SUPPLY CHAIN MANAGEMENT PRACTICES IN SMES: AN EMPIRICAL STUDY

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ABSTRACT

Supply chain is a major competitive strategy to enhance organizational productivity and profitability. For many small and medium enterprises, however, the focus on supply chain has been driven by survival issues. Based on extensive literature review we designed a seven-area supply chain management practices framework and evaluated small and medium enterprises in Southern Massachusetts through a survey mechanism.

Keywords: supply chain management, SME, survey, evaluation, SCM strategy

INTRODUCTION

Supply chain management (SCM) is a cross-functional approach including managing the movement of raw materials into an organization, internal routing of materials into finished goods, and the movement of finished goods out of the organization towards the end-consumer. As organizations strive to focus on core competencies, they reduce the ownership of raw materials sources and product distribution channels. The inbound and outbound functions are increasingly being outsourced to other entities as the business-partners can perform these activities better or in more cost effective way. Thus, the central purpose of supply chain management has been to improve trust and collaboration among supply chain partners (Baofeng, 2012; Gunasekaran, Patel and McGaughey, 2004). However, for many small and medium enterprises (SMEs) the focus still has been on improving internal operations so as to keep operationally viable in today’s competitive market. The emphasis on SCM activities has at best been guided by survival issues. The large enterprises on the other hand have made great headways in implementing SCM.

This paper deals with the enablers and barriers of supply chain in SMEs. The level of investment in software and technology, particularly in the areas of purchasing, logistics, and inventory management, is an important enabler. The level of collaboration among supply chain partners is also another important factor in supply chain success. How well the supply chain management is integrated into the overall business strategy also needs to be studied. We emphasize in an evaluation of the current state of supply chain in the directions mentioned above in SMEs with a survey analysis.

Our work is based on seven (7) areas of practices for effective SCM performance as shown in Figure 1. These seven areas - Characteristics of Supply Chain, Supply Chain Strategy, Green
Supply Chain, Organization Structure, Supply Chain Vulnerability, Supply Chain Risk Management, and Performance Evaluation – are supported by extensive literature review.

![Figure 1: Supply Chain Management Practices - Framework](image)

In order to have a better understanding of the extent of SCM practices in SMEs and the applicability of the proposed framework, we designed a survey and administered it to small and medium companies in the South Coast of Massachusetts. The aim of the survey was to determine whether manufacturing companies, particularly SMEs, apply SCM activities and if they do then to what extent? A particular focus of this study was to determine how successfully the supply chain managers are advancing SCM capabilities in the South Coast of Massachusetts.

The seven areas that influence SCM practices (as shown in Figure 1) are described in detail below.

**Characteristics of Supply Chain**

SCM was developed to express the need to integrate the key business processes, from end user through original suppliers. The basic idea behind the SCM is that companies and corporations involve themselves in a supply chain by exchanging information regarding market fluctuations and production capabilities.

The primary objective of SCM is to fulfill customer demands through the most efficient use of resources, including distribution capacity, inventory and labor. In theory, a supply chain seeks to match demand with supply and do so with the minimal inventory. Various aspects of optimizing the supply chain include liaising with suppliers to eliminate bottlenecks; sourcing strategically to strike a balance between lowest material cost and transportation, implementing JIT (Just In Time) techniques to optimize manufacturing flow; maintaining the right mix and location of...
factories and warehouses to serve customer markets, and using location/allocation, vehicle routing analysis, dynamic programming and, of course, traditional logistics optimization to maximize the efficiency of the distribution side.

**Development of Supply Chain Strategy**

Six major movements can be observed in the evolution of SCM studies: Creation, Integration, Globalization, Specialization Phase One, Specialization Phase Two and SCM 2.0 (as per Lavassani et al., 2008). Depending on the stage (era) SCM strategy is likely to vary across the companies. The highest level of SCM development is termed as SCM 2.0 to describe both the changes within the supply chain itself as well as the evolution of the processes, methods and tools that manage it in this new era.

SCM 2.0 leverages proven solutions designed to rapidly deliver results with the agility to quickly manage future change for continuous flexibility, value and success. This is delivered through competency networks composed of best-of-breed supply chain domain expertise to understand which elements, both operationally and organizationally, are the critical few that deliver the results as well as through intimate understanding of how to manage these elements to achieve desired results. Finally, the solutions are delivered in a variety of options, such as no-touch via business process outsourcing, mid-touch via managed services and software as a service (SaaS), or high touch in the traditional software deployment model.

