues such as how a material actually runs and inventory requirements. This trend toward TCO will continue. Now, LCP is working to improve suppliers manufacturing processes, and create synchronous manufacturing. This involves working more closely with

suppliers on cost (e.g. target costing and cost modeling), sharing proprietary manufacturing technologies, and bringing in the supplier early in the development stage (not the black box syndrome). The goal is to streamline the whole supply chain. This is a gradual shift towards improvement/streamlining rather than just focusing on price. This is a more difficult process with commodity type items, where market pricing prevails.

Sharing cost savings with suppliers varies with the situation. In general, cost savings and other benefits are shared, based on various criteria. The key is that both parties will benefit as appropriate.

Reward Structure and Organization

Traditionally, each function has been rewarded based on a combination of profit/volume and functional rewards. The reward system has recently been changed and broadened to look beyond profit, including such measures as:

- Total shareholder return – cash, profit, stock price.
- Profit and loss, working capital, capital investment.
- Forecast accuracy.
- Working capital in terms of operating cash flow.

LCP is trying to move away from rewarding behavior that doesn't make sense: e.g. getting the most volume in your plant. In general, purchasing is rewarded based on getting the best value, including price, supplier innovation, capital investment, etc. Customer service logistics are rewarded for on time delivery, perfect order, and combining enough volume to ship efficiently. Engineering is rewarded for service to BUs on corporate initiatives, broad application of its ideas, development of new ideas, and service.

The BU is rewarded for delivering projects on time, within budget, and for complexity reduction. People at LCP are heavily trained in cost management. The General Manager has responsibility for all sales, costs, and profits - in short, everything. The General Manager then delegates out total delivered cost and volume. The finance and accounting managers leads cost savings efforts at LCP, supported by product supply and marketing. A multi-functional team runs the business. Performance of the BU and team are rolled up into each member's performance appraisal. Total delivered cost is key to the product supply manager. LCP does target costing from a consumer standpoint (based on consumer research and competition), considering where it can drive costs out, and make a profit. If LCP can't figure out how to produce and deliver a product competitively, it might not launch that product. Early involvement in the product launch process is the key. Everyone is involved at the idea stage. The disciplines involved change, but suppliers are often involved.

Case Study Participants:
 Associate Director of Finance, PSM
 Director, PSM
 Business Unit Supply Chain Manager
 Manager, Corporate Supply Management
 Director, PSM Finance
 Director, Business Unit Finance
 Customer Liaison, Supply Chain Management
 Purchasing Manager

TELE CASE STUDY

Background

Tele is a large Telecommunications provider that competes in the local, long distance, and cellular markets. Like many of the other companies that were created when the telecommunications industry was deregulated, this company is now the product of several mergers of baby Bells, and others. The industry has been fiercely competitive, since it was deregulated. As one of those interviewed mentioned, "We spend the company's money as if it were our own." Thus, this company is extremely cost conscious.

Role of Procurement in Strategic Cost Management

Tele adopts a centralized approach in sourcing and supports a policy that encourages all contracts and purchases to go through a single procurement process. The procurement group includes several groups: sourcing/contracting, purchasing strategy and planning, systems and services, supplier diversity and supply chain logistics, and fleet operations (See organizational chart in Figure 10 below). All the groups are more or less involved in strategic cost management. However, because of the diversity of participants, an internal cost management-consulting group was formed to collect and analyze cost data for the entire procurement organization in a centralized manner, and then provide consulting service to the internal clients within procurement as well as clients within the enterprise.

Procurement is responsible for establishing and achieving savings and supply chain process efficiency targets. Strategic cost management and a continued emphasis on supply chain management can be achieved only if procurement plays a key role in delivering that value to the corporation.

Procurement works closely with the client organizations through a process called the Client Procurement Plan (CPP) to determine product and service requirements, product selection, and supplier selection. The CPP is a formalized process whereby the procurement organization meets with its clients a few times each year,

and as new projects arise, to discuss plans, goals, and expectations. These are developed into plans, and formal follow-up meetings are held to track progress and modify the direction, if necessary.

Procurement utilizes a Cross Functional Sourcing Team (CFST) structure to make sourcing decisions. CFSTs are comprised of members of procurement and client organizations, who meet on a regular basis to determine customer needs and the value proposition for the organization. Typical membership might include representation from contracting, engineering, marketing, supplier diversity, supplier quality, ICG, and other key stakeholders.

Within procurement, cost management efforts for new or existing products or services are driven by strategic sourcing organization (contracting organization). These efforts are monitored by evaluating the total cost of ownership for those goods/services, as well as supplier's performance in the area of product quality, on time delivery, and cost of product or delivery non-conformance.

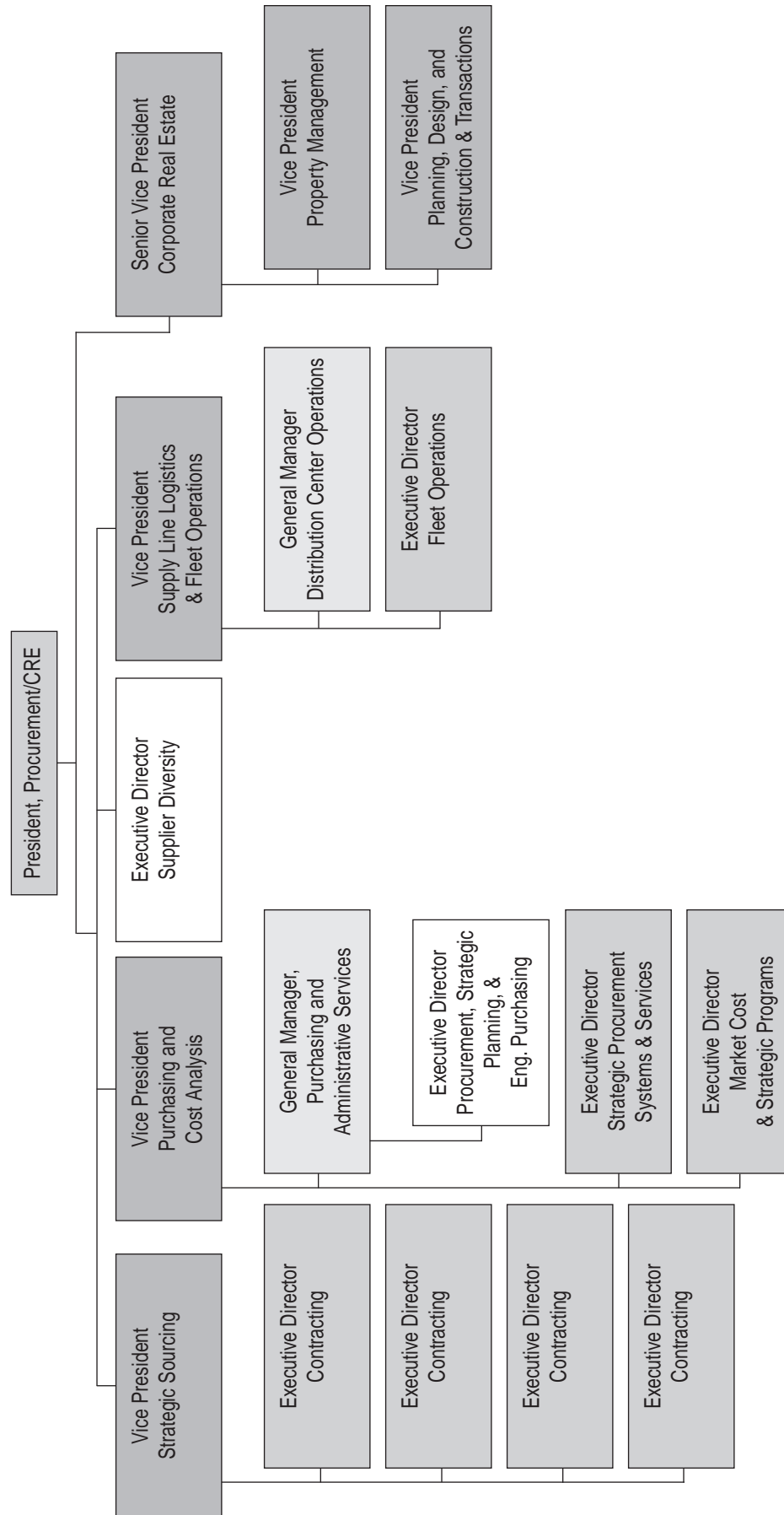
Contract managers leverage high volume material purchases to obtain the lowest purchase price through a request for quote process (RFQ). Value Added Resellers (VARs) are used to reduce costs and improve efficiencies in non-core business activities (e.g. assembly, packaging, installation, etc.). Tele has material planners who work with suppliers to communicate Tele's business requirements and material forecasts. The suppliers are required to reduce their prices year over year via their cost saving and quality improvement practices.

E-procurement allows for ordering to be a distributed function across the enterprise, which has always been the goal and direction of Tele. E-procurement also mechanizes some processes that were manual before. Strategic cost management in procurement is changing due to the advances in E-procurement that have the potential to streamline many current processes.

Internal Cost Management Consulting Group

Internal Consulting Group (ICG) was formed within procurement about four years ago when one of the sourcing managers approached the Vice President of Procurement with the idea that total cost of ownership analysis and doing a more thorough, complete analysis of purchases could reduce the company's costs significantly, and improve decision-making. The internal consulting group focuses on cost, process, and planning issues for internal clients. This group gets involved in a variety of projects, solely at the bidding of internal clients. There is no obligation to use their services, nor is there a direct charge for their services. ICG mainly serves internal clients within procurement. However, the group may

Figure 10
Tele Procurement Organizational Chart



service others within the enterprise either directly or indirectly, including senior management, finance, engineering, marketing, and others.

ICG usually responds to requests from its clients rather than actively looking for work opportunities. Some of the consulting opportunities also come from the senior leadership team of the company, including the President of Procurement, or any of its Vice Presidents of Supply Chain Logistics and Fleet Operations, Strategic Sourcing or Purchasing and Cost Analysis, as well as their Executive Directors, Directors or line managers. With approval of the Vice President of Purchasing and Cost Analysis or the Executive Director to whom it reports, ICG has occasionally pursued ideas that it generated.

The ICG is a service organization with a mission to support important decisions of all types within procurement, or somehow related to procurement. Virtually all of the decisions/analysis in which the ICG gets involved include some type of financial analysis/cost assessment. The members of this group have a variety of backgrounds, including many years of experience in accounting and finance, internal consulting in other areas in Tele, as well as purchasing and logistics experience. This broad base lends to the credibility of the group and ensures that the right expertise is available for the job at hand. ICG also includes, as needed on teams who are not directly part of the ICG. For example, many of their projects look at various software options. Thus, ICG frequently works closely with the IT group.

The ICG interfaces primarily with clients within the organization. It may be involved with suppliers to gather information or to attend joint meetings. However, it is not a primary interface with suppliers. The information gathered and recommendations made by ICG are provided to its clients for the clients to implement. Thus, ICG is a key strategic decision support group rather than an implementer. In general, it does not have contact with or direct involvement with the needs of external customers.

Examples of projects - ICG is apt to get involved in analysis of projects of fairly significant size and scope. It tends to participate in analysis of high visibility projects that are important to its clients.

Many of the projects that ICG has been involved in recently are logistics oriented and/or information technology (IT) focused. For example, on the logistics side, ICG has been looking at various software to run warehouse and inventory management systems. The types of projects that the internal consulting group (ICG) gets involved in vary greatly, but includes issues such as:

- Capital expenditure analysis.
- Outsourcing/make-buy analysis.
- Warehouse location decisions.
- Warehouse layout decisions.
- Information technology recommendations.
- Logistics network decisions, such as trans-shipment options, material visibility, and equipment choice.
- Total Cost of Ownership (TCO) analysis to support supplier selection.
- Supplier evaluation.
- Benchmarking best practices.
- Assessment of recommendations/decisions made by external consultants.
- General decision support within procurement, much as an external consultant would provide.
- Supply chain cost activity based models.

ICG results - Like an external consultant, ICG presents its clients with a thorough analysis and recommendations. It does not implement the project. A typical consulting project would progress as follows:

- Client requests an analysis.
- Team/person is assigned to client.
- Meet with client to assess the situation and understand the project charter.
- Determine information needs.
- Meet with client to develop a plan for gathering information.
- Collect the data.
- Analyze the data.
- Assemble the data into a package.
- Review and verify data and assumptions with key sources, providing preliminary results.
- Formally communicate the results and recommendation to client, including:
 - Executive summary.
 - Project charter.
 - Assumptions.
 - Background.
 - Analysis.
 - Recommendations.
 - Supporting data.

ICG uses a great deal of spreadsheet modeling to develop its results. It may also develop what-if spreadsheet models that the client can use to check various scenarios and options. The goal of ICG is thus to support informed decision making, filling in the resource gaps to do the analysis within the organization.

Contribution of ICG - The ICG fills a gap where there is an important analysis to be done, generally in procurement, and other groups which either do not have the time and/or expertise to give the analysis adequate attention. In many cases, this is primarily due to their total

concentration on the day-to-day operation that constrains their ability to conduct detailed operational reviews. ICG uses a fact-based, data driven approach to making its recommendations. ICG does not tell the client what he or she wants to hear. Rather, ICG may assess a scenario that a manager presents, and develop additional options. ICG is also in the position to see and understand how the actions and activities of one group or functional area may affect those of another group or the enterprise in an unfavorable way. ICG can elevate these problems and get visibility for them in an unbiased way, because it is generally not a stakeholder in the outcome.

Importance of Cost Management at Tele

Everyone interviewed agreed that cost management is very important at Tele. The responsibility for managing costs is well distributed throughout functions and levels in the enterprise. Those with budget and/or revenue objectives, as well as the entire procurement organization feel cost pressure keenly. All of those interviewed agreed that cost management is so important at both an enterprise-wide level and at procurement level in particular that it would be difficult to further increase its importance. Mergers have heightened the visibility of cost issues. One of the goals of the mergers was to significantly increase procurement savings. That goal has been achieved and exceeded, as savings have been greater than planned.

Cost management is one of the procurement group's four primary objectives, along with client satisfaction, process improvement, and a winning team. Purchasing savings factor in as a significant part of individual performance appraisals in procurement. Team awards and recognition are also based on cost savings.

There are specific rules as to what can and cannot be recognized as savings, and which savings need to be counted as hard or soft savings, and cost savings versus cost avoidance. The goals and expectations for savings are very specific and clearly laid out. In general, savings are based on obtaining lower unit prices for existing products. However, Tele is constantly purchasing new items and leading edge technologies. In these cases, savings would be calculated on the reduction in price obtained from the best initial competitive bid, to the final negotiated supplier price for the same scope of work. This method is accepted by the organization because it is relatively objective. The total savings achieved through reducing the costs of products and services and maintaining these low costs measure the overall value proposition of the procurement organization. This translates into bottom line business results. Thus, at a very high level, procurement performance is also measured by looking at supply cost as a percentage of revenue. The corporation's expectation that this metric should improve year over year has occurred.

Supply Chain Management Focus of Cost Management Activities

Procurement takes a total supply chain view of strategic cost management. This is evident in the support provided to strategic sourcing and logistics, which are fundamental enablers to achieving a status of lowest total-cost producer.

Tele's focus on managing the cost of purchased goods has increased over the last five years, and it has recognized the significant value that supply chain savings can bring with the advent of various mergers in 1997-2000. Supply chain savings have been promoted as one of Tele's key success factors in merger integration activity.

The procurement organization looks at the cost structure for first, second and often third tier suppliers in order to examine ways to improve processes that may affect downstream costs. Tele is growing in the area of partnering with its first, second and third tier suppliers to help them identify where they can drive costs out of their operations and pass them along to Tele.

In executing material contracts, strategic sourcing selection process involves:

- Quality/functionality.
- Service.
- Price.

Savings are recorded primarily based on the difference between what Tele is paying currently compared to what it will pay under the new arrangement. Strategic sourcing does not report internal process savings, as it is primarily responsible for reducing cost from suppliers. Utilizing the expertise of the ICG, strategic sourcing develops, implements, and executes plans that assure the best valued product/service is provided to its clients. The ICG brings a stronger focus on supply chain cost that adds to the quality/functionality, service price analysis and thus enhances Tele's value proposition. With all the Tele mergers, the primary emphasis has been to reduce first cost. Now that Tele is settling into a more stable environment and first costs associated with economies of scale have been achieved, it is expected that the total supply chain will be emphasized. As a consequence, more research is initiated to investigate the supply chain impact, i.e. transportation elements embedded in a supply chain.

The goal of Tele is to take a supply chain focus in its analysis. That is one of the reasons that ICG tries to use a total cost of ownership perspective in its analysis whenever it is applicable. It tries to understand and factor in the impacts of different alternatives on its suppliers and customers, as well as on its own performance. The reality of the situation is that many projects are very complex and far-reaching, and may be analyzed in part by a number of different groups. Whereas ICG might

look at the cost and operational issues associated with distribution center locations, marketing might look at customer service issues associated with the same decision. Thus, while ICG might focus more on supply side issues, other groups are investigating additional factors that affect the supply chain view. The contracting group asks major suppliers to provide it with detailed information about sources of supply and costs as part of the bidding process. This allows them to really understand key risks and costs associated with second, and even third tier suppliers, and ask the first tier supplier to modify its supply chain to reduce risk and cost.

Cost Management Tools Used

Tele's cost management emphasis focuses on Total Cost of Ownership, Target Costing, and Operating Procedure 6 (OP6). These tools are supported by the use of the Client Procurement Planning process, as mentioned above.

