



Supply Chain Management Accounting

By Professor John Cullen



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Supply Chain Management Accounting

Executive Summary

Firms compete with each other on the basis of the relative merits of their respective supply chains, so management accounting practices must support this reality rather than provide information that is rooted in traditional organizational settings. Management accountants need to work with their management colleagues to support development of greater supply chain competitive advantage. All organizations, small or large, operate in this environment and must develop management accounting practices that facilitate their long-term sustainability.

This Guideline presents the context for (a) considering the importance of Supply Chain Management Accounting (SCMA), and (b) focuses on some key techniques that can be used in practice. It recognizes that relationships between organizations will differ because of their different stages of maturity and strategic choices. It deals with management of risk, and briefly refers to the sustainability agenda as a factor gaining importance in the area of supply chain management. A central feature of the Guideline is a description of the way that management accountants can add value to the management of supply chains.

1. Introduction

“The notion of being ‘global’ is evolving beyond a multinational structure or mere presence in different countries toward establishing an interdependent network of worldwide assets with the ability to optimize resources horizontally and vertically. Current enterprise management structures (for example, holding companies, decentralized operating companies and integrated operating companies) show little differentiation in revenue and stock price growth.

“Therefore, enterprises will transform their business models to take advantage of this new way of defining a global presence. To make a strategic transformation, enterprises must also transform their operations. The key question is: do current financial management models have the necessary flexibility, not only to accommodate, but also to enable this transformation?”

(*The Global CFO Study*, IBM, in cooperation with the Wharton School and the Economist Intelligence Unit, 2008)

This Guideline covers two key areas:

- supply chain management as part of this business transformation towards optimization (see as well the recent Institute of Management Accountants Guideline [2008], *Managing the Total Costs of Global Supply Chains*), and
- the need for management accountants to continue to add significant value by working with their management colleagues to create competitive advantage

through supply chain improvements, specifically by using relevant supply chain management accounting (SCMA) techniques.

To understand the role that SCMA can play, it is important first to define supply chain management (SCM):

“The strategic management process (that unifies) the systematic planning and control of technologies, materials and services, from identification of need by the ultimate customer. It encompasses planning, designing, purchasing, production, logistics and quality. The objectives are to optimize performance in meeting agreed customer service requirements, minimizing cost, whilst optimizing the use of all resources throughout the entire supply chain.” (DTI Supply Chain Networks Group, April 1997)

Presutti Jr and Mawhinney (2007) suggest that SCM’s emergence is arguably the most significant development in business management since the early 1980s (when US firms began adopting the just-in-time concept). An AMR Research Study done in collaboration with the Supply Chain Research Council (2008) found that supply chain excellence is a competitive differentiator across industries. Analysis of the returns showed that an investment in one of their Supply Chain Top 25 (including companies such as Nokia, Apple, Tesco, The Coca-Cola Company, and Hewlett Packard yielded an average return of 17.9% in 2007 compared with returns of 6.43% for the Dow Jones Industrial Average and 3.53% for the S&P 500 (AMR Research, 2008).

A couple of examples from opposite sides of the Atlantic illustrate that SCM is crucial to any organization.

Example 1.1: J Sainsbury plc

In the UK, the retail operation of J Sainsbury plc (a large supermarket chain) had problems with its supply chain a few years ago that reduced its market share. Addressing the problems had a significant impact on its performance. This is highlighted in the J Sainsbury plc Annual Report published in June 2006:

“Getting the supply chain right has required decisive action. We transferred our operation at Charlton to a third party operator, closed our depots at Northfleet and Rotherham and reorganized our Basingstoke and St Albans depots into multi-purpose facilities, providing chilled, ambient and fresh products to stores. The many changes we’ve made have saved the business substantial amounts of money. We identified £400 million of cost reductions in October 2004 and delivered more than £110 million [in 2005/6], primarily in the areas of stock loss and central costs. We expect to deliver a further £175 million savings in the current year [2006/7] bringing the cumulative total to £285 million and stretching our original target to £440 million. Replenishment orders are being delivered faster and in a store-friendly way, with products already sorted according to the aisles in which they are found in-store, and we’re working with suppliers to help us improve availability even further and reduce costs.”