**Green Supply Chain**

In business today, companies cannot ignore environmental issues. Increasing government regulation and stronger public mandates for environmental accountability have brought these issues into the executive suite, and onto strategic planning agendas. At the same time, companies are integrating their supply chain processes to lower costs and better serve customers. These two trends are not independent; companies must involve suppliers and purchasers to meet and even exceed the environmental expectations of their customers and their governments (Walton, Handfield and Melnyk, 1998). The number of supply chain environmentally-friendly practices (EFP) which were identified by qualitative research methods for case-based research.

**Organizational Structure**

In today’s business climate, of course, adaptability and agility are keys. Your strategy may be changing more frequently than ever, and your supply chain organization needs to keep up with the changes you’re making, whether large or small. Such restructurings may require that you redefine roles and responsibilities to focus on changed objectives, reduce process complexity, or develop new competencies and skills for newly required capabilities. Or you may simply have the need to “clean house” or redeploy resources that are not performing to expectations.

Senior management teams across many industries are increasingly realizing how strategic their supply chain is to business: that it is, in fact, one of the critical success factors—for profitability as well as productivity. Yet configuring a supply chain strategy that aligns with the business strategy and organizing both people and process around that strategy, are no easy matters. Just as there is no universal definition for the supply chain organization, there is no one-size-fits-all approach for crafting that organization (Halldorsson, Kotzab and Skjott-Larsen, 2003).
are, however, several characteristics of effective organizations that should be incorporated into any design are:

- The organization is aligned to support the overall business strategy.
- There is agreement on what internal core competencies are needed.
- The organization is capable of executing all required supply chain processes—whether through internal capabilities or strategic partnerships with companies that can provide required competencies.
- Metrics are in place to provide objective information about organizational effectiveness.
- A set of practical design principles is used to structure and populate the organization.

Supply Chain Vulnerability

Supply chain vulnerability is defined as an exposure to serious disturbance, arising from risks within the supply chain, as well as risks outside of the supply chain (Peck 2005). Supply chain risk and vulnerability, should be regarded as a multi-dimensional construct, in an end-to-end supply chain context, thereby including anything that presents a risk, a hazard or any form of impediment to information, material and product flows from original suppliers to the delivery of the final product to the ultimate end-user.

Supply Chain Risk Management

The strategies to manage risk include transferring the risk to another party, avoiding the risk, reducing the negative effect of the risk, and accepting some or all of the consequences of a particular risk. Certain aspects of many of the risk management standards have come under criticism for having no measurable improvement on risk even though the confidence in estimates and decisions increase (Hubbard 2009). In ideal risk management, a prioritization process is followed whereby the risks with the greatest loss and the greatest probability of occurring are handled first, and risks with lower probability of occurrence and lower loss are handled in descending order. In practice the process can be very difficult, and balancing between risks with a high probability of occurrence but lower loss versus a risk with high loss but lower probability of occurrence can often be mishandled.

Performance Evaluation

There are a variety of supply chain models, which address both the upstream and downstream sides. The SCOR Supply-Chain Operations Reference model, developed by the Supply Chain Council, measures total supply chain performance. It is a process reference model for supply-chain management, spanning from the supplier's supplier to the customer's customer (Chen and Paulraj, 2004). It includes delivery and order fulfillment performance, production flexibility, warranty and returns processing costs, inventory and asset turns, and other factors in evaluating the overall effective performance of a supply chain.

The Global Supply Chain Forum (GSCF) introduced another Supply Chain Model. This framework is built on eight key business processes that are both cross-functional and cross-firm in nature. Each process is managed by a cross-functional team, including representatives from logistics, production, purchasing, finance, marketing and research and development. While each process will interface with key customers and suppliers, the customer relationship management and supplier relationship management processes form the critical linkages in the supply chain.
The American Productivity & Quality Center (APQC) Process Classification Framework (PCF) SM is a high-level, industry-neutral enterprise process model that allows organizations to see their business processes from a cross-industry viewpoint. The PCF was developed by APQC and its member companies as an open standard to facilitate improvement through process management and benchmarking, regardless of industry, size, or geography.

**RESEARCH METHODOLOGY**

An extensive literature review on SCM was conducted to establish the rationale of this study. The SCM practice framework as discussed above is supported by the literature. The literature review also provided the direct inputs to the survey questionnaire design.