Tele takes a total view of strategic cost management by focusing on a Total Cost of Ownership (TCO) model. TCO is a specified methodology for analyzing and reporting the value of first cost savings and other in-process costs. Among all the cost management tools, maintaining/updating TCO's component prices in an easily accessible location and format is most difficult. However, it is one of the principal analysis approaches used by ICG. ICG tries to identify all direct effects, and many of the indirect effects associated with the situations it analyzes. This tool cuts across many of its projects. It is a primary tool used in analysis of process costs and make/buy or insource/outsource alternatives. Where long-term investments or multi-year projects are involved, ICG also uses net present value analysis. Should-cost analysis is also used when trying to develop an understanding of a supplier's cost structure. Price analysis and benchmarking of costs and processes among the various "baby Bells" that make up Tele also provide the ICG with important information for its analyses.

The contracting process requires an RFQ and decision summary to ensure that the sourcing decisions are documented as the best overall value for the company. The contract decision summary documents the detailed description of why a project is needed, and details how a decision was made and what process was utilized to reach this decision. Thus, it provides clear and convincing information as to which award rationale applies to this project and how it applies to the award. The contract decision summary and target costing are considered the most important tools by the supply chain-planning group within procurement.

Besides TCO and target costing, Tele also utilizes a common set of tools entitled Operating Procedure 6 (OP6). OP6 is a detailed set of procedures used to

describe how to evaluate supplier capability and financial health, undertake price analysis, conduct the bidding process, and document the contracting process. It provides a single "One Tele" contracting process that allows sourcing requirements to be aggregated and coordinated across Tele for full leverage of the company's buying power. All contracts are audited to ensure compliance to OP6 process and procedures.

Status of Procurement within the Organization

Procurement is viewed as a key strategic function and highly regarded at Tele. The organization is involved in the planning an implementation of key company growth initiatives, and participates in high-level decisions on SCM direction and value propositions for the corporation. The overall value proposition of the procurement organization is measured by the Total Cost of Ownership - savings the organization achieves when sourcing products and services and reducing and maintaining the lowest operating costs, which translates into bottom line business results.

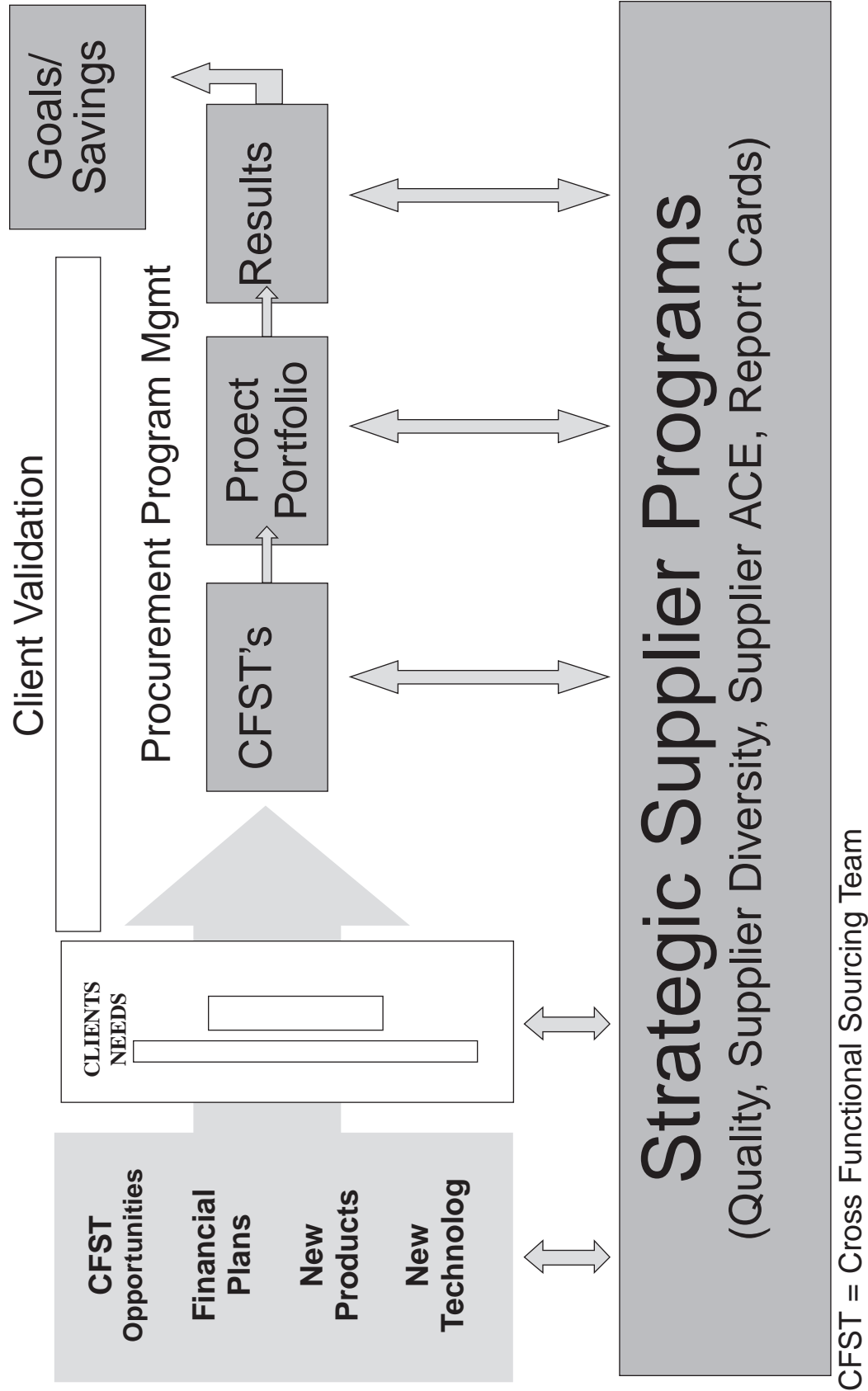
Over the last few years, procurement has been established as part of the core business of Tele. As such its expenses are watched closely at the corporate level. Procurement has quality processes integrated into the organization to enable successes at each level of the organization and with suppliers. Cross-functional teams are in place and empowered to help drive lowest cost sourcing and logistics strategies and business practices. In recent years, procurement savings have contributed more to bottom-line profitability than have sales.

However, procurement must constantly prove that it adds value to processes and purchases. There is no requirement within the corporation that other areas use strategic sourcing. They may circumvent the procurement organization if they feel it does not add value. However, given that procurement does handle a great deal of Tele's business, it is clear that some feel it is a value added operation. It has recently received much positive attention for the purchasing cost savings generated by the mergers. However, some areas mainly think about the procurement group when there is a problem to be solved. Senior management in procurement, and the senior management team in general is trying to educate other areas within the enterprise on the supply chain opportunities that exist in virtually all business decisions, and get procurement and ICG involved earlier and more frequently. An overview of Tele's supply chain processes is provided in Figure 11.

Involvement of Other Organizations in Strategic Cost Management

Internal function's involvement - At Tele, strategic sourcing, purchasing, logistics, fleet and corporate real estate are in

Figure 11
Tele Strategic Supply Chain Process



the same organization. Design and marketing are tied in through the Client Procurement Plan process. Other internal functions are usually involved and coordinated via a cross-functional sourcing team, which has representatives from the organizations that are affected by the specific commodity it is studying.

Various functions are tied to strategic cost management. Strategic cost management begins with an understanding of the organization's vision or business plan, which is called harnessing the power of the supply line. Functions such as purchasing, strategic sourcing, logistic, fleet, and inventory management provide a flow of information on best business processes. These are developed into strategies that make use of technology innovations, improvements in quality, and negotiating new contracts that increase revenue or reduce costs. Most importantly, the business plan tries to integrate all of the functions in procurement and tie all of the decisions, processes, and activities into a lowest-total-cost life cycle basis (starting with the raw materials, flowing to the end user).

Suppliers/Customers involvement - Suppliers are involved in cost management via training and quality programs. However, currently, Tele does not have a formal supplier-training program for SCM. It conducts ad hoc training in order to implement supplier performance metrics, relying heavily on documented TL9000/ISO 9002 methods. Suppliers are also trained on Web-based measurement tools and ensure the integrity of their performance metrics, according to TL9000 or other criteria.

Customers are involved via client procurement plans that provide for client interaction at the senior management level through a semi-annual planning process where Tele staff meet with their clients to identify/discuss their key initiatives, which translate into material and services requirements. These requirements are fed to cross-functional sourcing teams, which evaluate and make sourcing decisions. Additionally, the contracting group is organized by technology/product group and is considered a single point of contact for contracting and technical expertise for the client organizations.

The Client Procurement Plan (CPP) includes the following aspects:

- Clearly links the supply chain process to the client's success.
- Provides an opportunity to dialogue with client and calibrate on their key objectives, creating buy-in at the officer team level.
- Proactively focuses supply line issues to create a significant competitive advantage and increase client satisfaction.
- Develops and prioritizes client list - review periodically.
- Schedules attendance at client staff meetings whenever possible to facilitate participation of key direct reports and ease scheduling difficulties.
- Schedules one formal meeting per year - use follow-up appropriate to each client (e-mail, conference call).
- Integrates CPP into Cross Functional Sourcing Team (CFST) process, taking advantage of established lines of communication and eliminating duplication of effort.
- Assesses program effectiveness from both client and procurement viewpoint.

Potential Improvements to Tele's Cost Management Process

Tele is proactively engaged in doing more in the area of strategic cost management in the future. Tele has launched Critical Redesign Opportunities (CREDO) a broad based program aimed at identifying cost reduction opportunities and process improvement initiatives across the organization. The company recognizes that with industry restructuring and technology change, the competitive advantage lies in the supply chain.

The organization has initiated the integration and improvement of its various information systems. First, the day-to-day purchasing functions (invoicing, billing, tracing) need to be integrated because of multiple systems and processes introduced through mergers. Two regions have been converted, while the remaining two regions are on schedule. Second, much of current internal reporting is aggregated information aimed at top management. To remedy that, the organization is deploying an activity based cost management model for the entire logistics portion of the business. Tele plans to extend this activity-based tool to corporate real estate design and construction functions next. Operating level people have now the capability to understand and support day-to-day decisions related to their operation. Along the same line, it would be helpful if there were greater organizational memory, such as a database that warehoused past analyses and captured key process costs, best practices, and other process related information. This would help Tele's efficiency so that it would not continue to reinvent the wheel.

There has also been a positive trend towards getting ICG involved earlier in key decisions, when there is sufficient time to do an adequate analysis and create a thorough set of recommendations. Continuing along the path of earlier involvement in broader issues would also improve Tele's cost management capability.

Case study participants:

Director, Contract Savings & Reports
Director, Supply Chain Performance

Director, Supply Chain Planning
 Director-Operations, Supplier Diversity
 Finance Manager
 Area Manager, Purchasing
 Inventory Planning Area Manager
 Three members of the internal consulting group
 Executive Director of Market Cost and Strategic Programs

PRAXAIR CASE

Background

Praxair is a \$4.2 billion company that manufactures and sells a variety of gases and related products and services to a number of industries, including medical and high tech. Because Praxair is in a commodity business, it is under a great deal of pressure to manage and reduce costs in its manufacturing and delivery processes. More demographic information on Praxair is provided in Table 28.

Several years ago, Praxair underwent a significant re-engineering/reorganization on the recommendation of a major consulting firm. The sourcing area was a major focus of the reorganization. It is shown in its current form in Figure 12. The sourcing organization has continued to evolve. The major developments in procurement processes are shown in Figure 13.

Responsibility for Cost Management

The emphasis on cost management at Praxair is very high. The focus is both internal, on operating spending, and external, on money spent with suppliers. Each business is accountable for its own cost management. Responsibilities are as follows:

- Business Units – each is responsible for the cost of industrial gas that it sells.
- Distribution group – responsible for the cost of distribution of gas.
- Production/Operations – responsible for the cost to run/maintain facilities.

In sales and marketing, the focus is on revenue growth and cost in terms of the budget. Seventy percent of internal costs are salaries/benefits.

There are also certain service groups that have overall responsibility for cost management within the company:

- Global procurement is responsible for spend with suppliers.
- Productivity team looks at productivity initiatives throughout the organization, with a primary emphasis at the plant level productivity.
- Six sigma team/initiative looks at many projects and analyzes/creates solutions, to save the company money. Many of the issues this team deals with are related to Praxair customer satisfaction, such as on-time delivery.
- Energy management group is a dedicated energy management team that has existed for the past 10 to 15 years. Because electricity is one of Praxair's largest costs of doing business, this focused team looks for continuous improvement opportunities.

All of the teams have the overarching goal of generating measurable cost improvements, efficiency, and value as well as focusing on customer satisfaction. Each is accountable for delivering major, traceable savings each year. Each commits to delivering a certain amount of savings to the business units, which is in turn built into the business unit strategic planning process in terms of cost reductions.

Purchasing's Accountability for Cost Savings

The specific accountability for cost savings in the purchasing area includes:

- Operating profit impact: Purchasing has saved over \$100 million in the last three years. Praxair has a sophisticated database and tracking system to measure the impact of each initiative, comparing actual vs. planned savings on a monthly basis. To date, most of the \$100 million savings is measured in expense items rather than cost of goods.

Table 28
Corporate Profile: Praxair Inc.

Primary Business:	Praxair is a global company that produces and supplies atmospheric, process, and specialty gases and atmospheric technologies.
Key Business Units:	North America, South America, Europe, and Surface Technologies
Total Sales (2000):	\$5.043 billion
Operating Profit (2000)	\$707 million
Net Profit (2000):	\$363 million
Number of Employees:	23,500
Approximate Total Value of Purchases:	\$3 billion

Figure 12
Praxair Global Purchasing and Materials Management Organization: September, 2001

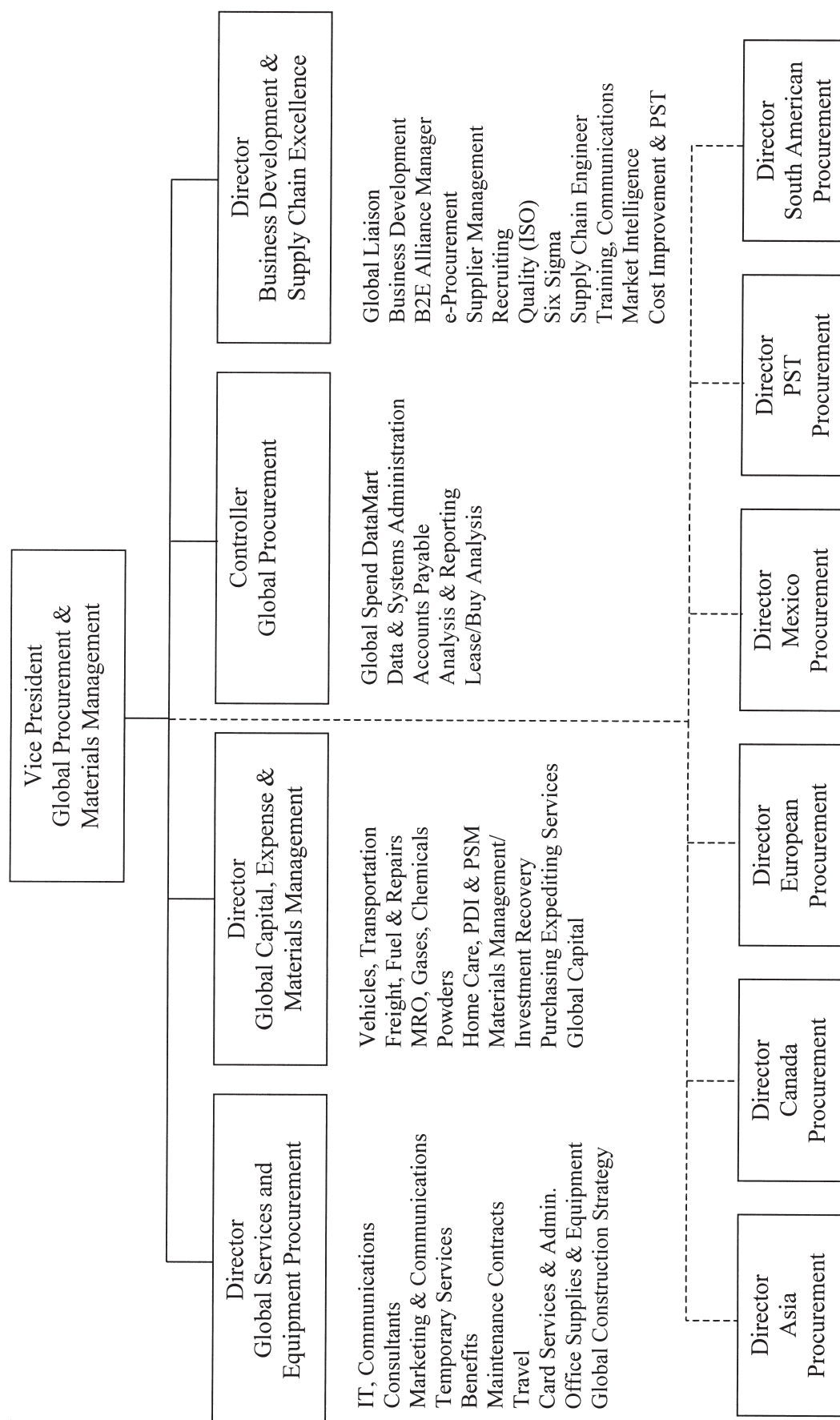
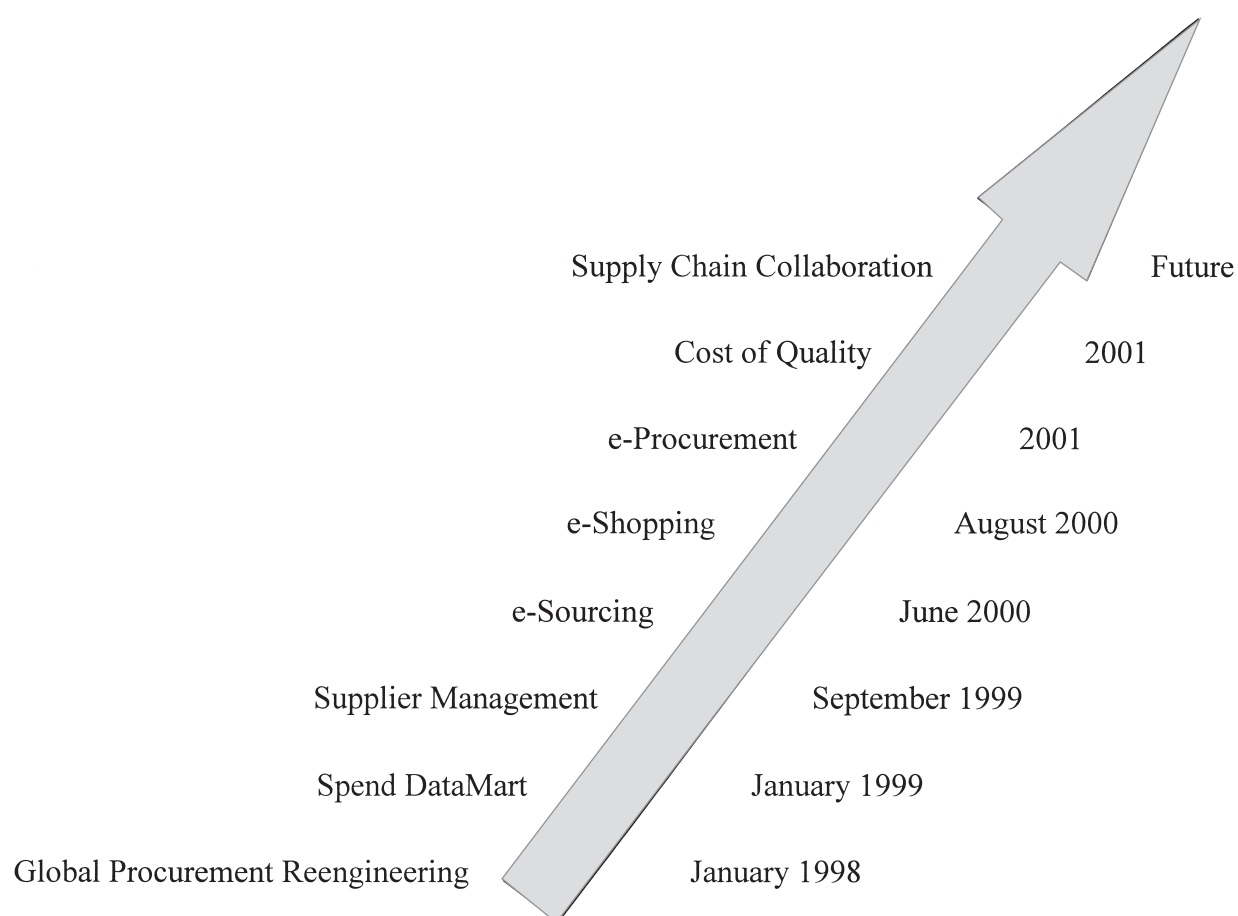