(J Sainsbury plc Annual Report, June 2006)

Example 1.2: Cisco

In the US, Cisco (the world's largest network equipment maker) experienced problems in 2001 when recession hit the country and the company shocked investors by warning them it would soon scrap about \$2.5 billion of surplus raw materials. This represented one of the largest inventory write-offs in US business history.

"Cisco ended up with a mountain of sub-assembly boards and semi-conductors it didn't need because of the way its supply chain partners had behaved in the previous 18 months. When demand slowed in the first half of fiscal 2000, Cisco found that it couldn't cut off supplies quickly. Moreover, it wasn't clear what Cisco had asked its suppliers to produce and what the contractors had manufactured in anticipation of Cisco's orders. Many contractors believed that Cisco had implicitly assured them it would buy everything they could produce. Since Cisco hadn't stipulated the responsibilities and accountability of its contractors and component suppliers, much of the excess inventory ended up in its warehouses. However, the supply chain imploded because Cisco's partners acted in ways that weren't in the best interests of the company or the supply chain."

(Narayanan and Raman, 2004)

A particular lesson from the Cisco example is that a holistic view needs to be taken of SCM. Firms often behave in ways that they perceive will maximize their own interests, but wrongly assume that at the same time they will maximize the interest of the supply chain. In fact, failure to incentivize the whole supply chain may result in an inefficient supply chain – a disaster in a business environment where competition is based on how good one supermarket's or manufacturer's supply chain is, compared to the supply chains of its competitors.

Inter-firm supply chains involve organizations that (a) work beyond their legal and organizational boundaries, and (b) build relationships with suppliers and customers via new organizational forms, such as strategic alliances, collaborations, partnerships, networks, and virtual organizations. The growth of these new forms has been a significant factor in securing competitive advantage in a dynamic market.

"While 38% of CEOs plan to keep work within their organizations, 71% – nearly twice as many – plan to focus on collaborations and partnerships. CEOs told us that they are pursuing more collaborative models to gain efficiencies, fend off competitive threats, and avoid commoditization. Their end goal is to offer customers a differentiated value proposition. 'The notion of what comprises an enterprise is critical. It must be a loosely coupled system' said one public sector leader from Australia. 'It's about when to collaborate, whom to involve, how to lessen the destructive force of competition.'"

(IBM Global CEO Study, "The Enterprise of the Future," 2008)

Supply Chain Management and the Management Accountant

Management accounting systems must be adapted:

- to handle the management of these new forms,
- to identify costs and value-adding processes across organizational boundaries, and
- to support different types of relationships between organizations.