The data collection was conducted through the Internet using the Survey Monkey portal. The link to the survey was distributed via e-mail. More than 500 potential respondents were contacted with a covering letter explaining what exactly the survey was about and the link to the survey. The survey instrument was a six page questionnaire which had seven sections. The first part of questionnaire included question on organization profile, organization nature, area of business and organizational workforce. The second part of questionnaire includes detail questions of supply chain practices used by organization. Designed question includes characteristics of supply chain which included its function, technology used, performance measurement and metrics and factor that played important role in successful supply chain implementation. Second section deals with the level of development of the supply chain. It captures question like various strategies that your organization applies, alignment of supply chain strategies with corporate strategies, how often employee get training on supply chain and how resistant they were in implementing. Third section deals with the green supply chain which is relative new and happening. Question of green management was designed to capture the state of their green supply chain activities, which green project they are undertaking, how much emphasis is green supply is getting and what saving has been made with it. Fourth section of the questionnaire capture performance evaluation regarding spending money, how much, on which function, any change in spending, expected changes, impact of supply chain on revenue and cost reduction. Fifth section deals with organizational structure which included question on supply chain executive reporting, leadership, area of supply chain which needs work. Sixth and seventh were based on supply chain vulnerability and supply chain risk management. These section included question regarding implementing them, take on them, supplier and customer order status, communication gap, when not done on time. Risk management section deals with supply failure, run out of cast, drop in demand, and how do they to avoid these types of problems.

**EMPIRICAL DATA**

**Survey Profile**

The data collected through questions 1 to 3 helped in profiling the organizations. In all, 32 responses were received. The organizations represented by the responders where categorized into ten categories. The organizations included manufacturers, wholesale, transportation, retail, financial service and other organizations which included IT industry, Banking and utilities. The persons who filled up the questionnaire are in the categories of managing directors, general managers, managers, CEO and owners.
The organizations that responded to the survey included manufacturing companies (33.3%), wholesale and retailers (33.3%), transportation, storage and communication (16.7%), utilities (8.3%), and financial banking services (8.3%). The industry profile of the surveyed organizations is shown in Figure 2.

![Figure 2: Profile of Organizations in the Survey.](image)

**Organizations’ operation and number of employees**

Most of the organizations that responded to the questionnaire were operating within the state of Massachusetts (39.1%) (see Figure 3). Also most of the organizations had employees ranging between 0-50. These two figures helped us to understand how big the organizations are and in which region they operate.

![Figure 3: Organizations Operation Location.](image)
SURVEY ANALYSIS

Characteristics of Supply Chain

Four questions were asked in this category. First question was what are the functions included in the supply chain at your organization and surprisingly many companies were indifferent about their functions most of them are involved in manufacturing and warehousing and marketing, sales. Figure 4 shows the percentage of organization that replied to the questionnaire on the specific question. Second question was designed for gathering data of various technologies used to enhance the supply chain development. As we can see in Figure 5 most of the industries are using Web-based application/services, Warehouse Management System (WMS), Inventory planning, analysis, optimization system (MRP). Third question ask the factors that played important role in your successful supply chain management and expected most of the organization agreed on visible and active senior executive commitment to outcomes.

Figure 6 shows the percentage of organization that replied to the questionnaire on the specific question. Question four was what are the performance measurements and metrics in supply chain management and from the mixed results we can say that companies emphasis on Measuring customer service and satisfaction and Supply chain reliability. Figure 7 shows the percentage of organization that replied to the questionnaire on performance measurements and metrics.

![What are the supply chain functions that are included in your Organization?](image)

**Figure 4:** Supply chain functions that are included in the Organization
**Figure 5:** Technologies used to enhance the supply chain development

**Figure 6:** Factors that played important role in the successful supply chain management

**Figure 7:** Performance measurements and metrics in supply chain management
Development of Supply Chain Strategy

As we can see in Figure 8, most of the organization have supply chain strategy comprehensive across the entire corporation and supply chain strategy is integrated into business strategy. It is heartening to see that maximum numbers of organizations are approaching sustainable supply chain initiatives (Figure 9). About 40% of the organizations suggested that their employee were resistant in implementing supply chain. Also, almost 50% of the companies agreed that they review their supply chain strategy every year.