Figure 13
The Path to Supply Chain Excellence



- Capital goods: There is separate measure for variance on capital expenditures over previous buys. It is harder to clearly measure savings on capital because Praxair buys different capital each year. One measure of savings being used, but not included in the \$100 million mentioned above, is whether purchasing spends less than budgeted to achieve the business unit goals.
- Materials management: This group concentrates on how to manage cash/inventory. The focus here is on continuously reducing inventory without decreasing service. Consignment and/or supplier inventory are two favorite and successful approaches.

When Praxair reorganized, it shifted towards a strong total cost of ownership (TCO) focus for external goods

and services. A critical goal for procurement is to deliver a quantifiable reduction in spending each year.

Financial objectives are set each year. These drive processes. The objectives are set based on savings translated in terms of earnings per share. Purchasing considers:

- Current initiatives that carry over to next year.
- Other ideas for cost savings.

Purchasing presents the cost savings ideas to the businesses, and the business units build the savings in to their business plan. They capture specific, separate line items in reporting that show procurement related savings. These appear right next to sales in the internal reporting. Purchasing savings are reported monthly, and must be

consistent with what the business units report as purchasing savings.

Individuals within procurement have specific, measurable goals, in such categories as operating business by country, by commodity, and by commodity manager. These focus on bottom line savings (operating profit impact).

Praxair uses a dashboard system that captures 27 measures. There is a sophisticated system to track progress versus goals, supported by the global procurement impact operating profit database. Cost improvement is part of the commodity managers PMP (Personal Management Program), goals for the year. Progress is measured and evaluated as an input to the annual salary adjustment. For more senior people, PMP performance also impacts the variable compensation bonus. They are also measured on the fixed cost to run the procurement organization

Purchasing also considers what it costs to provide purchasing services to the organization. This includes everything from having the right staffing level to travel and attending conferences. They are held accountable for internal cost management. The belief is that in order for purchasing to truly deliver value, it must also control its own costs. Thus, there is an emphasis on both internal and external cost management. Purchasing is a cost center, so it must convince the businesses to pay for their services every year as part of the annual budgeting process.

Praxair negotiates cost allocation of supply management to businesses. They do this on an activity based costing basis, matching the relative support of each person to each business. Accounting in general is roughly activity based on key cost drivers. Top management believes this approach to allocating departmental costs leads to better alignment between the service organizations and the goals of the business unit. Praxair is very results driven.

Purchasing Organization

Under the Vice President of Global Procurement and Materials Management, there are four key purchasing departments, as follows:

- Global Excellence, Expense and Materials Management.
- Global Services and Equipment Procurement.
- Purchasing Controller.
- Business Development and Supply Chain Excellence.

Globally, Praxair has 200 people who report into the procurement organization. In North America there are 90 people, including 15 in accounts payable. The general responsibilities of each are shown in Figure 12. The organization and responsibilities continue to evolve.

Business Development Group - The Business Development group is assigned projects to work on based primarily on procurement's six critical successful factors, as identified in the strategic plan.

- People excellence.
- Sourcing strategy/supply management.
- Internal client satisfaction.
- Measurement, reporting, and forecasting.
- Ease of doing business with.
- Globalization.

Each of these factors has a vision or an ideal state associated with it. Praxair has developed a transformation map that has a starting point of 1998 and extends four years beyond the current year (see Figure 13). This map helps identify and prioritize on what projects procurement should focus. The mapping process and execution are managed by the global procurement leadership team, which includes all procurement directors. A global procurement director is assigned to be accountable for each of the six critical success factors. This includes assessing the:

- Historic progress.
- Current state.
- Desired state included steps identified to improve.

This is an integrated process, a living document. The Business Development group works with the owners of each critical success factor to implement programs. The Business Development group includes members with expertise in people, process, tools, and technology, and a supply chain quality engineer. These individuals work with directors to identify and develop project plans. The Business Development group also maps its activities, which allows its members to see the impact and interrelationships among activities, and helps set priorities. They plan their focus for two years out. In addition, the Business Development group receives ad hoc requests for support from teams.

Purchasing controller - The controllership function of the global procurement group is a director-level position reporting to the Vice President of Procurement along with the three other procurement directors. This function was added for a number of reasons when the procurement organization was re-engineered. The reasons for adding the controllership function include:

- Improving the management of cash flow, including the use of appropriate payment terms.
- Helping to determine the savings potential of projects.
- Developing appropriate mechanisms for tracking cost savings.

- Tracking the actual savings potential of projects.
- Obtaining business unit buy-in to the actual project savings.
- Working with corporate/business unit Controllers to reduce budgets by the amount of purchasing savings realized.

This function has also been important to developing and maintaining the credibility of the savings achieved by purchasing. Credibility of purchasing's numbers had been a problem in the past. Currently, the focus is on reporting only savings that directly affect the bottom line.

Praxair views purchasing like it views sales, as a way to grow the business, but with an emphasis on savings rather than sales. The reporting by the controller lends credibility to the savings calculations. The controller and his team report savings, provide direction, educate staff to help reduce operating costs within procurement, and monitor the budget. The controller function works with analysts within business units to identify monthly spend patterns. It also works with purchasing to understand spend at the supplier and commodity level. The controller function then goes back to internal clients at the business units to make sure that they are realizing the savings anticipated. The biggest reason for not achieving savings is spending that is out of compliance with negotiated agreements. Thus, the controller function has also educated business partners on lost opportunities as a result of using suppliers outside of procurement's contracts.

One of the primary duties of the controller is to coordinate and ensure consistency in purchasing's operating profit impact in terms of forecasts, actual reporting and estimates.

He plays a coordination role between global procurement, the global business units and the financial services group. Within the purchasing controllership function, a team of three analysts supports day-to-day activities. Accounts payable also reports to the purchasing controllership. They are looking for synergies here in terms of reducing the workload, and streamlining processes.

There is no real or perceived conflict regarding the controllership function's reporting relationship to purchasing. The controllership area is data driven, provides credible numbers, and shares the basis of its calculations.

Controller's span of interaction

The controller works with everyone in the procurement organization. When procurement claims to have an operating profit impact, there is substance to it, as verified by the controller function. To determine the amount of savings realized, Praxair compares past spend to current spend, adjusted for volume. It reports savings

over a 12 month period. The initiative drops out of the savings calculation after a 12 month period. This provides consistent reporting of savings. While most contracts are two or three years in length, purchasing only gets credit for the first 12 months of savings.

Reporting savings

Purchasing/controllership is accountable for reviewing savings calculations with businesses; purchasing doesn't get to report savings unless business unit finance buys into the savings. The controller works with purchasing to get business unit finance to buy in to the savings calculations in advance. No savings are claimed until a new contract is in place, and goods/services have been received – where savings are actually recognized on the books.

Tools are critical to help support reporting and determining savings. A key tool is the spend data warehouse. This has given Praxair the ability to sort spending throughout the world, by region, by commodity, by supplier, and so on. There are also systems to track progress on various initiatives. These systems are key to forecasting and planning of current and future savings potential.

The controller realizes that the level of emphasis on strategic cost management in the future is at least somewhat a function of the economy. If sales rise, there is less emphasis, because if the top line rises, so does bottom-line. The role of purchasing in strategic cost management processes continues to evolve. The initial emphasis has been finding the suppliers with the best price and cost structures. In the last 12 months, reverse auctions have helped significantly in getting results. So leverage has been important. There is a limit to what you can do here. Once it chooses a supplier, Praxair looks for improvement opportunities, asks to benchmark with the supplier. The next step is to help suppliers manage their costs.

Strategic Sourcing Processes after Reorganization

The changes in purchasing/supply at Praxair were made under the directive of and with the full support of the CEO and CFO. Prior to the reorganization, purchasing at Praxair had been transaction-oriented. With the reorganization, and the help of a major consultant company, purchasing has developed and implemented a rigorous 12 step strategic sourcing process. This approach utilizes cross-functional teams to thoroughly analyze the organization's current spend and uncover opportunities for improvement. The strategic sourcing process includes:

- Quantifying the organization's total spend, including who buys what from whom.
- Continuously identifying the commodities that afford the greatest potential savings opportunities.

- Understanding the market for that commodity.
- Developing a should-cost analysis for the commodity, including make versus buy.
- Benchmarking secondary data and internal pricing data.
- Understanding the scope, qualifications and reach of the current supply base.
- Developing steps for improvement.
- Implementing action plans, including meeting and working with suppliers to solicit their ideas and cooperation.

Praxair procurement has demonstrated success by following these processes. But one of the keys to its success is its ability to analyze data. The implementation of its data warehouse has been a critical improvement to its operations. Another factor has been the role of the procurement controller, who helps track project progress and savings, and helps gain buy-in from the business units.

The steps that are particularly relevant to strategic cost management are presented in more detail below.

Identifying opportunities for Savings - There are several ways that Praxair identifies cost reduction opportunities. One method is through the strategic sourcing process. Opportunities also come from reviewing spend data. With Praxair's data mart, procurement personnel and others are constantly reviewing the data for opportunities.

Also, a growing source of ideas comes through the strong alignment of purchasing with the businesses today. Business units now pull purchasing in and want their involvement, unlike the past. Business units help identify opportunities where they know they need help. In some cases, purchasing may attend monthly business unit updates, and have the opportunity to present ideas as well as learn about key business unit issues. The exchange of ideas may prevent the business or purchasing from wasting time going down unproductive paths.

Cost savings tools - Praxair uses a wide variety of tools to gain cost reductions. Their data warehouse is a critical element for them to obtain the information required to understand their spend, identify and measure the opportunities, and track ongoing results. Praxair uses e-business tools to focus on transaction cost reduction and efficiency. The modular portfolio/piecemeal approach to its software selection and use allows Praxair to choose the tools best suited to its needs. It has also effectively used B-2-E tools such as electronic bidding, and both reverse and forward auctions in managing and reducing costs, and managing its entire sourcing operations on a hosted, web-based platform. Other cost management tools used by Praxair include:

- Working with suppliers to manage cost drivers.
- Supplier suggestions – give and take.
- Price analysis.
- Total cost of ownership (TCO).
- Target costing for capital equipment.

Total Cost of Ownership focus - Total cost of ownership (TCO) is a key issue for Praxair. To them, it is a primary approach for assessing spending on particular goods or service area. All Praxair procurement members are taught to look beyond purchase price in assessing opportunities. For example, in purchasing PCs, they consider software; help desk, uptime, etc. They would also standardize on the PC brand and model number to further save TCO on support elements.

TCO assessment is an integral part of the strategic sourcing process. Praxair tries to quantify all the key elements in the TCO model it develops for a commodity. For example, if it is sourcing cranes, Praxair will consider the cost for equipment and the operator, as well as the capability of the crane, and how long it will take the crane to get the required job done. In many cases, a fundamental strategy is to first standardize, then go to market.

There are situations where there is a conflict between TCO and price. Price is easy to track, so it may receive more weight than it should. Praxair is developing good methods for tracking TCO to overcome this potential conflict. The best way to get people internally and externally to understand TCO principles is through education. Praxair conducts training with key suppliers, business unit contacts, and sourcing people on TCO principles. As a result of this training, Praxair has set up pilot programs with teams to use TCO. This helps the understanding and use of TCO.

Praxair's concept of TCO is to look at all cost elements from a design, supply chain, and usage perspective, and drive costs out by coming up with better solutions.

One success that Praxair could share was the use of TCO to significantly lower the cost of an imported product that it formerly brought to a central location and distributed. Praxair has redesigned the supply chain, improving freight and using a third party to distribute. This was a great TCO example of working with a supplier and considering the whole supply chain/processes.

Team perspective - One of the goals of the 1998 reorganization was to broaden the perspective and scope of procurement. Thus, Praxair has cross-functionally staffed the organization. In addition to getting a better customer perspective, this move has helped relations with internal customers. They see that their counterparts in

purchasing have the same background, understanding, and perspective, and this improves rapport and credibility.

The use of procurement-led cross-functional sourcing teams is important in improving analysis and facilitating change in sourcing practices and execution. The primary purpose for creating a strategic sourcing team is to lower the TCO for the commodity studied while maintaining the level of service. Praxair also wants to increase the level of support and attention it gets from the suppliers, to get a higher allocation of the suppliers' resources. The sourcing teams stay together through the implementation and management of the chosen supplier. Some of the goals of keeping the team together include getting people to utilize the preferred supplier, and creating a high level of commitment to and visibility for the supplier. They also measure internal client's compliance with the contract and try to understand why people are not using the preferred supplier.

The cross-functional teams vary in membership. For example, with the global PC contract, there was a user representative from each region of the world. The team for sourcing cranes included a procurement person with an engineering and project management background, representatives from operations who run existing plants (users), engineers, and project management.

Example of Strategic Sourcing: Commodity Management

The commodity management process is founded on the 12 step strategic sourcing process. Commodity managers lead the cross-functional teams. The commodities under focus vary from year to year. In general, Praxair performs a complete commodity analysis on one to two major commodity categories per month.

Supplier interaction on cost management occurs as part of the strategic sourcing process. After the sourcing team has internally developed a strategy for TCO improvement, and a formal sourcing strategy document, it involves the suppliers. It conducts individual supplier workshops with suppliers that it intends to invite to participate in the RFQ. Praxair shares with the suppliers one-on-one what the initiative is about, the goals, how it views the TCO elements, and their magnitude. The suppliers are then asked to answer questions about their best practices for cost management, delivery, and related issues so that each can build its case as a viable supplier. The suppliers receive the questions in advance, so they can be prepared. This meeting validates and enhances the sourcing process.

Based on the workshops, the pool of suppliers invited to participate in the RFQ might be reduced. The workshops also leave the team very well equipped to write a solid

RFQ. The supplier workshops and supplier inputs validate and enhance Praxair's strategy before it goes out to the market. This allows it to ask the right questions for TCO elements in that situation. As a result, it gets good responses from its RFQ process. Any outstanding issues are clarified before the cross-functional team selects the winner(s).

The cross-functional team assesses the suppliers' bids based on what they rated as important in the TCO model. After selection, they negotiate with the supplier and develop/execute the contract and its terms and conditions. They then notify the internal clients that this new contract is available for use, and how to contact them. The sourcing team engages the chosen supplier in implementing their relationship and communicating with internal clients. In some cases, the supplier may hold information sessions within Praxair, visiting various locations.

Supply Chain View of Cost Management

Supply chain focus - The aspiration of Praxair procurement is to develop a supply chain view of cost management. This is seen in its extensive use of total cost of ownership. Praxair considers more than price. It also looks at supplier performance in areas such as quality and electronic capability. Total cost of ownership is also a key tool for capital acquisition. TCO also comes into play in managing internal cost/budgets.

Today, Praxair doesn't see the entire supply chain within its procurement area. The business development function focuses more on the buy side, up to product delivery. The supply management group is not yet dealing directly with customers on a regular basis. The sales/marketing organization is protective of customer relationships, and purchasing now has plenty to do without direct customer involvement.