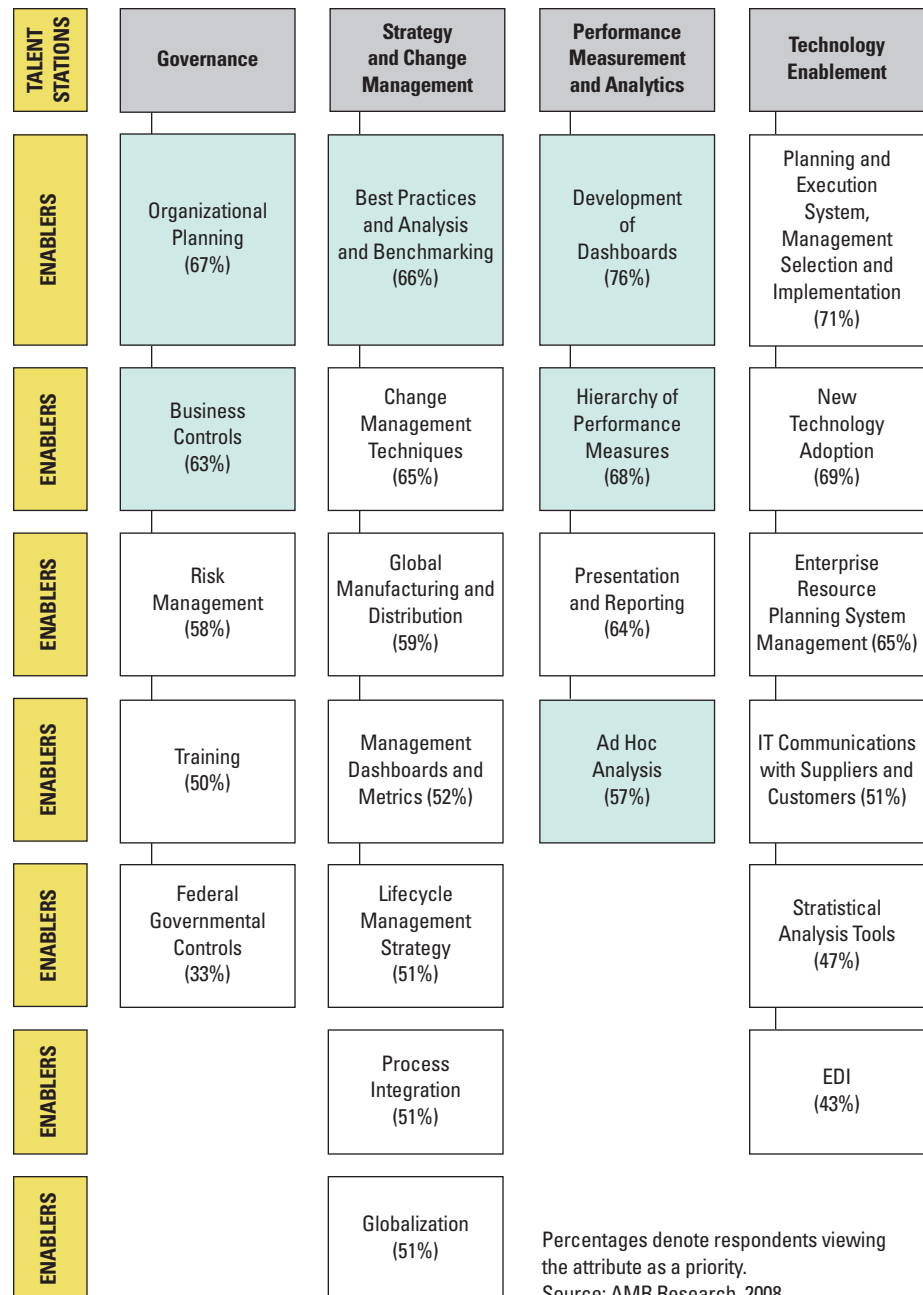
What, then, are the specific roles of management accountants in SCM? An Institute of Management Accountants Guideline (1999) on the *Tools and Techniques for Implementing Integrated Supply Chain Management (ISCM)* identified nine key roles for management accountants in ISCM, to which are added the relevant SCMA techniques that will be explored in this Guideline:

Role of management accountant in ISCM	Relevant management accounting techniques
<ul style="list-style-type: none"> • Developing financial analyses of the costs and benefits of ISCM to the participating firms 	<ul style="list-style-type: none"> • Value chain analysis • Open book accounting • Quality costing • Activity-based costing
<ul style="list-style-type: none"> • Creating performance benchmarks, milestones, and measures to support the development of the ISCM business case 	<ul style="list-style-type: none"> • Benchmarking • Performance measurement
<ul style="list-style-type: none"> • Providing economic and non-financial evaluation of alternative opportunities to facilitate the development of ISCM priorities 	<ul style="list-style-type: none"> • Value chain costing • Activity-based costing • Outsourcing
<ul style="list-style-type: none"> • Participating in identifying and implementing new databases and information technology enablers for key supply chain transactions 	<ul style="list-style-type: none"> • Activity-based costing • Open book accounting
<ul style="list-style-type: none"> • Supporting process redesign efforts to remove waste, reduce throughput time, and increase the flexibility and responsiveness of financial transactions across the supply chain 	<ul style="list-style-type: none"> • Quality costing • Customer accounting • Activity-based costing • Performance measurement
<ul style="list-style-type: none"> • Collaborating with finance and operations professionals in the partnering organizations to find creative ways to solve logistics and support problems 	<ul style="list-style-type: none"> • Open book accounting • Value chain costing • Target costing • Outsourcing
<ul style="list-style-type: none"> • Providing analytical support to ISCM teams, including estimating the costs and benefits of various decisions throughout design, conversion, and execution efforts 	<ul style="list-style-type: none"> • Value chain costing • Target costing • Customer accounting
<ul style="list-style-type: none"> • Creating management reporting and evaluation tools to ensure that the ISCM initiative meets its objectives and delivers the required performance improvements 	<ul style="list-style-type: none"> • Customer accounting • Performance measurement
<ul style="list-style-type: none"> • Ensuring the integrity of supporting databases, internal control procedures, key proprietary technologies, processes, and physical and/or knowledge assets 	<ul style="list-style-type: none"> • Performance measurement • Open book accounting