<table>
<thead>
<tr>
<th>Strategies that your organization applies</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>We do not have a supply chain strategy</td>
<td>5.0%</td>
</tr>
<tr>
<td>We are in the process of developing a supply chain strategy</td>
<td>20.0%</td>
</tr>
<tr>
<td>Our supply chain strategy is developed and integrated into business strategy</td>
<td>25.0%</td>
</tr>
<tr>
<td>Our supply chain strategy is developed and integrated into business strategy</td>
<td>25.0%</td>
</tr>
<tr>
<td>Our supply chain strategy is comprehensive</td>
<td>30.0%</td>
</tr>
<tr>
<td>Our supply chain strategy is integrated into business strategy</td>
<td>30.0%</td>
</tr>
<tr>
<td>Our supply chain strategy is shared and</td>
<td>20.0%</td>
</tr>
</tbody>
</table>

**Figure 8: Strategies that the various Organizations applies**

Which of the following best describe your organization’s approach for evaluating and implementing sustainable supply chain initiatives?

- Already implemented
- Currently implementing
- Currently evaluating
- No current initiatives or plans at present

<table>
<thead>
<tr>
<th>Approach Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Already implemented</td>
<td>25.0%</td>
</tr>
<tr>
<td>Currently implementing</td>
<td>20.0%</td>
</tr>
<tr>
<td>Currently evaluating</td>
<td>35.0%</td>
</tr>
<tr>
<td>No current initiatives or plans at present</td>
<td>20.0%</td>
</tr>
</tbody>
</table>

**Figure 9: Evaluating and implementing sustainable supply chain initiatives**

Green Supply Chain

When we turned specifically to Green issues under the sustainability heading, we received a wealth of information, not all of which was consistent. When asked characterize the state of your company's green supply chain activities 50% reported Early (information-gathering stage) further breakdown can be seen in Figure 10. When asked which green projects is your company...
undertaking reduce energy consumption in manufacturing and buildings (43%), Recycle returned products or scrap material (43%) were the choices of most of the organization. When asked if Green and sustainability supply chain issues are receiving more or less emphasis than 18 months ago, 40 percent reported seeing more emphasis and another 60 percent saying they say about the same level. This is very encouraging news, as we believe Green will be a dominant element in future SCM efforts.

<table>
<thead>
<tr>
<th>How would you characterize the state of your company's green supply chain activities?</th>
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<tbody>
<tr>
<td>Advanced (active for &gt;5 years)</td>
</tr>
<tr>
<td>Intermediate (active 3-5 years)</td>
</tr>
<tr>
<td>Beginning (active 1-2 years)</td>
</tr>
<tr>
<td>Early (information-gathering stage)</td>
</tr>
<tr>
<td>We don't have a 'green/sustainability' strategy.</td>
</tr>
</tbody>
</table>

0.0% 10.0% 20.0% 30.0% 40.0% 50.0% 60.0%

**Figure 10:** State of your company's green supply chain activities

**Organizational Structure**

When asked to whom does your most senior supply chain executive report to in the organization 40% responded by saying CEO. Leadership is an extremely important aspect of successful supply chain efforts, but it doesn’t stop with a professional leader: SCM must involve others from the management ranks. 20 percent said they had top management involvement from the financial sector, and another 42 percent said they had medium involvement, or a strong 69 percent overall level (Figure 11). Supply Chain is finally becoming a company-wide effort. Fifty-three percent of the respondents indicated they had an executive officer who manages all supply chain functions. When asked in which areas of supply chain your organization needs most work planning and execution needs most work. The graph (Figure 12) below shows the percentage of organization that replied to the questionnaire on the specific question.
Supply Chain Vulnerability

It is worth noting that while risk and vulnerability remain crucial issues for most supply chain professionals, the survey once again did not indicate the kind of concern or preparedness we would expect. When we asked the respondents if they were concerned that the supply chain is vulnerable, we saw evidence that there are more than a few apprehensions. Across all the areas in which we asked questions, there was more concern than satisfaction. When asked if your organization or is your organization planning to initiate supply chain vulnerability reviews most of the organization as we can see in Figure 13 has 70 percent of them opted for Inventory planning and inventory level strategy. In parallel vein, in terms of supply chain organizations having a contingency plan in the case of significant disruption, we were again surprised that only 40 percent said “yes,” while the remainder were still “not sure” or replied "no." When asked if
the organization pays sufficient attention to supply chain vulnerability measures and risk mitigation actions, only 37% agreed or strongly agreed. Asked if the organization has sufficient executive visibility and accountability for supply chain continuity and protection, over 60% were neutral to saying they did not agree. Clearly, with all of the progress reported, vulnerability looms as an issue to be conquered before supply chain efforts are deemed complete. We must question why senior management is not more demanding in this area, with all of the recent global issues surrounding terrorism and natural disasters.