The sourcing process is integrated with the business units, so purchasing gets much front-end involvement. Today, supply management looks at all aspects that touch the supply chain from design to purchasing to strategy to payment, transport and storage. Supply management is really looking at all the key elements of the supply chain. The perspective is getting broader.

Supplier cost management - Supplier cost management occurs primarily through the commodity management/strategic sourcing process. Praxair asks suppliers for cost breakdowns, and also does its own. It presents the cost breakdowns to suppliers, and asks suppliers to tell them where Praxair is wrong. The more open suppliers are the ones Praxair wants to work with. This approach worked well on PCs, services, and with some construction contractors. They agree on profit margin, and share in the risk on costs. Travel is also

managed in a detailed way, in which the cost management process includes management of the entire overhead.

To facilitate supplier process improvements, Praxair encourages them to use Praxair's commodity management approaches with their suppliers. Praxair does some on-line reverse auctions, and on-line bids; Praxair encourages its suppliers to use a similar approach to reduce their own costs, because it wants its suppliers to be effective and competitive.

Key Supplier Management and Continuous Improvement

Once the relationship is under way, Praxair has a program for supplier management that it uses with key suppliers. The process involves meeting with critical suppliers to identify key performance indicators (KPIs) such as price, technology and service. Based on the KPIs, they establish a report card, and work with cross-functional teams to get feedback from the various businesses on how the supplier is doing. In addition to doing a formal report card rating each critical supplier, Praxair gets input from suppliers on Praxair's performance and how Praxair can improve as a customer. Praxair calls this the TARGET process, because the focus of continuous improvement revolves around a combination of the following elements:

- **TCO.**
- **Assurance of Supply.**
- **Responsiveness.**
- **Global reach.**
- **Environment and safety issues (big for some suppliers).**
- **Technology.**

These TARGET elements vary in importance with the buy. The lessons learned during the supplier management phase can impact the strategy and focus for that area commodity, so the whole process is circular. Cost is normally part of the equation in every situation, but it may not be the area of greatest importance.

In situations where Praxair has ongoing relationships with suppliers, price is still an important consideration. However, Praxair also looks at how to take costs out of the system, exploring options in packaging, collaboration, and so on. Praxair tries to work with a total cost of ownership (TCO) approach.

Praxair does a good job of digging into supplier's costs through its supplier management program. It works with suppliers to find out what Praxair does that hurts the supplier's productivity or increases costs. The focus of cost management is primarily suppliers, but is expanding to include other supply chain elements. There is not as

great a supply chain emphasis for corporate services; the emphasis is more internal. But other areas naturally lend themselves to a supply chain perspective, such as distribution costs, the costs of hiring transportation. There is a closer connection to understanding the supply chain. In addition, Praxair gets some feedback from customers through sales, to engineering. This process is not mature, but it is moving in that direction.

Supplier relations - As a first step of the supplier segmentation process, Praxair segments its supply base based upon the criticality of the purchase and the supplier to Praxair. This is how Praxair determines suppliers with whom to collaborate, versus those where the focus can be more price-oriented. Criticality is viewed in terms of dollar spend, safety issues, quality issues, and other similar factors. Praxair limits the number of suppliers with whom it will align to 65 to 100. With this group of suppliers, Praxair works very closely to collaborate on joint efforts for mutual benefit. This is in line with the supply management program TARGET, as presented above. Praxair is also developing a supplier award program to formally recognize top suppliers.

Praxair procurement works with some suppliers on development. Praxair asks its suppliers for year over year cost reductions on a cost and performance basis. This is not a formalized process, rather procurement people work with suppliers on an individual basis. Praxair knows its suppliers and sees the relative opportunities, so not all suppliers get the same demands.

Sharing of savings varies with the situation. For example, Praxair outsources the driving of its delivery trucks. In one case, the drivers weren't properly filling the tanks. This created an inefficient load, significantly increasing Praxair's delivery cost and reducing performance to its customers. Praxair created a system to measure and achieve a better load ratio, then worked with the supplier and trained the drivers to use this improved system. The savings from full loads have been shared with the supplier. In an ideal world, Praxair would like to make such improvements a win-win scenario and provide incentives to suppliers to improve performance. However, this is not always possible due to cost reduction pressures.

Understanding the customer - While the procurement group focuses mainly on internal Praxair clients and plays a predominant role with suppliers, it does have an understanding of the external customer. Within purchasing, specific sourcing managers are aligned with specific businesses. They become integrated with the business team, which is where they develop their understanding of the needs of customers. This varies considerably by business. In the businesses that support

the electronics industry, Praxair becomes very involved with some of its key customers. However, purchasing always strives to understand the importance of the end customer. Some customers, especially in the electronics sector, are concerned with Praxair quality, and look closely at Praxair systems, and Praxair's interfaces with its suppliers. However, most of the customer's influence on Praxair's supplier relations and supplier cost/price reduction is indirect.

An example of procurement's direct interaction with customers has developed at the request of Praxair sales. Praxair purchasing has met with a number of customers to explain some of the approaches that it takes to achieve improved savings and value in procurement, and help the customer develop savings ideas.

Early involvement in new products/services - While Praxair is in a commodity product area; it does offer new product delivery systems and services to its customers. For example, it may change the size of industrial gas product lines to fit a particular market. Global engineering designs the gas plants to specification to meet customer's needs. Procurement is involved in terms of understanding the specifications of the plant, the equipment needs, and finding the best suppliers/contractors to meet the needs.

When offering new physical capabilities within a plant, procurement works heavily with R&D and engineering to develop and determine plant needs. Procurement has become more involved, and involved much earlier in new technologies, so that the process is front-end loaded. In general, Praxair is creating cross-functional teams earlier, including sales/business unit representatives, operations, engineering, procurement, and R&D. It is a very integrated process. Business clients must believe that procurement and the strategic sourcing process bring value in order to bring them into processes sooner.

Training - Training has been designed for people throughout the organization. In addition, external customers have paid to participate in Praxair's training. The training is led by procurement. Training programs include the 12-step sourcing process, presentation skills, and business processes. Strategic sourcing training has also been licensed to a local university. It has a business development person that spends a small portion of his time looking for revenue opportunities to fund the business development organization. The goal is to become self-funding.

The Role and Image of Purchasing in the Firm

Purchasing was not viewed as an attractive place to be before the 1998 reorganization. The contributions of global procurement are now acknowledged at the top of the organization. Today, purchasing is asked to participate in

businesses, and is viewed as key member of the business team. Purchasing participates fully in monthly reviews with the office of the chairman, and presents its progress and plans like any other business unit. Purchasing has made a great deal of effort to develop an organization with a high level of credibility and skills. It is their success that has helped get them more involved. Prior to 1998, the purchasing focus was primarily on capital expenditures. With the reorganization and the help of consultants, it has developed a broader focus and a process.

For example, Praxair has had many acquisitions recently. Supply management developed an acquisition process to build the synergies of the supply. For example, from a procurement standpoint, in their healthcare business, the sourcing person who supports the healthcare business is a member of the advance team that visits the acquisition, investigates its suppliers, its purchasing spend, commodities, and so on. The sourcing person then works with the acquired organization to gain access to the contracts, see who is has the best contract, understand leverage opportunities, and get the best deal for Praxair. The acquired company may have a better position in some areas. Praxair will use the contract that benefits Praxair from the first day of engagement once the acquisition is official. The acquired company becomes part of Praxair's spend profile, with savings goals just like any other business unit. Praxair has had immediate savings results in certain cases.

Another initiative that has helped move the supply organization forward is the new college recruiting approach. Praxair now recruits from universities with professional purchasing programs, and hires people from different schools, with new and different ideas.

Purchasing is definitely an area that is respected and whose input is valued in the organization. This is clear, or it would not be included in critical processes. At present, dependence on procurement delivering cost savings is higher and higher, especially with the economic slump.

Purchasing's Contribution to Organizational Success

From the standpoint of the office of the chairman, purchasing's contributions can be viewed as based on:

- Operating profit improvement.
- How effectively it manages the internal fixed cost/budgets.
- How effectively it contributes to the improvement of working capital.

Within the area of working capital, there are two major elements:

- Accounts payable and payment to suppliers.
- How well it manages inventory, including:
 - Spares for capital items.
 - \$10+ million of expense related items.

Purchasing has specific goals to meet in each area. The benefits that purchasing will deliver to each business are agreed upon with the business as part of the annual planning process. The business units incorporate the savings into their budgets accordingly.

Purchasing saves \$30 million to \$35 million per year on \$1.5 billion spend. To achieve this, purchasing focuses on specifics; it does not look at every spend category each year. The purchasing initiatives are managed like projects. They separate initiatives that generate profit from capitalized savings in property, plant, and equipment (P, P, & E).

Why Has Praxair's Reorganized Sourcing Effort Been Successful?

Praxair's reorganization of purchasing has met and exceeded everyone's expectations in terms of improved performance and bottom-line results. Some of the key reasons for this success include:

- Praxair brought a number of key people from sales into procurement; these people understood negotiations issues, sales, and market pressure from a different, but complementary perspective.
- Personnel from R&D, finance were also mixed in with procurement professionals to create a stronger organization.
- With the implementation of the data warehouse, procurement can get its hands around all the data available – transforming it to information to make decisions. There is structure/organization to data.
- Praxair learned the process of strategic sourcing from McKinsey Consulting.
- It developed its own internal training programs – new people are on the same page.
- It has very strong support and visibility from senior management leadership support – CEO, VP of Finance.

Areas of Continued Improvement Focus

Cost management is a very integrated part of commodity management/strategic sourcing process. When Praxair does the annual budgeting, it commits to goals at mid to upper management levels. It is a continual challenge to have the ongoing commitment of people in the organization to work on cross-functional sourcing teams since they have many priorities and responsibilities. The issue of compliance with selected suppliers could be improved. Praxair loses some savings opportunity and supplier leverage when people don't use the contractual

supplier agreements. However, Praxair is not a mandating corporate culture; people can choose. The most effective way to improve compliance is through the use of a cross-functional sourcing team, not only during supplier evaluation and selection, but also through implementation of the preferred supplier. Internal compliance is also improving, as Praxair is able to monitor contract compliance and report the results to business unit management. Because the business unit is held accountable for savings through reduced budget levels, business unit managers discuss non-compliance issues with parties not using corporate contracts and ask them to change when it makes sense to do so. This has proven to be a powerful approach for creating accountability.

Future of Cost Management at Praxair

Cost management will continue to be a strong focus at Praxair in the future. The focal point is on measurable operating profit, not just price variance. Thus, overhead and budget issues are an important consideration. As Praxair works through many of the potential savings opportunities, revenue enhancement will continue to grow in importance. The sourcing group at Praxair is also open to new ideas and opportunities from suppliers and internal clients to contribute to revenue enhancement.

One concern for the future is the belief by senior leadership that procurement can deliver the same magnitude of results year after year. It can't be done. There is a limit. Procurement must work to educate them on additional contributions that can be made beyond bottom line cost reduction.

In the future, purchasing will look even more at rigorous TCO and process improvement as a way to support the organization. With the selected suppliers, Praxair will go forward and work with them to create mutual dependence. Both parties can make changes to processes to save money. In turn, Praxair will be loyal to suppliers who perform well and add value.

Case study participants:
Three Purchasing Directors
Purchasing Controller
Business Development Manager

Appendix B:

Research Proposal

Center for Advanced Purchasing Studies Research Grant Proposal

Strategic Cost Management in the Supply Chain

Submitted by

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April 6, 2000

Strategic Cost Management in the Supply Chain

Research Proposal

Background

Since the CAPS focus study, *Total Cost Modeling in Purchasing*, was published in 1994, there has been an increased interest and awareness of the cost modeling in purchasing. Additional cost modeling concepts, such as target costing, have begun to spread, expanding cost modeling concepts outside of the organization to include first tier suppliers. *The Role of Supply Management in Target Costing* was the subject of a 1999 CAPS focus study. As the author of both of these studies, I believe that there is opportunity to incorporate and expand these previous studies to explore cost management throughout the supply chain.

Topic of Interest

The primary topic of interest is strategic cost management in the supply chain. Strategic cost management in the supply chain is characterized by the following:

- It is purposeful: it supports the organization's strategy.
- It is boundary spanning: goes beyond supply management both within the organization and outside the organization (suppliers, customers).
- It is rare: few organizations do an excellent job here.

Strategic cost management in the supply chain is an extremely broad topic. It encompasses upstream cost management issues such as target costing, understanding supplier costs, and cost drivers. It also encompasses understanding and managing downstream costs such as finished goods inventory, logistics, and costs of serving customers. It includes consideration of, and response to, cost pressures by customers at all levels in the supply chain. In the broadest sense, strategic cost management takes a holistic, total cost perspective throughout the supply chain.

As this topic is so broad, it could be investigated from a number of angles. The extent of strategic cost management throughout a supply chain could be explored in a survey. This type of study would fit in the category of CAPS research that identifies the current state of the practice. I have concerns about doing this type of research. Strategic cost management in the supply chain is in its infancy at best. What are needed are insights into best practices in strategic cost management in the supply chain. Thus, the survey results would not be of much interest, nor would they provide much information to CAPS sponsors or the National Institute for Supply Chain Integration (NISCI), which is co-sponsoring this research.

On the other hand, an entirely different approach, focusing on a *research approach that identifies the leading*

edge of current practice and applications might be more relevant to CAPS/NISCI sponsors and NAPM membership. I am proposing to use in-depth, on-site case studies to explore best practices in strategic cost management among leading edge purchasing organizations today.

There has been limited literature explicitly linking strategic cost management with supply chain management in general, and with the role of supply management in particular. Based on the research and review of the relevant literature, trends that I have observed, and areas of interest identified by the National Institute of Supply Chain Integration's April 2000 conference, this study will:

1. Identify and study a number of best practice organizations across several industries.
2. Explore BOTH upstream and downstream strategic cost management issues and practices.
3. Synthesize these best practices.
4. Develop a prescriptive model for world class cost management in the supply chain.

Specifically, some of the key elements to explore include:

- Purchasing and the wider organization's use of:
 - Total cost of ownership.
 - Target costing.
 - Cost information sharing/monitoring internally and externally.
- Understanding of supplier's cost structure and how it relates to:
 - Relationship/cost management.
 - Influence on next tiers.
 - Documentation/improvement strategies.
- Understanding of profitability of key customers, and how this affects strategic cost management in the supply chain.
- Cost monitoring and management systems, including key cost drivers.
- Cost management goals, expectations, and the impact these have on the reward structure.

Research Methodology

Clearly, no individual or function within the organization will have the ability to address all of these issues. Thus, this research will employ a "snowball" case study method, where the initial contact point in the organization helps identify those parties in the organization who have the knowledge required to address the issues presented above. The goal is to have a minimum of a triad of companies in each supply chain: a supplier, a manufacturer/assembler/service provider and a customer. If possible, the researcher will attempt to study additional nodes in the upstream and downstream supply chain.

The researcher will contact the middle of the triad as the starting point of investigation moving up and down the supply chain. Based on the nature and breadth of the topics to be investigated, the researcher believes that for the research to be successful, it will require the support of a high level person within the initially contacted organization. Thus, within the middle organization of the triad, the researcher would like to interview:

- The high level sponsor to establish an overview of the organization's supply chain cost management strategy, and key internal and external contacts.
- Purchasing/supply management.
- Accounting/cost management.
- Marketing/sales (customer perspective).
- Logistics/distribution.
- Other internal parties involved in cost management.

In addition, the researcher will ask the initially contacted organization for contacts at:

- A key account customer.
- First tier supplier(s) involved in the organization's cost management effort.
- Possibly a second tier supplier.

If it is not possible to gain entrée into these links through the initially contacted organization, the researcher will make contact with related supply chain links directly.

The case study research method that I am proposing, as mentioned above, is the use of focused case studies to identify, synthesize, and report best practices in strategic cost management in the supply chain. The research methodology has several critical phases in its formulation.

Phase I- Review the literature to develop an understanding of the concepts, previous research, and issues.

Phase II- Develop proposed topics/practices of interest to investigate in each area,

Phase III- Protocol development, review and approval.

Meet with a focus group/committee made up of those particularly interested in strategic cost management practices to identify their particular areas of interest. These issues, as well as issues identified in Phase II, will then become the focal point of the research. This will include members of the CAPS North American Executive Purchasing Roundtable and the National Institute for Supply Chain Integration.

In addition, representatives from this group (and potentially others) will be identified as members of the advisory board for the study. They will be called upon to

review interview protocol, review the study scope and aims, and provide feedback through out the study, including review of the final report.

Phase IV- Creation of interview protocol based on Phases I-III.

This phase will entail the identification of best practices firms, based on Phases III and I. It will also involve screening the companies identified to ensure a good fit with the research objectives, and that the candidate organizations understand the level of commitment required. The screening of companies will include in-depth telephone interviews/screening to verify:

1. The organization represents a best practice firm in terms of supply chain cost management.
2. The organization wants to participate in the case study, and is willing to devote the time, effort and resources to host the investigator's visit.
3. The organization will share samples of their analyses and allow them to be published in the study, either as-is, or disguised.
4. The organization will arrange for participants outside of the supply management function who play major roles in the process under investigation to participate in the study.
5. The organization is willing to identify and request participation of other supply chain members (customers, suppliers) to participate in the research.

The participating organizations will receive pre-meeting copies of the protocol so that they can be prepared, and everyone's time is well spent. In addition, they will be asked to send the researcher any available printed material on their cost management practices, processes, and policies, as well as general information about their company and supply management processes in order that the researcher be prepared.

Phase V- Case Studies.

This phase will involve on-site visit(s), gathering of data/documents, development of a case study database for each organization, supply chain, and the case studies as a whole. The goal is to involve at least three companies as links in the supply chain studied.

Phase VI- Data analysis and Report Development.