This Guideline illustrates how management accountants have followed the roles suggested in the 1999 Guideline, and the techniques they have used. It also shows the growing importance of opportunities for management accountants to add value to SCM practices, and how the range of tools being used has been extended.

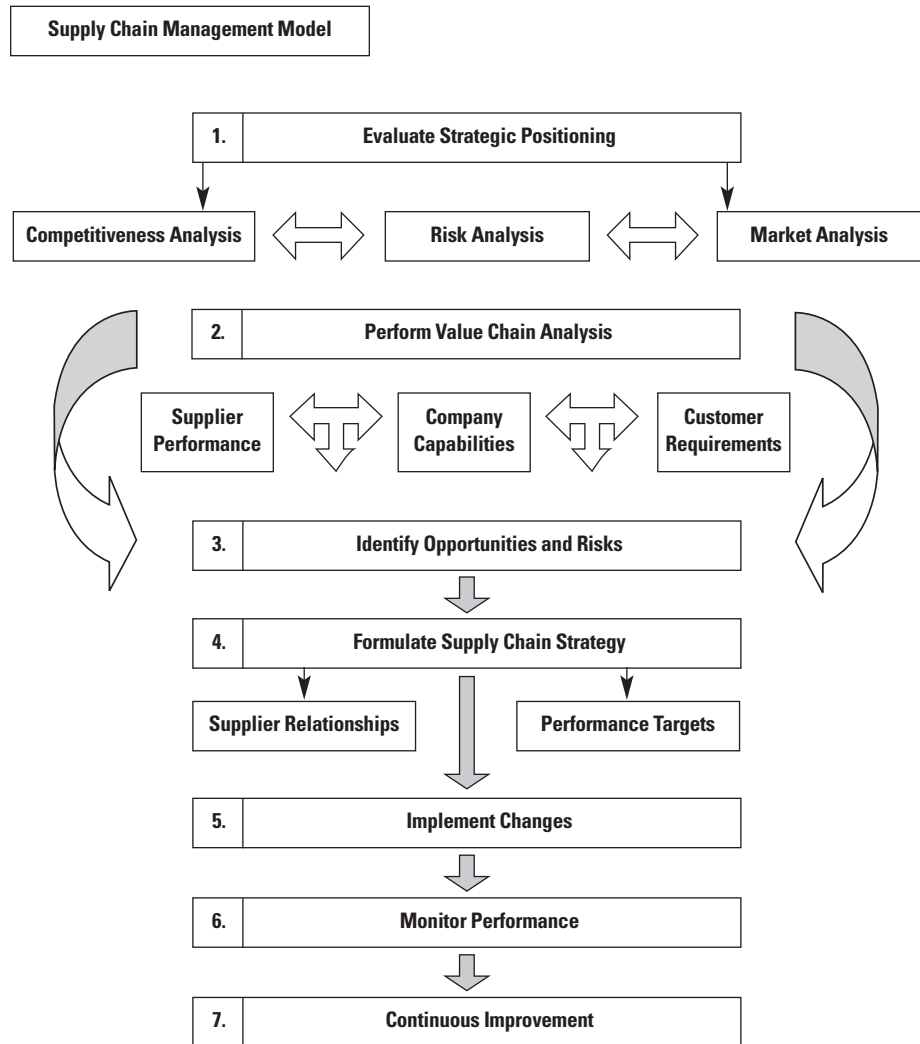
In this context, an AMR Research Project 2008 entitled *Supply Chain Talent: State of the Discipline* offers an opportunity for management accountants to add value. Respondents to the project's survey identified enablers within four main "talent stations" (governance, strategy and change management, performance measures and analytics, and enabling of technology). Many of these enablers can be specifically related to the role that management accountants play in SCM, as highlighted in Figure 1.1 below.