Figure 13: Supply chain vulnerability review

Supply Chain Risk Management

The matter of risk management and handling risk as part of SCM has the emerging topics. This remains an area of concern by nearly all supply chain organizations, but only among the leaders do we find the kind of deliberate and consistent attention that leads to knowing what to anticipate in the way of risk and having contingency plans to deal with unfortunate circumstances. When asked to rate the level of agreement with statements relating to the extent to which a company manages supply chain risk, the answer was encouraging. This is a positive step as firms are digging into their databases to find the source cause of their difficulties and to anticipate reoccurrences in the future. Unfortunately, the survey received only a 30% when it came to the company having well-communicated contingency plans for use in case of a significant disruption.

Performance Evaluation

When asked ‘what is the percent of revenue spent on the supply chain in your organization’, half of the respondents said it is in between 0 to 10 percent. 70 percent of the respondents selected purchasing, procurement, and sourcing the main functions in which they spend. In spite of poor economic conditions, companies actually achieved higher revenues and found out ways to cost reduction. In terms of growth in revenue, only 30 percent reported no results or not knowing impact on revenue of supply chain initiatives.
CONCLUSIONS

This paper provides a better understanding of SCM practices among SMEs in the south coast region of USA. The survey reveals that companies are making significant investments in software and technology to lead supply chain improvements, particularly in the areas of purchasing, logistics, and inventory management. However, the survey suggests that because technology is still being put ahead of process improvement, companies are not seeing advances in collaboration across the supply chain, even in leading companies. Lack of collaboration is resulting in businesses failing to see the full benefits of advanced supply chain management in terms of building revenue — rather than just a case of savings costs.

Additionally, respondents indicated that supply chain management is rarely integrated into the overall business strategy or seen as a strategic competence. Lack of collaboration and strategy, as well as focus on cost savings is impacting the ability to enhance customer loyalty and profitability. Findings indicate that retail and high-tech companies rate themselves as more advanced in supply chain capabilities than other industries. Indeed, the findings reveal a widening gap between those companies, such as leading retailers, reaping the benefits of supply chain advances and those still struggling to do so.

This widening gap may be a result of the lack of strategy development among the responding companies. The shortfall is especially evident when it comes to connecting the supply chain strategy with the business strategy. Just over half of all respondents reported that their firms did not have a supply chain strategy or were just starting to develop one.

Perhaps the most important insight from the survey is that the real business benefit of advanced supply chain management remains largely untapped. The results only hint at what can be achieved in terms of cost savings, revenue increase, profit improvement, customer satisfaction ratings, and more. If businesses keep an open mind and dedicate themselves toward real advancement, they can start to see breakthrough results in all of these areas.

However, without a strategy that is linked to the business plan, companies will not be in a position to capitalize on the sought-after business benefits. Survey results indicate that companies continue to chase cost savings rather than pursue the long-term benefits of an extended enterprise supply chain. Ultimately, the most effective supply chain networks will control the most attractive customers and consumer groups.

Collaboration was cited as the single most pressing need—both internal collaboration and external collaboration with suppliers and customers. This finding confirms that supply chain professionals understand the criticality of forging collaborative relationships. It also says that they are still struggling with the ways and means to achieve it.

Progress is being made, however, on one collaborative front. It involves the relationship between supply chain leaders and their counterparts in IT. 39 percent of respondents said that their work relationship with IT leadership to introduce new technologies had not been very effective or was only marginally so. That decreased sharply to 14 percent. Conversely, 37 percent of respondents
said that the relationship was moderately to very effective. It looks as if the message of collaboration between the supply chain (responsible for process improvements) and IT (responsible for the systems to enable the improvements) finally is getting through.

For future improvement, the companies need to calibrate their businesses against the maturity levels and ascertain how much progress has been made with supply chain. With the positions determined, the potential gap between current performance and the possibility to make the kind of progress indicated by the survey becomes apparent, particularly in terms of the number of new points of profit which might be added. The business can then develop a supply chain strategy that augments the business plan by calling for substantial improvements to costs and revenues, based on application of advanced supply chain skills. To assure that these objectives are met, the final step is to prepare a roadmap that will guide the firm to an advantaged position in its industry. It’s not too late to leapfrog to the front of the class.

REFERENCES