In focusing on the needs of CAPS and NISCI, rigorous research practices will still be employed in gathering the data, executing the case studies, and analyzing the results.

Relationship of this Study to Previous Research

This study builds on the previous CAPS focus studies, *Total Cost Modeling in Purchasing* (Ellram, 1994) and *The Role of Supply Management in Target Costing* (1999). These studies used case analysis to explore various approaches to total cost modeling/target costing and both a descriptive and prescriptive approach to total cost of ownership/target costing.

Little has been done in the area of strategic cost management in the supply chain. There has been virtually no work in this broad arena from a supply management perspective. The work that has been done focuses on certain practices that may support strategic cost management in the supply chain, such as target costing (Newman and Rhee, 1990; Ellram 1999). There has been limited conceptual work done exploring cost management in the supply chain (Cavinato, 1992).

More work has been done in the accounting literature, but that is also not as broad as the research proposed here. Like the supply management literature, most of the work in the accounting literature focuses on a specific practice, such as target costing (Kato, Boer, and Chow, 1995; Fisher, 1995; Brausch, 1994; Shim and Sudit, 1995;) or TCO (Ellram, 1995; Carr and Ittner, 1992). There was some excellent conceptual work done exploring strategic cost management that includes a value chain perspective (Shank and Govindarajan, 1992, 1993). The concepts developed in that study will be incorporated into this research. More recently, a book was published entitled, *Supply Chain Development for the Lean Enterprise* (Cooper and Slagmulder, 1999). Based on a doctoral dissertation, this book examines cost management practices in 25 Japanese manufacturing firms. The focus of the book is on target costing, but the broader lessons learned from this book will also be incorporated into this study.

This research proposes to go beyond the current studies, examining the current best practices in strategic cost management in the supply chain. A prescriptive model for using strategic cost management in the supply chain will be developed. In addition, an implementation framework will be developed for strategic cost management in the supply chain. This should be valuable to practitioners implementing or interested in these approaches, as well as to researchers of strategic cost management in the supply chain in building and developing future research.

Proposed Time Line

The following represents the proposed time line based on the use of a case study method.

Activity	Dates
Begin literature review	Ongoing
Develop proposed topics within TCO/target costing for study	March, 2000
Meet with NISCI symposium	April 4-5, 2000
Develop research plan based on NISCI/other input and revise proposal	Completed (this document)
CAPS approval	May, 2000
Select Advisory Board	May, 2000
Further literature review/research as needed	Summer, 2000
Develop preliminary case study protocol	May, 2000
Pilot cast study with preliminary protocol	May-June, 2000
Have feedback on case study protocol	Early June, 2000
Revise protocol	Late June, 2000
Identify/contact best practices case study firms	April-June, 2000
Conduct case studies	June-October, 2001
Analyze data	Through December, 2001
Develop CAPS Focus Study Report	by February 28, 2002

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Appendix C:

Interview Protocols, Cover Letter and Abbreviated Research Proposal

Abbreviated Research Proposal Sent to Case Study Participants

Strategic Cost Management in the Supply Chain
A research project

conducted by Lisa M. Ellram, Ph.D., CPA, C.P.M.
For the National Initiative for Supply Chain Integration
and The Center for Advanced Purchasing Studies

The proposed research involves in-depth, on-site case studies to explore best practices in strategic cost management among leading edge purchasing organizations today.

There has been limited literature explicitly linking strategic cost management with supply chain management in general, and with the role of supply management in particular. This study will:

1. Identify and study a number of best practice organizations across several industries.
2. Explore BOTH upstream and downstream strategic cost management issues and practices.
3. Synthesize these best practices.
4. Develop a prescriptive model for world class cost management in the supply chain.

Specifically, some of the key elements to explore include:

- Purchasing and the wider organization's use of:
 - Total cost of ownership.
 - Target costing.
 - Cost information sharing/monitoring internally and externally.
- Understanding of supplier's cost structure and how it relates to:
 - Relationship/cost management.
 - Influence on next tiers.
 - Documentation/improvement strategies.

- Understanding of profitability of key customers, and how this affects strategic cost management in the supply chain.
- Cost monitoring and management systems, including key cost drivers.
- Cost management goals, expectations, behaviors, and relationships and the impact these have on the reward structure.

Research Methodology

Clearly, no individual or function within the organization will have the ability to address all of these issues. Thus, this research will employ a "snowball" case study method, where the initial contact point in the organization helps identify those parties in the organization who have the knowledge required to address the issues presented above. The goal is to have a minimum of a "triad" of companies in each supply chain: a supplier, a manufacturer/assembler/service provider and a customer. If possible, the researcher will attempt to study additional nodes in the upstream and downstream supply chain.

The researcher will contact the middle of the triad as the starting point of investigation moving up and down the supply chain. Based on the nature and breadth of the topics to be investigated, the researcher believes that for the research to be successful, it will require the support of a high level person within the initially contacted organization. Thus, within the middle organization of the triad, the researcher would like to interview:

- The high level sponsor to establish an overview of the organization's supply chain cost management strategy, and key internal and external contacts.
- Purchasing/supply management.
- Accounting/cost management.
- Marketing/sales (customer perspective).
- Logistics/distribution.
- Other internal parties involved in cost management.

Each interview is expected to take about 45 minutes to two hours. Questions can be provided to the participants in advance.

In addition, the researcher will ask the initially contacted organization for contacts at:

- A key account customer.
- First tier supplier(s) involved in the organization's cost management efforts.
- Possibly a second tier supplier.

If it is not possible to gain entrée into these links through the initially contacted organization, the researcher will make contact with related supply chain links directly.

Participants will have the opportunity to review all of the data and edit for content accuracy as well as for confidentiality. Nothing will be published without the explicit permission of participating companies. The participants may choose to have their name/industry disclosed or disguised.

The time frame of the research is fall of 2000 through summer of 2001, with a final report expected late in 2001/early 2002.

Interview Protocol Used Inside the Core Company

STRATEGIC COST MANAGEMENT QUESTIONNAIRE

Background (begin with Purchasing)

Name _____
 Company _____
 Division _____
 Industry _____
 Job Title _____
 Yrs in Position _____
 Years with Co. _____
 Years in Purchasing _____

NOTE: Your answers to the questions should include people, dollars, and activities that report to the organization headquartered in this country.

1. Approximate total annual sales, 2000 (or latest fiscal year), in U.S. dollars.
 _____ under \$500 million
 _____ \$500 million to \$1 billion
 _____ \$1.1 billion to \$5 billion
 _____ \$5.1 billion to \$10 billion
 _____ over \$10 billion
 Approximately what is the ratio of purchases of outside goods and/or services to revenue?

What is the approximate percentage of your sales to industrial customers? ____ directly to consumers? ____ other? ____ (specify source)

Would you classify your firm as primarily:

- _____ manufacturing
- _____ service-oriented
- _____ distribution
- _____ government
- _____ other (specify)

2. What is the major business of your company?
3. What are the key issues/competitive challenges facing your firm?
4. Are you currently undergoing, or have you undergone, any major changes in your purchasing organization or practice in the past year? Please discuss.
5. How is the purchasing function organized? Do you have an organizational chart I could have a copy of? (Names may be deleted if necessary.) Where does the purchasing function report within the firm? (Reporting chain)
6. Do you have specific, quantifiable written cost savings/cost management objectives for purchasing? Give an example. What is the highest level that reviews those plans?
7. How is the achievement of purchasing's objectives evaluated?

General SCM questions-purchasing

8. How important is cost management within your company?
 Within purchasing?
 Explain why you believe this.
9. What is the focus of your cost management efforts within purchasing?
10. Please describe to me your overall approach to cost management within purchasing for:
 new products/services.
 existing products/services.
11. How does purchasing become involved in/develop an understanding of customer needs/the value proposition of the organization?
12. What other functions/groups do you interact with inside the company in your cost management efforts?
 Please describe the interaction.

13. How do you interact with your suppliers/others outside of the company in relation to managing cost?

Internal issues (ask each function, including purchasing)

14. Who owns the cost management practices within the organization? Please explain the nature of their responsibility?
15. Have you ever benchmarked strategic cost management practices with other firms? Please discuss.
16. Does your organization take a total supply chain view of strategic cost management? Explain why or why not.
17. How are various functions, such as logistics, purchasing, design, and sales/marketing tied in to the organization's SCM efforts?
18. How are these functions held accountable for SCM performance?
19. What do you consider the key cost drivers that you are attempting to manage within your organization? Supply chain?

Supplier Side (Purchasing, Cost Group and/or Engineering)

20. Tell me about the way that your firm uses SCM with suppliers. Is there a basic framework or approach that your firm uses for each situation of buy or do you have different approaches? If there is a framework, what is it?
21. Are there a set of common tools, which are usually considered across SCM models?
If so, what are they?
Which tools do you consider most important?
Which tools do you find easiest to manage and why?
Which tools do you find the most difficult to manage and why?
22. To the best of your knowledge, do your suppliers use a SCM approach? Do you encourage your suppliers to use SCM approach?
23. If cost savings are created, how are they shared among members of your supply chain?
24. Do you feel this sharing is equitable? How would you change it?
25. Could you provide me with the name of a supplier or suppliers that you work with effectively on SCM initiatives to interview?

26. Would you be willing to share with me an example of the SCM models that your firm uses for different types of purchases? (Ask to see/have explained, take a copy with me.)

27. Where does the SCM approach reside/exist (paper, mainframe, PC, etc.)? Ask for source of model.
28. Do you use some type of SCM approach for everything your firm buys? Or does it depend on the importance/dollar magnitude, etc.?
29. If you don't use SCM for all situations within a type of buy, what determines whether or not you use TC for a given purchase?
30. Are any employees trained on the use of the SCM model/approach? If so, how does that training occur? Do you train suppliers in SCM? Explain.

Cost accountability (purchasing)

31. What is the purchasing function's responsibility for cost/price of purchased goods/services?
32. Are you individually responsible for cost/price variances on items purchased? In what way? Is there a tie-in to performance appraisals/merit increases?
33. If purchasing is directly responsible for costs, what are costs compared to? Do you consider market prices?
34. Do you feel your firm's emphasis on managing costs of purchased goods and services has increased, decreased, or stayed the same? Why?
35. How would you improve your organization's approach to SCM?

Role of purchasing in the firm

36. Do you think that purchasing is viewed as a strategic function in your organization? (A function that is a respected, whose input is valued; who participates in high-level decisions?)
Please give some examples to support your position.
37. Do you believe that the way purchasing is viewed in the organization has an impact on its participation in the cost management process?
38. Do you see your firm doing more or less strategic cost management in the future? What areas will be affected and why?

39. Do you see purchasing's role in the strategic cost management processes changing in the future? In what way, and why?
40. Is there anything else that you would like to say about strategic cost management in general, in your company; your supply chain(s) or purchasing's role in SCM?

Thank you very much for your participation!

Questions to Ask Other Functions:

Internal issues (ask each function)

1. Who owns the cost management practices within the organization? Please explain the nature of their responsibility?
2. Have you ever benchmarked strategic cost management practices with other firms? Please discuss.
3. Do you believe that your organization takes a total supply chain view of strategic cost management? Explain why or why not.
4. How are various functions, such as logistics, purchasing, design, and sales/marketing tied in to the organization's SCM efforts?
5. How are these functions held accountable for SCM performance?
6. What do you consider the key cost drivers that you are attempting to manage within your organization? Supply chain?
7. Is there anything else significant about your use of SCM approach or your implementation of an SCM approach that you think I should know about?

Customer Side (Sales, Marketing or Accounting ...Someone Knowledgeable in These Areas)

8. Do your customers use target costing and SCM efforts in attempting to manage your costs? Please explain.
9. Do you understand the profitability and cost drivers in your various customer accounts? Explain.
10. Do you work with your customers in an effort to manage your costs of doing business with them? Explain how.
11. Who would be a good customer to talk to in terms of capturing your best practices in customer-supplier cost management? Would you give me a contact name and support my interviewing them?

Overall Issues (ask the process owner or owners)

12. Do you feel that you understand your organization's total approach to strategic cost management/value management in the supply chain?
13. Could you please explain the overall approach, including:
 - Accounting approach (ABCM, etc.).
 - Key participants within the organization.
 - How and which suppliers participate.
 - How and which customers participate.
 - Overall objectives.
 - Overall processes/tools included.
 - Measurement of outcomes.
 - Results to date.
 - Key success factors and lessons learned in implementing this approach.

Questions to Ask Supplier(s)

1. Tell me about the way that you interact with Company X on cost management issues. For example, do they give you cost targets, provide training and assistance, share cost savings, etc.?
2. If cost savings are created, how are they shared among members of your supply chain?
3. Do you feel this sharing is equitable? How would you change it?
4. Does the customer's approach influence the way that you manage costs in the supply chain? Why or why not, and how?
5. Could you please explain your overall approach to cost/value management, including:
 - Type of accounting system (ABCM, etc.).
 - Key participants within the organization.
 - How and which suppliers participate.
 - How and which customers participate.
 - Overall objectives.
 - Overall processes/tools included.
 - Measurement of outcomes.
 - Results to date.
 - Key success factors and lessons learned in implementing this approach.
6. How do you manage your own supplier's costs, and how is that influenced by Company X's approach towards you?
7. Would you be willing to let me talk with one of your suppliers, to get their impression of your strategic cost management approach toward it? Could you give me a contact name?

8. Is there anything else significant about your use of SCM approach or your implementation of an SCM approach that you think I should know about?

Key Account Customer

1. Could you please explain your organization's approach to managing the costs of its key suppliers, such as X?
2. Do you feel that you understand your organization's total approach to strategic cost management/value management in the supply chain?
3. Could you please explain your overall approach to cost/value management, including:
 - Type of accounting systems (ABCM, standard costing, etc.).
 - Key participants within the organization.
 - How and which suppliers participate.
 - How and which customers participate.
 - Overall objectives.
 - Overall processes/tools included.
 - Measurement of outcomes.
 - Results to date.
 - Key success factors and lessons learned in implementing this approach.
4. How does your approach to cost management affect your relationship with your suppliers?
5. How does your approach to cost management influence the total supply chain?
6. Do you undertake any activities or have any desire to influence the cost management of your supplier's suppliers?
 - Why or why not?
7. In what manner?
8. Can you give me any examples of ways that you and X have collaborated to improve cost management/value management in the supply chain?
9. If cost savings are created, how are they shared among members of your supply chain?
10. Do you feel this sharing is equitable? How would you change it?
11. Is there anything else significant about your use of SCM approach or your implementation of an SCM approach that you think I should know about?

Supplier Request to Participate Sample Letter and Research Summary

Dear Mr.:

This is a follow up to the phone call that you received from Ms. ____ of "core case study" regarding your potential participation in a research project. I am a Professor of Supply Chain Management at Arizona State University. "Core case study" is participating in a cost management study that I am undertaking for the CAPS Research and the National Initiative for Supply Chain Integration. "Core case study" supports both of these organizations. I have attached a document that explains a bit more about the study, and would be happy to answer any questions you might have.

The study is looking at cost/value management throughout the supply chain. I have talked to about 10 people at "core case study" about their internal operations and external relationships. I would like to arrange a time to talk with you and interview you for the study to get a supplier's perspective. I would be happy to come and meet with you at your location in XXX, or we could talk on the phone. I think I would need about 90 minutes to two hours of your time.

If you are willing to do this, and have a support person who handles your calendar, could you please e-mail me his/her telephone number, and I will contact him/her? Otherwise, perhaps you could call me or e-mail me information on your availability. I can e-mail you the questions pertinent to you before we meet. Nothing you discuss with me will be written, published, or disclosed to anyone, including "core case study," without your review and approval.

If you need any more information about the project, my background, etc., please let me know. You can view my bio at:

http://www.cob.asu.edu/directory/bio_directory_action.cfm?directoryid=73&dept=SCM

My direct phone number at ASU is (480) 965-2998. Thanks very much. I look forward to meeting with you!

Best regards,

Lisa M. Ellram
Professor of Supply Chain Management
Arizona State College of Business
Dept. of Supply Chain Management
Tempe, AZ 85287-4706

Strategic Cost Management in the Supply Chain

A research project conducted by Lisa M. Ellram, Ph.D., CPA, C.P.M.

For the National Initiative for Supply Chain Integration and The Center for Advanced Purchasing Studies
Lisa.Ellram@asu.edu

The proposed research involves in-depth, on-site case studies to explore best practices in strategic cost management among leading edge purchasing organizations today. Specifically, some of the key elements to explore include:

- Cost information sharing/monitoring internally and externally.
- Relationship/cost management.
- Influence on next tiers.
- Documentation/improvement strategies.
- Understanding of profitability of key customers, and how this effects strategic cost management in the supply chain.
- Cost monitoring and management systems, including key cost drivers.
- Cost management goals, expectations, behaviors and relationships and the impact these have on the reward structure.

This research will involve a number of supply chains in a number of industries. The overall findings will be synthesized into a report and published by the Center for Advanced Purchasing Studies (CAPS). A brief version of the individual case studies used to develop the overall report will be included as an appendix.

Research Methodology

Clearly, no individual or function within the organization will have the ability to address all of these issues. The goal is to have a minimum of a triad of companies in each supply chain: a supplier, a manufacturer/assembler/service provider and a customer. If possible, the researcher will attempt to study additional nodes in the upstream and downstream supply chain.

The researcher will contact the middle of the triad as the starting point of investigation, moving up and down the supply chain. In this case, that was Chip. In addition, the researcher will ask the initially contacted organization for contacts at:

- A key account customer.
- First tier supplier(s) involved in the organization's cost management efforts.
- Possibly a second tier supplier.

Your Participation

Your organization has been selected as the key supplier of indirect/consumables to get a supply chain view in the Chip case. The purpose of talking with a supplier is:

- To understand how the customer (Chip) tries to manage/influence the supplier's (your) costs and supply chain both directly and indirectly.
- To understand the nature of the relationship between the supplier and the customer, how they work together.
- To understand the basic approaches that the supplier uses to manage its overall supply chain costs.