Figure 1.1: Enablers for the key talent stations in the supply chain (AMR Research, 2008)



The framework for development of this Guideline is the supply chain management model shown in Figure 1.2 below.

Figure 1.2: Supply chain management model



In this Guideline, separate sections on points 1 to 3 in the model will be followed by an analysis of management accounting techniques that support (a) the formulation of supply chain strategy, (b) implementation of changes, (c) performance monitoring, and (d) continuous improvement (points 4 to 7).

The objectives of this Guideline are:

- to provide an overview of SCMA techniques that are available to increase competitive performance.
- to provide readers with appropriate management accounting techniques in working with their managerial colleagues to improve supply chain performance.
- to illustrate the application of management accounting techniques in specific supply chain situations.

The target audience comprises:

- management accountants (financial controllers, finance directors) wishing to work with their management colleagues in taking their organizations forward in today's competitive environment.
- colleagues from other managerial disciplines wishing to engage their management accountants in continuous improvement initiatives through the supply chain.

2. Evaluate Strategic Positioning

Supply chain initiatives and supply chain thinking must form a supply chain strategy that aligns with the organization's overall objectives and competitive strategy. To do this, the organization should evaluate its current strategic positioning. Consistent with the supply chain management model found in Figure 1.2, this stage in the process involves competitive and market analysis, and risk analysis.

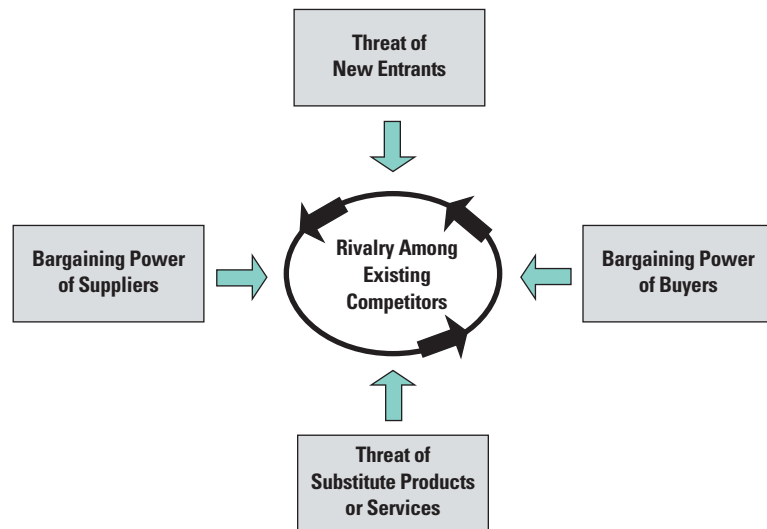
In 1979, Michael E. Porter published an article in *Harvard Business Review (HBR)* that transformed thinking in the strategy field. His "Five Competitive Forces that Shape Strategy" (Figure 2.1) has been used by both practitioners and academics as a model to shape their thinking about the key strategic issues facing organizations, in particular the level of competitive rivalry within an industry.

In 2008, Porter reviewed his original work and published an article in *Harvard Business Review* that reaffirmed, updated, and extended the model. In this article are found a couple of interesting comments that highlight issues particularly relevant to this Guideline:

"An industry's structure can be reshaped in two ways: by re-dividing profitability in favour of incumbents or by expanding the overall profit pool. Re-dividing the industry pie aims to increase the share of profits to industry competitors instead of to suppliers, buyers, substitutes, and keeping out potential entrants. Expanding the profit pool involves increasing the overall pool of economic value generated by the industry in which rivals, buyers, and suppliers can all share."