This research can be conducted on the telephone (interviews of approximately 60 to 90 minutes in length), or in person. The goal to set up the interview is the June or July time frame, at your convenience. The researcher would like to talk with those who are the key contacts with Chip. It would be helpful to talk with someone at your organization prior to setting up the interview(s), to determine whom to interview.

Participants will have the opportunity to review all of the data and edit for content accuracy as well as for confidentiality. Nothing will be published without the explicit permission of participating companies. The participants may choose to have their names/industries disclosed or disguised. The data will be published by CAPS/NISCI as an appendix of case studies to support the overall research case studies. The time frame of the research is summer of 2000 through summer of 2001, with a final report expected in fall 2001/winter 2002.

Strategic Cost Management Questionnaire (Supplier)

Background

Name _____
Company _____
Division _____
Industry _____
Job Title _____
Years in position _____
Years with Co. _____

NOTE: Your answers to the questions should include people, dollars, and activities that report to the organization headquartered in this country.

1. Approximate total annual sales, 2000 (or latest fiscal year), in U.S. dollars.
 _____ under \$500 million
 _____ \$500 million to \$1 billion
 _____ \$1.1 billion to \$5 billion
 _____ \$5.1 billion to \$10 billion
 _____ over \$10 billion

Approximately what is the ratio of purchases of outside goods and/or services to revenue?

What is the approximate percentage of your sales to industrial customers? ____ directly to consumers? ____ other? ____ (specify source).

Would you classify your firm as primarily:

- ____ manufacturing?
- ____ service-oriented?
- ____ distribution?
- ____ government?
- ____ retail?
- ____ other (specify)?

2. What is the major business of your company?
3. What are the key issues/competitive challenges facing your firm?

Questions to Ask Supplier(s)

1. Tell me about the way that you interact with Company X on cost management issues. For example, do they give you cost targets, provide training and assistance, share cost savings, etc.?
2. If cost savings are created, how are they shared among members of your supply chain?
3. Do you feel this sharing is equitable? How would you change it?
4. Does the customer's approach influence the way that you manage costs in the supply chain? Why or why not, and how?
5. Could you please explain your overall approach to cost/value management, including:
 - Type of accounting system (ABCM, etc.).
 - Key participants within the organization.
 - How and which suppliers participate.
 - How and which customers participate.
 - Overall objectives.
 - Overall processes/tools included.
 - Measurement of outcomes.
 - Results to date.
 - Key success factors and lessons learned in implementing this approach.
6. How do you manage your own supplier's costs, and how is that influenced by Company X's approach towards you?
7. Would you be willing to let me talk with one of your suppliers, to get their impression of your strategic cost management approach toward it? Could you give me a contact name?

8. Is there anything else significant about your use of SCM approach or your implementation of an SCM approach that you think I should know about?

Customer Request to Participate in Research Summary and Sample Questionnaire

Strategic Cost Management in the Supply Chain

A research project conducted by Lisa M. Ellram, Ph.D., CPA, C.P.M.

For the National Initiative for Supply Chain Integration and The Center for Advanced Purchasing Studies

Lisa.Ellram@asu.edu

The proposed research involves in-depth, on-site case studies to explore best practices in strategic cost management among leading edge purchasing organizations today. Specifically, some of the key elements to explore include:

- Cost information sharing/monitoring internally and externally.
- Relationship/cost management.
- Influence on next tiers.
- Documentation/improvement strategies.
- Understanding of profitability of key customers, and how this effects strategic cost management in the supply chain.
- Cost monitoring and management systems, including key cost drivers.
- Cost management goals, expectations, behaviors and relationships and the impact these have on the reward structure.

This research will involve a number of supply chains in a number of industries. The overall findings will be synthesized into a report and published by CAPS Research. A brief version of the individual case studies used to develop the overall report will be included as an appendix.

Research Methodology

Clearly, no individual or function within the organization will have the ability to address all of these issues. The goal is to have a minimum of a triad of companies in each supply chain: a supplier, a manufacturer/assembler/service provider and a customer. If possible, the researcher will attempt to study additional nodes in the upstream and downstream supply chain.

The researcher will contact the middle of the triad as the starting point of investigation, moving up and down the supply chain. In this case, that was LCP. In addition, the researcher will ask the initially contacted organization for contacts at:

- A key account customer.
- First tier supplier(s) involved in the organization's cost management efforts.
- Possibly a second tier supplier.

"Customer Name" Participation

"Customer name" has been selected as the key account customer to get a supply chain view in the "core company" case. The purpose of talking with a customer is:

- To understand how the customer tries to manage/influence the supplier's costs both directly and indirectly.
- To understand the nature of the relationship between the supplier and the customer, how they work together.
- To understand the basic approaches that the customer uses to manage its overall supply chain costs.

This research can be conducted on the telephone (interviews of approximately 90 to 120 minutes in length), or in person. The goal to set up the interview is the October or November time frame. If needed, the researcher would make a trip to visit "Customer name" at "Customer name's" convenience. The researcher would like to visit with the "Customer name" key contacts with "core company." It would be helpful to talk with someone at "Customer name" and "core company" in advance of setting up the interviews, to determine whom to interview.

Participants will have the opportunity to review all of the data and edit for content accuracy as well as for confidentiality. Nothing will be published without the explicit permission of participating companies. The participants may choose to have their names/industries disclosed or disguised. The data will be published by CAPS/NISCI as an appendix of case studies to support the overall research case studies. The time frame of the research is summer of 2000 through spring of 2002, with a final report expected in summer of 2002.

Customer Questionnaire

STRATEGIC COST MANAGEMENT QUESTIONNAIRE

Background (begin with Purchasing)

Name _____
 Company _____
 Division _____
 Industry _____
 Job Title _____
 Years in position _____
 Years with Co. _____

NOTE: Your answers to the questions should include people, dollars, and activities that report to the organization headquartered in this country.

1. Approximate total annual sales, 2000 (or latest fiscal year), in U.S. dollars.
 _____ under \$500 million
 _____ \$500 million to \$1 billion
 _____ \$1.1 billion to \$5 billion
 _____ \$5.1 billion to \$10 billion
 _____ over \$10 billion

Approximately what is the ratio of purchases of outside goods and/or services to revenue?

What is the approximate percentage of your sales to industrial customers? ____ directly to consumers? ____ other? ____ (specify source)

Would you classify your firm as primarily:
 _____ manufacturing?
 _____ service-oriented?
 _____ distribution?
 _____ government?
 _____ retail?
 _____ other (specify)?

2. What is the major business of your company?
3. What are the key issues/competitive challenges facing your firm?

Key Account Customer

1. Could you please explain your organization's approach to managing the costs of its key suppliers, such as "core company"?
2. Do you feel that you understand your organization's total approach to strategic cost management/value management in the supply chain?
3. Could you please explain your overall approach to cost/value management, including:
 - Type of accounting systems (ABCM, standard costing, etc.).
 - Key participants within the organization.
 - How and which suppliers participate.
 - How and which customers participate.
 - Overall objectives.
 - Overall processes/tools included.
 - Measurement of outcomes.
 - Results to date.
 - Key success factors and lessons learned in implementing this approach.

4. How does your approach to cost management affect your relationship with your suppliers?
5. How does your approach to cost management influence the total supply chain?
6. Do you undertake any activities or have any desire to influence the cost management of your supplier's suppliers?
Why or why not?
7. In what manner?
8. Can you give me any examples of ways that "Customer name" and "core company" have collaborated to improve cost management/value management in the supply chain?
9. If cost savings are created, how are they shared among members of your supply chain?
10. Do you feel this sharing is equitable? How would you change it?
11. Is there anything else significant about your use of SCM approach or your implementation of an SCM approach that you think I should know about?

Appendix D:

Request to Review Study Letter

Dear Ms -----:

I would like to thank you for your help in meeting with me and providing me with information and support on my cost management study. It was really an interesting discussion for me! I have attached a rough draft of characterization of our discussion on “your company’s” cost management practices in your area. This is only the piece I got from you. Still to come are the overall combined views of the people I interviewed at “your company,” and customer and supplier’s views. Have you had the opportunity to talk with a supplier to see if one would be willing to speak with me to support this project? I would really appreciate it!

What I would like to ask you to do is look over the attached document and change or add anything that you believe would improve the overall accuracy of this document and paint a fair picture. Feel free to add if you believe something important is missing or incomplete. Also, delete anything you do not want released. No one will see this document; it will be distilled into the overall summary of “your company.” So don’t worry about grammar, punctuation, etc. I tried to take care of that, but a professional editor will go through the final document. X at your company will also review the final document prior to publication. I will also pass the results on to you. Also, it won’t be released until late spring/early summer, if that makes any difference in terms of what you are willing to disclose.

Thanks again very much for your help. Could you please provide me with your feedback by 10/23/2001? Feel free to call me with any questions. Please send me an e-mail, or fax your comments to (480) 965-8629. If you send a fax, please put my name on it.

Thanks again very much for fitting me in to your busy schedule! It was very useful to my study!

Best,

Lisa Ellram

Appendix E:

Case Studies of Suppliers and Customer

Table 29
Buyer-Supplier Case Study Relationships

Customer	Industry	Supplier	Industry	Items sold to customer
Deere	Heavy equipment manufacturing	Metal	Precision plastic and metal parts	Precision metal parts
Chip	Semiconductors	SC	Subcontractor of custom integrated circuits and chips	Custom integrated circuits and chips
LCP	Consumer products	Packaging	High technology containers and packaging	High technology custom containers
Tele	Telecommunications	Network	Manufacturer of network equipment and software	Network equipment
Praxair	Industrial air products and chemicals	McJunkin	Pipe, valve and fittings distributor	Integrated supplier for P, V, F

METAL CASE: SUPPLIER TO DEERE

Background

Deere is the major customer to the Metal division of this supplier. In the area of metals, Deere buys:

- Sheet metal equipment for agriculture/construction equipment.
- Feeder houses (combine).
- Frames/main structural components on tractor.
- Hoods, side shields, grill screen.
- Fuel, hydraulic tanks.
- Misc. fabrication.
- Cab for backhoe.

Deere has a similar breadth of purchases with Metal's Plastics division.

History of cost sharing

Deere's business really took off in the early '90s. Cost modeling was not as prevalent at that time, but by the mid-90s Metal had an open-book policy with Deere

without exception since then. Deere gets whatever information it needs. Deere meets with Metal's accounting folks, and walks through details of cost assumptions. Sometimes Deere cost management people know Metal's numbers as well as Metal does.

Deere develops cost targets and shares them with Metal most of the time. Increasingly, Metal and Deere work together to actually establish cost targets. During the interactions of Deere's design, Metal provides multiple quotes for different designs for a certain product.

Today, Deere requires its suppliers to share cost information if the supplier would like a long-term relationship. People at Metal were probably initially nervous about cost sharing. However, sharing cost information takes a lot of emotion out of the privacy issue and does away with a lot of the games in a relationship. Their process involves establishing agreement on gross margin percentage, then looking at cycle times, process time, and so on, to determine what the costs should be. Metal and Deere commit to try to achieve a certain percentage gross margin.

Metal was chosen as sole supplier for Dubuque Works when it outsourced *en masse*. Metal and Deere have a multiple year agreement that establishes Metal's expected margins and Deere's expected cost reduction for each year. The best intent of both parties is to always maintain margins. However, sometimes, on very mature products with very high industry pressures, Metal may give up some margins, sometimes unwittingly. Deere may actually question Metal if gross margin percentage goes down. Metal and Deere understand each other's goals. Metal must support Deere's goals.

Relationship Today

Metal has had complete cost transparency with Deere since the mid 1990's. This includes raw materials, freight, burden rates, including costs by process, fixed overhead, variable overhead, labor, and margins. This information was shared with Deere in a variety of ways initially; now Deere is trying to use a standardized John Deere quote form throughout the enterprise. Most of the information for new business to Deere. When Deere has outsourced products to Metal, in many cases Deere has provided Metal information on its own cost breakdowns such as cost drivers, raw materials cost, cycle times, but not overhead, union wage rates, and other very sensitive items.

Metal has intense interaction with Deere every day. Each day both companies visit the other's facility. Metal gets involved very early in design and development to ensure that new products work on Metal's existing assets, or to find the proper next technology to support the process. If new equipment is required to support a process, Metal has to decide:

- Can we justify the investment?
- Which equipment should we invest in?
- Is Deere willing to pay for the costs associated with this investment?

Deere has made many resources available to Metal from within Deere's supplier development organization. For example, when Deere works with Metal on engineering improvements, they establish charter cost agreements that include the scope of project, the resources allocated from both sides, and the value to both organizations.

These can be painful activities, but they help drive the right behavior between organizations. In general, Metal and Deere have some sort of shared savings agreement for improvements made in existing products. Typically, savings are shared 50-50, based on real cost that you can take out of bottom line as best as can be measured. This sharing of savings is fair. It is the best way to get buy-in to the process from both sides, and the premise of the JDCrop approach: to recognize real cost savings and share them 50-50.

Deere's understanding of Metal's cost structures and associated issues is high. They do question a lot. It helps them better understand issues and from where costs are coming. They still struggle over price/cost, but there is more focus on reducing cost, not just price. The relationship between Metal and Deere is characterized by a commitment on both sides to act as partners. In supporting Deere, Metal's goals must include:

Delivery and quality as prerequisites to business.
Support of Deere's achieving excellence goals.
Effective cost management.

The objective is to have a long-term relationship with Deere, to understand each other's business objectives. This is a competitive industry, and whoever excels benefits. Delivery and quality are mandates. Whoever has the low cost gets the business. Metal must perform. There is a healthy tension, the failure to meet objectives is NOT acceptable; Metal must be a low cost provider or it runs the risk of not getting future projects.

Deere Processes

Deere has three processes for managing the cost of current products:

Supplier development: Offering resources to help the supply base.

JDCrop initiative: Drive/consolidate cost reduction; supplier improvement ideas.

Value Improvement: Events that Deere hosts to support suppliers in identifying areas that they can take cost out while maintaining quality/delivery. These events may be a day or several days long.

In the new product arena, Deere has PDP (product delivery process). This is the upfront program to establish cost targets and get supplier participation in design and development.

Deere works from both sides, managing costs both during the early/new product development phase and once in production. Deere may also help suppliers improve prices by leveraging volume for items.

Deere is improving the way it manages processes for achieving excellence metrics. These metrics are now consistent across the board. The supplier quote form that is used for supplier cost disclosure is also standard across businesses. Processes are becoming much more standard on a high level. The difference is in the details. Each factory within Deere is somewhat different in terms of its processes. There may even be differences with in a single factory. Metal focuses on the Deere metrics that drive the business.

Deere's Impact on Metal's Supplier Management

The way that Deere interacts with Metal does impact Metal's supplier management. Cost targets from Deere have encouraged Metal to look for more information from its suppliers than in the past (it has learned from Deere). Metal is beginning to use the tools and processes learned while partnering with Deere. Metal's purchasing does interact with Deere, and understands Deere's supplier management processes.

Metal is now working on developing its own method for supply chain management and consolidate its supply base to gain leverage. It is using a very Deere-like process. Metal plans to put this into place soon; it has established a core team to implement the process. Metal was more tactical in dealing with suppliers in the past. It is moving toward strategic processes, benchmarking, and related processes. It is moving from many to few suppliers and developing cost models.

SC CASE: SUPPLIER TO CHIP

Background

SC is both a subcontractor for and a competitor of Chip. The high-technology electronics industry has always had a strongly competitive price orientation. To support this low cost/low price emphasis, all of SC's manufacturing facilities, and most of its suppliers, are located in Asia, where production/labor costs are significantly lower.

Industry Pressure for Cost Management and Supplier Impact

In the past 18 to 36 months, a shift in industry forces has created and supported a change in the cost management emphasis in this industry. Recently, the end consumers have gained much influence; they are demanding higher performance, more variety, and lower prices. This is no longer a high volume, low product variety business. This has created greater complexity and higher production cost. As a result, SC's customers, like Chip, are putting more cost/price pressure on SC. SC, in turn, has put more cost/price pressure on its suppliers. For example, about 18 months ago, SC approached its suppliers and told them that it needed a 20 percent across the board price decrease to meet its customer's demands. The suppliers responded that this was not a reasonable expectation, and that the price decrease had to be approached analytically. In some areas, there might be opportunity greater than 20 percent. In other, more mature products, there was little/no cost saving opportunity.

Supplier Collaboration

Thus, SC worked with suppliers to develop reasonable price targets by product, rather than across the board.

Simultaneously, SC developed training courses to work with its suppliers and own internal customers, training them in supply chain management concepts such as collaboration, inventory management, the benefits of forecast sharing, total cost of ownership, and so on. A key concern of SC was to ensure that its suppliers were not damaged by price reductions, but were focusing on cost reduction measures that support improved operational and cost efficiency throughout the supply chain.

Cost Management Approaches

Simultaneously, SC developed should-cost models of key supplier inputs. SC's should-cost approach involves:

- Mapping processes.
- Breaking down and analyzing all that it knows about the supplier processes in terms of cost.
- Considering what the market will bear based on market research (target development).
- Developing detailed should-cost models.
- Estimating supplier's cost structures.

One output of the should-cost effort was the development of generalized models for major cost categories. Another result was an understanding of the key cost drivers of various inputs. This helped SC develop price targets for suppliers and get a better understanding of cost issues over a product's life cycle. Much of this effort was influenced by the high degree of price pressure SC was receiving from its customers, such as Chip. Some of its customers, including Chip, have the same suppliers as SC. Thus, SC's suppliers were being pressured from multiple customers simultaneously.