(Michael E. Porter, "The Five Competitive Forces that Shape Strategy," *HBR*, January 2008, p. 90)

Figure 2.1: Porter's Five Forces Model



The Five Forces that Shape Industry Competition (Porter, *HBR*, 2008)

"Re-dividing the industry pie" involves industry competitors taking actions to ensure that there is a reduction in the share of profits "that leak to suppliers, buyers, and substitutes or are sacrificed to deter entrants" (Porter, *HBR*, January 2008, p. 90). In terms of supply chain strategy, such an approach is based on a "transactional" relationship with other parties in the supply chain, as will be seen later in this Guideline.

"Expanding the profit pool," a more collaborative approach to reshaping the industry's structure, explicitly incorporates a supply chain strategy, as follows:

"When overall demand grows, the industry's quality level rises, intrinsic costs are reduced, waste is eliminated, and the pie expands. The total pool of value available to competitors, suppliers, and buyers grows. The total profit pool expands, for example, when channels become more competitive or when an industry discovers latent buyers for its products that are not currently being served. When soft-drink producers rationalized their independent bottler networks to make them more efficient and effective, both the soft-drink companies and the bottlers benefited. Overall value can also expand when firms work collaboratively with suppliers to improve co-ordination and limit unnecessary costs incurred in the supply chain. This lowers the inherent cost structure of the industry, allowing higher profit, greater demand through lower prices, or both. Or, agreeing on quality standards can bring up industry-wide quality and service levels, and hence prices, benefiting rivals, suppliers and customers.

"Expanding the overall profit pool creates win-win opportunities for multiple industry participants. It can also reduce the risk of destructive rivalry that arises when incumbents attempt to shift bargaining power or capture more market share. However, expanding the pie does not reduce the importance of industry structure.

Value Chains and Organizational Competitiveness

How the expanded pie is divided will ultimately be determined by the five forces. The most successful companies are those that expand the industry profit pool in ways that allow them to share disproportionately in the benefits."

(Michael E. Porter, "The Five Competitive Forces that Shape Strategy," *HBR*, January 2008, p. 92)

Forms of possible collaboration in the supply chain were touched on briefly in the introduction to this Guideline. They included partnerships, strategic alliances, and networks. Different forms may be adopted at different points in the supply chain. Indeed, a firm may have different types of relationship with the same third party in different contexts. Factors affecting the choice of collaborative form, especially supply chain maturity, will be considered in Section 4 of this Guideline

In terms of how the individual firm competes in its market, a key model is the value chain, which was also first suggested in the work of Michael E. Porter (1985). *Value Chain Analysis for Assessing Competitive Advantage*, the subject of a previous Management Accounting Guideline (CMA Canada, 1999), needs to be understood to appreciate fully the importance of the SCMA techniques referred to later.