Supplier Education

Initially, the SC's suppliers resisted SC's new approach. They were accustomed to the traditional price haggling. But suppliers came around as SC educated them. The focus of SC's supplier education efforts have been on the suppliers' top executives, such as CEOs, and their chief technology people. These are the people who can influence and set policy for the rest of the organization. SC even developed a class in supply chain management for its suppliers to deliver to their suppliers. SC also shares some information on its cost structure and profitability with its suppliers, so that suppliers understand the justification for price targets SC gives them.

Importance of Information Technology

Subsequently, SC has also worked with its suppliers on increased electronic information sharing. This has allowed suppliers more control in their planning and manufacturing, and has supported a significant shift toward Vendor Managed Inventory (VMI). Prior to this information sharing, there was excess inventory at all

nodes in the pipeline. This is extremely costly as technology changes rapidly, creating significant obsolescence costs. It is estimated that the annual carrying cost of inventory is between 40 percent and 50 percent in this industry. Today, SC has negotiated agreements with its customers, making the customers responsible for a certain amount of inventory based on the customer's demand forecasts, moving the whole supply chain closer to a make-to-order environment. As a result, SC has been able to reduce its inventory by about 80 percent since this approach was implemented. Its suppliers have had similar reductions, and are enthusiastic about VMI. SC has also been focused on its own Enterprise Resources Planning (ERP) system implementation to improve internal communications among its operations and seven production facilities.

Customer Interaction on Cost Management

SC's suppliers have been quicker to embrace the supply chain cost management efforts than have its customers. As mentioned earlier, this market is extremely price oriented. SC believes that most of its customers still have a price focus. Some customers, like Chip, have developed excellent tools for understanding the costs that drive price, which have helped SC's understanding of costs immensely. While price will always be important, SC believes it is not a sufficient focus for them if they hope to achieve significant improvements. Thus, SC has approached its customers about improving collaborative efforts.

SC's customers are more interested in collaborating in terms of combining their volume and leveraging it with common suppliers than they are on collaborating on improving supply chain efficiency, combining technology roadmaps, and other process-related issues. The emphasis recently has been on how to leverage materials purchases using e-commerce tools, like hubs or market places. As in any industry, the players here are all profit maximizers. There is a hesitancy to get too close and share too much. This creates a barrier to true collaboration. SC sticks with some of its powerful customers like Chip due to its large volume and market presence. However, the customers' relentless search for deep price cuts limits real alliance development.

Earlier Involvement in Design Opportunities

One factor that distinguishes SC from other types of suppliers is that SC is a subcontractor. As a subcontractor, it is more innovative, and generally has more specific design capability and expertise than its customers; many of its customers come to it for its design capabilities. Typically, a customer approaches SC with some information on the design/capabilities it desires and a target cost. SC designs and produces the product. Frequently, the customer will tell SC what material and/or process it should use. However, the technology they are

dealing with is very complex and constantly changing, so the customer may lack the expertise to know whether the specified material/process will really work. This creates time delays and added costs as SC tries to make it work. SC has been working to educate its customers so that its customers get involved earlier in concurrent engineering efforts, at the concept stage. In cases where it has been involved earlier, it has been able to reduce the total design cycle by as much as 75 percent, achieve lower design costs, make better initial decisions and free up resources. So the early supplier involvement definitely contributes to improved outcomes as well as enhanced cost management in the supply chain.

Cost Improvement Opportunities

SC has a process-engineering group that focuses solely on cost improvements. This is a very important group due to the extreme price pressure on SC from its suppliers. SC always meets its customer's target costs. Sometimes it meets these costs before it knows how it will achieve them, but it always meets them. Technology plays the biggest role for SC in meeting cost targets. About 80 percent to 90 percent of its cost improvements come from improving design and application of technology. Only about 10 percent to 20 percent come from commercial opportunities such as price reduction of existing materials. Most of the commercial price reduction opportunities have already been squeezed out of the supply base. All of its major customers have dedicated resources/personnel co-located in SC's factories to collaborate during the production process. A key to real improvement is to have very early collaborative/concurrent engineering efforts in design.

Future Issues

SC is continuing to increase its focus on collaborating with suppliers, and moving into collaborating with and understanding the markets of second tier suppliers. Education has proved to be one of the most valuable tools in improving supply chain performance and cost management.

SC has a goal of being a preferred customer to its suppliers. Relations with suppliers have not always been good, due at least in part to the continual price squeezes. While the price emphasis will never go away, SC is now working closely with its suppliers to facilitate improvement. SC is co-locating engineers at supplier locations, emphasizing process and technology innovations and improvements, and sharing the savings. SC is also benefiting from the efforts of competitors, who are working to improve the same supply base.

Case study participants:

PSM Executive

Two Customer Account Executives that service Chip

NETWORK CASE: SUPPLIER TO TELE

Background

Network is a broadband company with a goal of helping “the world communicate, supplying network equipment, software solutions, and integration services for broadband, multi-service networks that deliver data, video, and voice communications over telephone, cable television, Internet, broadcast, wireless, and enterprise networks.” It is in a challenging competitive environment, and most of its customers have been suffering financially.

Network differs from the competition in that it is smaller than most of the competition, yet it wins business by being flexible and having the ability to meet customer needs quickly. Network’s competitive posture is one of being very customer service oriented, focusing on delivery, service, and bundling. This has always been its approach. Another area that it emphasizes is relationships. It forms very deep and lasting relationships, and has very good working relationships with its customers.

Focus on Cost Savings

In the relationship between Network and Tele, there are no specific cost targets as such. As they negotiate contracts, they do have a good working relationships. Both sides work to maintain margins while Network provides year-over-year cost reductions, or adds value. This is common in all negotiations and contract renewals. Network works to understand its customer’s motivation: cost, service or some combination.

In the past, Tele had its own warehousing/distribution. This was extremely expensive, because this is not Tele’s core business. Tele bought directly from Network. Network worked with Tele to help it locate a distributor that could handle Network’s product and non-competitive products that Tele also uses. One order can now deliver all a technician’s needs in many cases. Network also worked with Tele to help it locate and work with minority suppliers as distributors. Tele pays a slight mark-up for a huge reduction in administrative costs. Network helped Tele identify critical issues such as the support Network needed, the service and software the potential suppliers could support, and similar issues.

An example of another program on which Network worked with Tele is that Network participated as a pilot supplier on Tele’s supplier quality program. The quality program reduced or eliminated Tele’s need for inspecting Network’s components, creating significant savings for Tele. Tele does not share cost savings with Network. It is not a standard practice to share cost savings in this industry. It is an extremely competitive industry.

Cost is a constant issue in this industry, and in dealing with Tele, Network’s sales model is not to be the low price provider, but to sell based on value. It has to make sure that customers get the service they expect. On a strict bidding war, Network loses.

In working with Tele, Network can look at administrative costs, and bring Tele new ideas. Tele is willing to consider value vs. just price, because Tele understands the value of looking at the total cost and service package. Network believes that in the long run, Tele has gained a great deal from looking at the total cost perspective.

As a company, Tele/Network have some joint teams. Network has worked closely with Tele on minority supplier development and reporting. Network also participated on a quality team, as mentioned above. They work together on teams on a pretty regular basis. Tele is sensitive not to get Network involved in too many things, but the teaming with Tele is growing.

Tele Relationship

Network and Tele have a long-term relationship. They have been working together for eight to 10 years. During that time, it has strengthened considerably, becoming a close working relationship. Network has a team of three to four account specialists for their key customers like Tele. When Tele calls in, the Network personnel that it deals with are familiar with its business, the products it uses, the applications, and its pricing. That further adds value and helps personalize the relationship. This is the way that Network competes; it can’t win based on price due to its relative size vs. competition. It works closely with its large customers on systems and services.

Supplier Relationships

Historically, Network has not had as great a focus on supplier relationships because it is very vertically integrated. To a great extent, the raw materials that it purchases are commodities. However, the focus on suppliers, supplier relationships, and supplier cost management is growing as Network outsources more. It does work with some suppliers on helping the suppliers reduce costs. Network has a top 20 to 25 preferred supplier program where it works with some key suppliers as long-term partners.

Key Success Factors and Lessons Learned

In successfully working with its customers on a value-based approach, Network must make a lot of promises initially. But the results it helps its customers achieve speak for themselves. Network focuses on delivery of the value-added aspects of the relationship. It builds a budget for these expenses, supports and plans for value-added activities. It must consistently do what it says it will do. Its customers measure its performance and have high expectations.

As a manufacturer to service providers, Network finds that it may be difficult for the customer to really understand manufacturing costs, cost structures, etc. Customers would like to believe that if it identifies suppliers for Network, it would save them money. But manufacturing is Network's business, so it generally knows where the opportunities lie. Some customers' cost savings ideas actually increase Network's cost of doing business. Thus, Network may need to educate customers a bit in that regard.

Overall Cost Focus

Network's internal incentive program includes all employees. As part of that, every person in the company is evaluated based on his or her contribution to cost savings within the company. This applies to each person in the company, from the mailroom to the factory to key execs.

The engineering group is also constantly looking at all phases of engineering: development, manufacturing, continuation engineering (for mature products), and how to achieve cost efficiencies for each product at every stage of its life cycle. The engineers constantly look for commonalities and ways to improve. There is a continuous improvement focus that spans the range from negotiating better with more leverage to better utilizing the learning curve, and related issues.

Manufacturing engineers also design and develop improvements in production equipment. They improve on the standard equipment that they buy in order to reduce costs. The cost focus permeates the company; it is part of the culture of the company. Several years ago Network switched to using Economic Value-Added (EVA) as a key basis for evaluating company performance, and its performance has really improved.

MCJUNKIN CASE: SUPPLIER TO PRAXAIR

Background

McJunkin is a family owned and operated, \$800 million distributor of industrial pipe, valves and fittings (PVF). Ninety percent of its revenues are derived from distribution. About one-third of those revenues are tied into integrated supply relationships. The level of integration varies significantly, from integrating all of the supplies from various manufacturers and distributors for a customer, to running the customer's warehouse, stores, and even acting as a full-blown purchasing department, integrated supply is the fastest going aspect of McJunkin's business. The focus on integrated supply involves only those customers whose primary maintenance, repair, and operating supply (MRO) consumption is pipe, valves, and fittings.

Relationship with Praxair

McJunkin has been in its current integrated supply relationship with Praxair since January, 2001. Praxair's account representative from McJunkin has worked with Praxair for 15 years in a variety of capacities. The focus has been on identifying and implementing creative purchasing concepts. As part of its integrated supply relationship, McJunkin has a branch site at Praxair's technical center. Praxair and McJunkin share virtually everything at that center: equipment, machinery, computers, and so on. The goal is to take all redundant costs out of the supply chain.

Another significant cost savings effort that McJunkin has worked on with Praxair is identifying second tier suppliers of items and eliminating as many as possible. The rationale behind this in a distribution setting is to simplify the supply chain and reduce number of levels and times that profit is made. These second tier suppliers are suppliers of other MRO items to Praxair. McJunkin can get them direct over 80 percent of the time, and reduce markups, taking cost out the chain. Praxair uses some proprietary/custom parts that McJunkin cannot get direct. However, McJunkin serves a number of other air products/chemical companies as well, so is aware of potential substitutes and is working with Praxair on the viability of these substitutes.

In addition, from McJunkin's perspective, Praxair has done a good job on the front end in managing these proprietary suppliers, and having suppliers hold inventory. McJunkin now manages most of the second tier relationships. McJunkin can also get greater leverage even with some of these proprietary suppliers by combining Praxair's volumes with other customers.

Information sharing between McJunkin and Praxair on pricing and other sensitive issues is done at a high level – director level. Information is shared two ways. McJunkin's computer systems are very secure to protect information transfer to or from competitors. The scope of contact for sensitive information is very limited to ensure confidentiality.

Praxair Processes

McJunkin is working closely with Praxair on Praxair's Six-Sigma teams. Some major goals of these teams are to reduce rework and increase contract compliance. Praxair and McJunkin are spending a lot of time talking about and working to improve compliance issues, understanding the benefits of compliance and related issues. Representative from McJunkin have been accompanying Praxair purchasing people and others to site locations to educate users on the benefits of using McJunkin's automated ordering system in terms of rework, order accuracy, quality, and cost. This improvement effort is viewed as a partnership. Praxair very much understands

and embraces the total cost of ownership/value concept. This is the basis on which McJunkin tries to establish relationships with its customers. This approach is much more sustainable and mutually beneficial than only a first-price approach.

Praxair expects McJunkin to be proactive and come to them with cost advantages. McJunkin has achieved a benchmark/goal of saving \$24,000 per month. The new target is to do as well or better than this. While it had no specific goal in mind, it had identified a rough savings target. This philosophy of continuous improvement has been going on since the early '90s. Ideas and suggestions come from both sides. This is how it developed the idea to share assets in the supply center that McJunkin runs for Praxair. It is a win for both parties. The continuous improvement attitude is just part of their culture of working together.

Praxair does not share cost savings with McJunkin. Cost savings are an expectation that allows McJunkin to continue to win the business, and be presented with increased opportunities for additional business. The integrated supply relationship between McJunkin and Praxair has been in place in its current form for over a year. The account representative from McJunkin views himself as the current custodian of the McJunkin/Praxair relationship.

Praxair's Influence on McJunkin

McJunkin has brought many ideas to Praxair and learned much from Praxair as well in terms of identifying and implementing cost savings. Cost management is an integral part of the long-term relationship between Praxair and McJunkin. McJunkin must continue to prove itself and earn its business. Praxair is tough but fair with McJunkin.

McJunkin's Supplier Relationships

McJunkin tends to have long-term supplier relationships, and relies a great deal on leverage over both time and quantity with these suppliers wherever possible. In much of the industry, pricing is based strictly on volume level. McJunkin is beginning to implement some strategic supplier initiatives and supply base reduction to further focus its volume. It just re-examined its supply base for a certain type of valve, committing to the suppliers, asking for price and field support advantages, to really form a partnership. If this is successful and provides advantage, McJunkin will spread this idea to other areas where it is beneficial. In general, the suppliers and McJunkin's interests are well aligned.

McJunkin's Processes for Managing Customer Costs

In the economic recession, McJunkin has found that there is much more interest in the integrated supply arena.

Companies want McJunkin to provide them with more service due to the increased opportunity for cost savings. Customers save a great deal on administrative costs just by not bidding each project. It also lets key customers' maintenance subcontractors buy from McJunkin at that customer's prices so that the customer can enjoy the savings.

McJunkin positions itself as the quality player. It uses its focus on value and life cycle cost/total cost of ownership as a marketing tool. McJunkin has worked closely with its customers to develop software that accounts for and assigns a value to every available savings opportunity and then provides customers with regular reports on documented savings at each of their locations. These spreadsheet summaries, provided by McJunkin, help customers get the big picture on real costs and savings for all aspects of their operations, from a TCO perspective.

McJunkin has designed a system that it calls Value Plus®, as a knowledge center to support its salespeople in delivering cost-savings ideas to its customers. It is a database that breaks down the operations of a facility and identifies common inefficiencies and solutions providing sales staff with ideas and places to begin. In part of the initial selling process or the ongoing relationship, they will commit to a customer for specific cost savings. They can also engage in risk-reward sharing contracts, where savings are shared once McJunkin exceeds its goals. This creates a greater two-way incentive.

The steps in McJunkin's Value Plus®, system begin with projecting customer savings based on conducting a comprehensive survey of the supply operations and related costs. Next, it tracks the savings against projections based on the actual savings achieved. It then provides customers with full documentation of their actual cost savings and regular savings reports. This information includes savings from faster, easier transactions, reduced inspections and testing, reduced rework, better life cycle costs, and other factors. The savings documentation is available for any time period (including monthly, quarterly, or annually), for specified categories or all categories, at a specific site or company-wide (for national accounts).

Documentation of savings to customers is very important. McJunkin's value proposition to prospective customers is to work the supply chain costs to the advantage of the customer. About 82 percent of McJunkin's costs are cost of goods. It does not have much to cut, so it must add value. Most of its internal costs are the costs to serve the customer. McJunkin has to educate the customer to focus on the 82 percent of the cost structure, and understand process costs, value, TCO.

The major sources of savings from Value Plus, include savings from:

- Improved materials management/availability.
- Improved transactions management using numerous electronic transactions to help customers reduce time and manpower involved in workflow processing.
- Managed services, including outsourcing to McJunkin storeroom management, integrated supply and purchasing services.
- Product cost management via standardizing products and streamlining inventories, suggesting substitutes and ways to reduce consumption.
- Product and process application, enhancing quality to end incoming inspections and reduce rework, improve life cycle costs.

McJunkin has countless examples to demonstrate how being a first price or low-price only buyer can actually end up costing the organization significantly more money.

Key Success Factor in Continuous Improvement with Customers

Above all, McJunkin identified a collaborative environment, with a clear understanding of the economics of the supply chain in working well with customers. It helps immensely if the customer understands TCO, and there is participation in the integrated supply relationship beyond purchasing, to include the decision-makers in engineering, operations, and other relevant parties. Purchasing needs to have cooperative relationships with other internal groups.

McJunkin also recommends that customers should negotiate savings expectations in their contracts with suppliers. This creates specific pressure for the supplier, such as McJunkin, to perform and create the best cost-savings opportunities possible for the customer.

Case Participants:

Account Executive to Praxair
Corporate Account Executive

MAJOR DISCOUNT RETAILER CASE: CUSTOMER TO LCP

Introduction

Major Discount Retailer (MDR) is one of LCP's customers. MDR is currently undergoing a re-engineering or transformation effort aimed at dramatically changing its supply chain and business model to embrace a customer focus while fixing its supply chain. MDR is radically changing its supply chain, taking a long-term, big-picture view rather than focusing on how to get the lowest price

today. In the past, rather than providing incentives for suppliers or collaborating with suppliers, MDR behaved in a reactive manner, penalizing suppliers for a whole host of non-compliance issues. Thus, instead of directing suppliers' attention on how to do things better, its focus was on how to avoid fees and penalties. This mentality also created an adversarial culture between MDR and its suppliers. Cost management was treated as an issue separate from supply chain value. Management directed its efforts more in terms of price to MDR than looking at true costs in the supply chain.

Customer Impact

Today, the focus is on simultaneously understanding the cost and value drivers in the supply chain. The focal point is on serving the ultimate retail customer. This includes removing the waste and redundancy from the supply chain that creates higher cost without commensurate value. For example, MDR's promotional spend had doubled in the last five years or so. Yet all of these promotions were creating huge costs and supply chain inefficiency, as MDR placed huge orders to fulfill promotional demand, then drastically reduced buying for that item. It was buying its customers with low prices, not with value creation. Today, MDR recognizes that in order for its cost management efforts to be effective, it must examine how it serves its customers and its own irrational behavior in its supply chain. It is moving towards an everyday low price mentality rather than a deep discount and promotional approach.

Supplier Relations in General

MDR feels that it has treated all but a few of its key suppliers as commodities in the past. It recognizes that true collaboration is required for both it and its suppliers to be successful. It is moving in that direction.

As a show of good faith to support its move toward more positive supplier relations, MDR has suspended all penalties associated with its supplier compliance program for 100 days. It is re-evaluating its approach to supplier compliance, and intends to focus on only a few standard issues, such as bad universal product codes (UPCs). It will work collaboratively with its suppliers to solve all other problems. It has also responded to suppliers' complaints that it was unresponsive to suppliers' questions and comments. MDR has recently instituted a supplier tracking system to ensure that 100 percent of the suppliers' issues are resolved.

Its overall supply chain direction related to suppliers includes:

1. Getting the basics of good supply chain management in place.
2. Rationalizing the supply base.
3. Increasing supplier partnerships.

It is working on several key initiatives aimed at taking costs out of the supply chain. Before MDR begins to proactively work directly with suppliers to reduce their costs, it is developing an understanding of the poor practices that it employs, and how these practices affect the supply chain and the costs of its suppliers. It is moving more in the direction of supplier-managed inventory, and on improving its logistics operations, including quick unloading of trailers rather than using supplier's trailers as temporary warehouses. It realizes that its own practices represent a large part of the supply chain cost savings opportunity. It sees itself as going through a correction in its business practices. MDR is also outsourcing in some areas it would have never considered outsourcing in the past, such as some distribution. The Chairman of the Board of MDR is on record as saying that MDR can have no real improvement and change in its supply chain unless it significantly improves its relationship with its suppliers.

MDR's Relationship with LCP

MDR has had a very close working relationship with LCP, so much so that MDR has not historically beat up LCP like it has many of its other suppliers. MDR credits LCP with taking the initiative to maintain that relationship. MDR notes that it is difficult to quantify all of the savings that LCP has generated for MDR. However, LCP has been instrumental in helping MDR think about and evaluate its supply chain philosophy, and recognize some of the opportunities to improve its supply chain. For example, LCP worked with MDR to set up a project to track its out of stock and overstock costs and causes, and help MDR really see the opportunities for supply chain improvement in its own behaviors. MDR sees LCP as a model supplier, and would like to replicate the type of relationship it has with LCP with other suppliers.

Case Participant: Vice President of Operations

Appendix F:

Literature Review

Cost is a driving force in purchasing today, as it always has been. In a recent study entitled, *Major Structural Changes in Supply Organizations* (Leenders and Johnson, 1998), cost was mentioned as one of, if not the only dominant environmental pressure causing change in purchasing organizational structure for all of the 15 organizations studied. This was a pressure whether the organization moved from centralized to decentralized, decentralized to centralized, or to or from a hybrid organizational form. With the growing pressures of increased global competition and rising customer demands, cost is a pressure that no organization seems to escape today. Increasingly, we see companies attribute favorable surprises in profitability performance to effective cost management. Companies such as JC Penney (Forest, 2002) and General Electric (General Electric 2001 Annual Report) show improving profit despite lower sales revenue due to improved cost management

Two CAPS Research studies that focused on cost management were published in the 1990s. The first, *Total Cost Management* (Ellram, 1994) focused specifically on how organizations try to better understand their true costs of doing business with particular suppliers, or using particular processes. *The Role of Supply Management in Target Costing* (Ellram, 1999) examined the target costing process and how organizations use it internally and in relation to their customers and supply bases. One of the findings of that study is that cost management approaches such as target costing are not isolated initiatives, but rather one supporting approach in a web of approaches that organizations use to support new product development and better manage their costs. Indeed, Cooper and Slagmulder (1999) argue that target costing is the foundation of strategic cost management. In their book, *Supply Chain Development for the Lean Enterprise*, they argue that target costing and working with suppliers are the foundation and basis for strategic cost management in the supply chain. However, while

they stress the importance of supplier management and properly segmenting the supply base for cost management, they do so from an accounting perspective. Their case studies all took place in Japan, where purchasing does not play a major role and, in many cases, does not even exist as a distinct function or process. Their book provides an excellent framework and insights, but does not directly explore the role of PSM in strategic cost management in the supply chain.

Most of the research studies and popular articles that have been written exploring PSM's role in cost management look at one particular cost management technique such as total cost of ownership (TCO) (Ellram and Siferd, 1998; Degraeve and Roodhooft, 1999), target costing (Ellram, 2001b; Newman and McKeller, 1995), cost analysis and should-cost analysis (O'Connor and Hopkins, 1997; Burt, Norquist and Anklesaria, 1990) and price analysis (Woods, 1998; Graw, 1998). Each of these tools, if applied independently without reference to the way other cost management tools and processes are being used or without regard to the organization's objectives, becomes a tactical approach to cost management rather than a strategic approach. The goal of this study is to look at cost management strategically: How do various approaches to cost management fit together and support the organization's overall strategy, value proposition, and extend beyond organizational boundaries into the supply chain?

The purpose of this study is to use the existing literature and frameworks to better understand the role of supply management in strategic cost management in the supply chain, looking at both the upstream and downstream supply chain issues. To do this, a framework of strategic cost management is used. This theory was developed in the accounting literature.

Strategic Cost Management Theory

Strategic cost management, in order to be truly strategic, is grounded in three elements:

1. Developing an understanding of what drives cost in the supply chain.
2. Understanding the customer value proposition upon which a particular business is based.
3. Understanding the organization's supply chain (Shank and Govindarajan, 1993).

This research examined PSM's involvement in and understanding of each of these key elements of strategic cost management. The first element, understanding of supply chain cost drivers, is explored in terms of how PSM interacts with suppliers in cost management, what cost management tools and processes are used, and how results are measured. The second element, the customer value proposition, is examined in terms of how PSM comes to understand the customer's needs and incorporates value into its cost management processes. The third piece, taking a supply chain perspective, deals with how the organization translates customer needs into its internal processes and supplier interactions. Do they take a supply chain perspective?

Appendix G:

Research Design

This study was conducted to answer the following research questions:

1. How important is strategic cost management in the organizations studied, and why?
2. How are firms organized to effectively achieve strategic cost management?
3. Who is responsible for conducting cost management in the organization, and who is accountable for delivering results?
4. How do organizations determine the focus of their cost management efforts?
5. What specific cost management tools do organizations use to support strategic cost management?
6. How are the results of cost management efforts reported?
7. What other unique processes or organizational structures contribute to the success of strategic cost management efforts in the organization?
8. What impact do supplier relationships have on the organization's cost management approaches?
9. What is the supplier's perspective on the organization's cost management efforts?
10. What impact do customers have on the organization's cost management approaches?
11. Does the organization take a true supply chain management perspective of strategic cost management?
12. What are the key success factors and barriers to strategic cost management?
13. What is the future of strategic cost management in your organization?

Design

This study was conducted using an in-depth case study research method. This method was chosen to support the broad and exploratory nature of the research questions of

interest (Yin, 1994; Meredith, 1998). In developing the content and research issues for the study, the researcher presented the research proposal to a group of purchasing and supply management professionals and first tier suppliers who are all members of an organization called the National Initiative for Supply Chain Integration (NISCI). The input of these PSM professionals was used to modify the research design.

Sample Selection

The case study participants were chosen using critical case sampling. Critical case sampling is a type of purposive sampling (Neumann, 1991) that looks for cases that are “particularly information rich or enlightening” in relationship to the questions under consideration (Kuzel 1992; Yin 1994). The point of this sampling method is to allow for logical generalization in such as a way that the information in the cases can be applied to other similar cases. The case study organizations were identified and selected in a number of ways. First, members of NISCI who are actively involved in supply chain cost management were asked to participate. Members of CAPS Research also were presented with the criteria and asked to participate in the study during the CAPS Research 2001 Executive Purchasing Roundtable North American Venue.

The criteria for participation were as follows:

1. Active involvement in cost management efforts working with suppliers and/or customers to reduce supply chain costs.
2. Belief that some of your organization's cost management practices are leading edge/innovative.
3. Significant bottom line savings to the organization through supply chain cost management efforts.
4. Willingness to openly share thoughts and processes involved in supply chain cost management.

5. Willingness and ability of the initial contact to act as a liaison to provide the researcher with entrée to other members of the organization, the supply base, and customers.

Upon volunteering or expressing a willingness to participate in the study, potential participants received a letter thanking them, and providing them an overview of the study purpose. These are shown in Appendix B. The researcher then followed up with a telephone interview to confirm that the organization had the characteristics desired, and the willingness to support the study through all of its phases. Several companies that volunteered to participate were screened out at this stage of the research.

Engaging the Core Company

Upon determining that the core company displayed the desired characteristics, the researcher spoke to the key contact who had volunteered to be part of the study, and began to set up interviews with key informants within the organization. The initial contact may or may not have been included as a key informant. The researcher used a modified snowball technique for identifying individuals to interview as part of the case study. In this application of the snowball method, an initial informant or group of informants was identified. Traditional forms of the snowball technique begin with a random selection of initial respondents (Green and Tull, 1978), which was not appropriate in this research. As these informants participate in the research and come to develop an understanding of the research and its purpose, they identify other informants. This process continues until the researcher reaches a point at which the informants cannot identify anyone that they think will add significant additional value, or the informants begin to become redundant (Kuzel, 1992). This approach was used to identify most of the participants from the core case study organizations, all of the suppliers, and the one customer organization that participated.

Engaging Others in the Supply Chain

As part of agreeing to participate in this research, all of the primary contacts were asked if they would be willing and able to help the researcher get in touch with a key supplier and a key customer with whom the core case study believed that it had successfully worked on strategic cost management. Each of the organizations agreed to this. In reality, making contact with a key supplier and a key customer turned out to be one of the most time consuming aspects of this study. The core company provided the researcher with one or more supplier contacts in all cases, and made the initial contact with the supplier. Despite this, the core company had to intervene on the researcher's behalf and make multiple contacts in all but one of the cases in order to get any response. It was common for five to six months to pass between initial

identification of a supplier and actual engagement. Part of this was due to the state of the economy: Many people were changing jobs, being laid off, and under more work pressure than usual. In such circumstances, supporting any activity that is not core to the organization's success takes a low priority. The researcher greatly appreciates the diligence of the core participants in following up with their suppliers. A similar pattern occurred with the researcher's attempts to make contact with the core companies' customers. This was even more challenging because the key contact was generally more steps removed from the customer, and had to sell to a key account representative or sales executive the idea of letting the researcher talk to a customer. This sell did not always work. After repeated attempts and follow-ups with the core companies and the contacts they provided, the researcher was able to successfully interview only one customer. The difficulty for PSM to gain access to customers was in itself a finding. The researcher decided not to pursue customer contact independently of the core company. That would have been a violation of the initial agreement between the researcher and each core company. In addition, the researcher asked one of the core companies about the approach of having the researcher make direct contact. The company specifically asked the researcher not to do this.

Focus of the Study

In this research, the analysis focused on the PSM group within the core organizations studied. While many perspectives beyond that of PSM are included in this research, the purpose of this research is to gain an understanding of PSM's roles, responsibilities, and influences in strategic cost management in the supply chain. The point of involving parties outside of PSM in the research is to broaden the perspective and reduce the bias that might come from PSM, or any function, reporting on its own activities. In addition, the focus of this study is limited to the period when data collection began to when it ended for each core organization.

Interview Protocol

An extensive interview protocol was developed for the research as shown in Appendix B. The participants were asked different questions based upon their functional representation, and whether they were a supplier, customer, or part of the core case organization. All participants received an abbreviated version of the research proposal, a letter of introduction explaining their role in the study and the confidentiality issues, and a copy of the general questions that would be addressed in the course of the research. The interview protocol was validated by a panel of PSM executives who are interested in strategic cost management in the supply chain from PSM's perspective. The research protocol was also pre-tested on one case study organization and modified accordingly.

Conducting the Case Studies

The interview protocol provided a series of semi-structured, open-ended questions to guide the overall discussion with case study participants. Participants were not prompted with particular answers or ideas; the conversation was allowed to flow. This helps reduce research bias and provides a fresh perspective (Yin, 1994; Strauss and Corbin, 1998). In addition, a semi-structured approach allows the researcher to delve more deeply into unanticipated lines of discussion, and uncover new, previously not considered insights (Yin, 1994; Crabtree and Miller, 1992; McCutcheon and Meredith, 1998). If the researcher found a particularly fruitful or interesting issue, she would deviate from the protocol.

The case study interviews were conducted on both the telephone and in person, based on the availability and preference of the respondent. The researcher met face-to-face with at least one person from each of the core case study organizations. The length of the interviews varied from approximately 90 minutes to three hours. The number of people interviewed and their functions varied among the organizations, based on the snowball technique. A summary of the representation of case study participants is shown in Table 4. In all core cases, representatives from PSM and finance/accounting participated in the case studies. Individual cases summarizing the respondents' comments were prepared and e-mailed to the individual respondents for comments. These were very detailed, beyond the summary cases included in Appendix A. Participant feedback was incorporated and the case modified. A summary case was prepared for the organization and again e-mailed to the participants for feedback. In one of the cases, this resulted in the researcher conducting two additional interviews, based on the respondent's input.

Four of the five supplier cases were conducted on the telephone. The calls ranged from 90 to 150 minutes, not including follow-up. At three of the five supplier case studies, only one informant was engaged, generally a customer relationship manager/key account representative. At one supplier, an executive account

representative and the supplier's immediate contact were engaged. At a third supplier, two account representatives and a PSM executive participated in the study. All of those interviewed had long relationships (from five to 20 years) with the customer. Further, the researcher interviewed one key customer with whom the case study believed it had achieved successful cost management results. The interview with the customer was conducted via telephone with the customer's Vice President of Operations, who had worked very closely with the supplier for several years.

Other Sources of Evidence

In addition to interviewing multiple informants representing multiple functions in each of the core case study organizations, interviewing a supplier to each of the core companies, and interviewing one customer, the researcher gathered other evidence to support the research. This evidence included copies of internal and public presentations made by the organizations on related topics, copies of articles written about the companies, organizational charts, copies of internal processes and procedures, copies of case studies written about the companies, previous research conducted related to the companies, and information from the companies' websites and financial statements. Gathering these data helped to support the case study database upon which the analysis was conducted. While case study research may be inefficient in that large amounts of data are gathered in order to determine patterns and draw conclusions, it provides important insights that are not available from other forms of research (McCutcheon and Meredith, 1993).

Data Analysis

The case studies were coded for analysis using Nud*ist Vivo® software for qualitative research. This software was used primarily for between-case analysis. Within-case analysis was conducted first by classifying the answers provided by the informants to correspond with the research questions, and then combining all of the individual cases from one organization into one case study representing the organization. The data was

Table 30
Case Study Participants

CASE	PSM	OTHER INTERNAL*	SUPPLIERS	CUSTOMERS	TOTAL
Deere	6	3	1	-	10
Chip	5	7	3	-	15
LCP	4	4	2	1	11
Tele	8	3	1	-	12
Praxair	4	1	2	-	7
Total	27	18	9	1	55

*Titles/positions of each participant are available in the appendices to this report at the end of each case study

analyzed using open coding to develop basic categories for analysis, axial coding to link the various categories together, and selective coding to integrate concepts and link related issues (Strauss and Corbin, 1998). This method of analysis employed a form of an iterative triangulation process, whereby published data and case studies, literature, and primary data from case organizations are all used to develop an understanding of the phenomenon of interest (Lewis, 1998). Many tables were created to analyze and compare the data among the organizations studied. This helped identify patterns and provide insights and additional lines of analysis.

Validity

A number of measures were used to increase the validity of the study, as shown in Table 5. *Construct validity* addresses the issue of whether the variable identified is really the variable being measured. *Face validity* deals with whether a knowledgeable person would agree that the issues being studied appear to be addressed in a reasonable manner. *Internal validity* addresses whether the proposed cause-and-effect relationships have been established. *External validity* explores whether the findings from the study are generalizable to other organizations or settings. *Reliability* addresses whether the study's results could be replicated and would result in similar findings (Yin, 1994, p. 41).

The use of multiple informants within each case, supplier participation, multiple cases exploring the same phenomenon, triangulation of data and the case study

data base, having case participants review the case studies, and the use of a case protocol all increase the validity of the findings (Yin, 1994; Strauss and Corbin, 1998; McCutcheon and Meredith, 1993).

Table 31
Tactics Used to Increase Validity

Construct Validity	-External business executives review interview protocol research proposal
	-Use multiple sources of evidence as included in the case study database:
	• Multiple informants
	• Internal and external informants
	• Multiple sources of evidence including presentations, web-sites, published articles
	-Have key informants review case study draft report
Face Validity	-External business executives review
Internal Validity	-Pattern matching
	-Multiple informants from within the same company review study
	-Multiple informants from within the same company report on same phenomenon
External Validity	-Replication with five core companies and five suppliers
Reliability	-Use case study protocol
	-Develop case study database
	-Triangulation

Adapted from Yin, 1994; Ellram, and Siferd, 1998.

Appendix H:

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