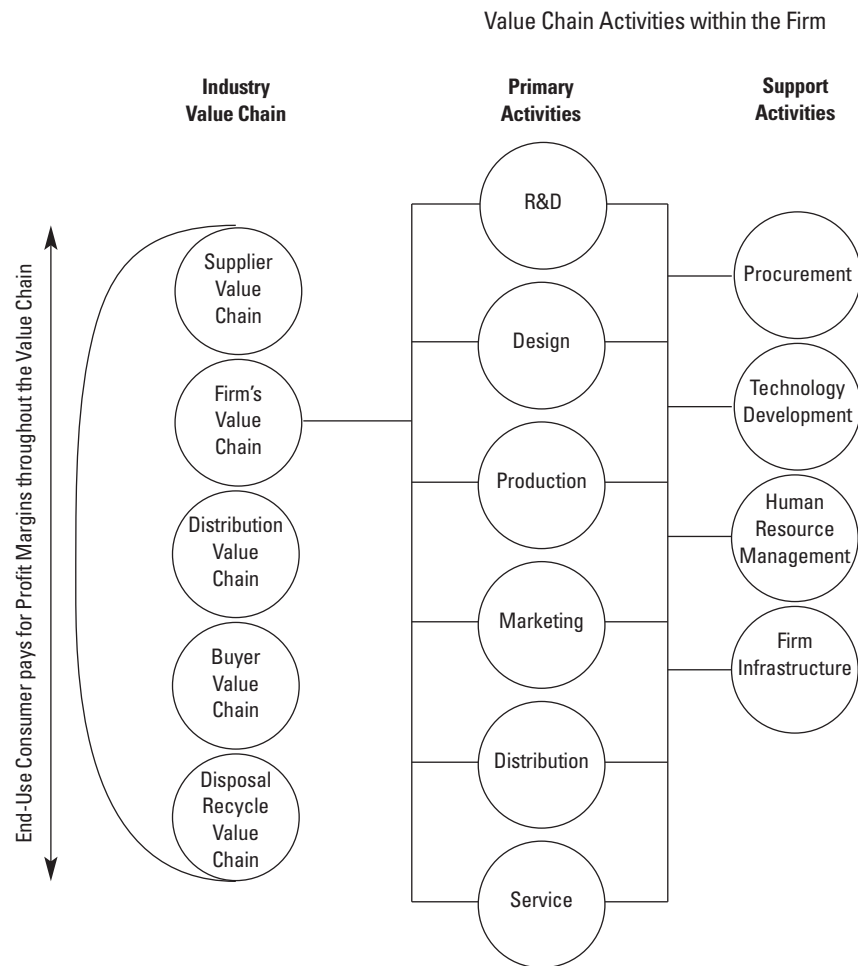
Porter described two major categories of business activity: primary activities and support activities (see Figure 2.2). He defined the individual firm's value chain as "*the internal processes or activities that a company performs in order to design, produce, market, deliver and support its product.*" The object of the value chain at all times is to provide value to the customer by supplying a product or service that meets the customer's requirements.

Shank and Govindarajan (1993) extended the value chain concept to an industry value chain, which they define as "*the value chain activities all the way from basic raw material sources from component suppliers through to the ultimate end-use product delivered into the final consumers' hands.*" A comparison of the two perspectives is provided in Figure 2.2.

As a further development of the industry and firm's value chains, Shank and Govindarajan (1992, 1993) explored, under the term "strategic cost management," the use of accounting inputs in value chains. They examined how the use of cost management and cost control in value chain analysis should be varied depending on the competitive strategic positioning chosen by the firm, whether it be (a) cost leadership (producing at the lowest cost in the industry as a whole, so being able to compete very well on price in the market), or (b) product differentiation (competing primarily on product, service, and relationship features). This positioning was first highlighted by Michael E. Porter. In addition, they extended the concept of the value chain to take into account the interdependence of the activities of buyers and suppliers.

Shank and Govindarajan's work on strategic cost management and extensions to the value chain model are important, because the subject of SCMA requires recognition of value-adding activities beyond individual organizational boundaries.

Figure 2.2: Industry and firm value chains



The Value Chain Exhibit (CMA Canada, 1999)

Risk Analysis

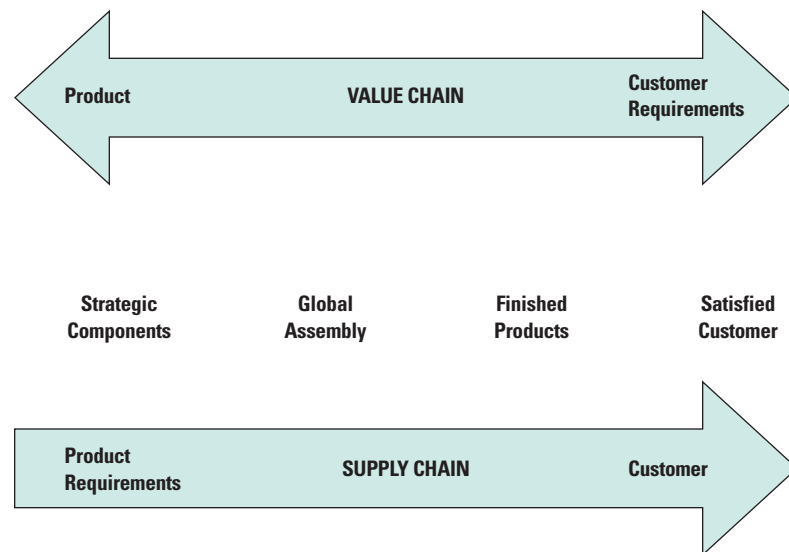
As well as competitive and market analysis, the first stage of the supply chain management model set out in Figure 1.2 (evaluation of strategic positioning) involves risk analysis. This is covered in *Managing Opportunities and Risks*, a Guideline by Bekefi, Epstein, and Yuthas dated 2008, and will be touched on again later in this Guideline (see Section 4).

3. Perform Value Chain Analysis

The second stage of the supply chain management model is to perform value chain analysis. Its purpose is to identify "value" from the perspective of the customer; it does not make sense just to supply goods or services to a customer without creating value in that customer's mind. Supply chain management encompasses the entire supply chain, from producer to consumer. Feller et al (2006) put forward

that the supply chain and the value chain are thus complementary views of an extended enterprise, with integrated business processes that enable the flows of goods and services in one direction (from producer to customer), and of demand and cash flow in the other direction (from customer to producer).

Figure 3.1: The value chain and the supply chain (Feller et al, 2006)



A comparison of a value chain with a supply chain (Feller et al, *BP Trends*, 2006)

The supply chain management model in Figure 1.2 shows that value chain analysis incorporates analysis of:

- supplier performance
- company capabilities, and
- customer requirements

The Need for a Customer Focus

Traditional management accounting techniques involving efficiency measures and controls can be used to analyze supplier performance and company capabilities in isolation, but the object of value chain analysis is to view each link in the chain through the perspective of customer requirements. Central to SCMA techniques that recognize this is the notion of a horizontal organization (Chenhall, 2008), where a "central emerging theme is a focus on how organizations integrate activities across the value chain to support strategy that is customer-focused" (p. 518).

Key aspects of a horizontal organization are as follows:

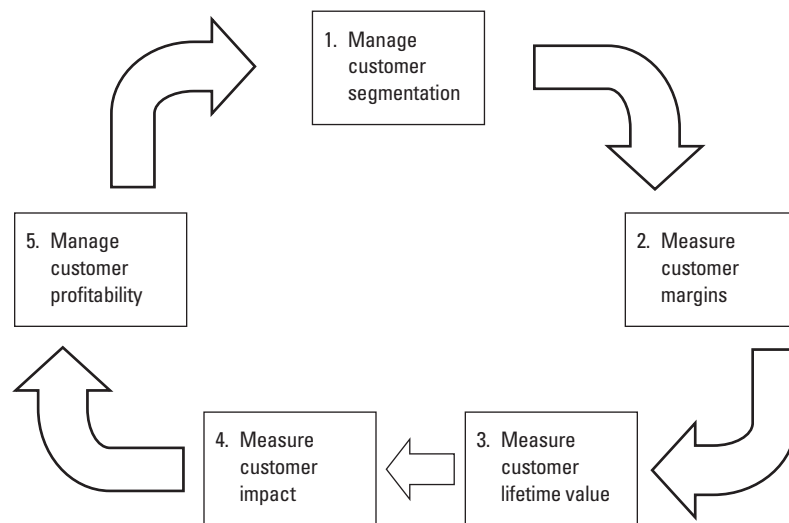
- Organization around processes and teams, integration with customers and suppliers, development of employee skills, measurement of end-of-process performance objectives, and use of information technology to help managers undertake work and build a value-adding culture.

- * Production processes structured around customers and human resource initiatives that encourage a motivated and committed workforce.
- * Use of management accounting techniques, such as activity-based cost management, integrated cost systems, target costing, life cycle costing, strategic performance measurement systems such as balanced scorecards, quality costing, theory of constraints, customer-focused accounting, and open book accounting.

The management accounting techniques in this Guideline therefore cover both processes within organizations and relationships between different organizations.

Epstein and Yuthas produced a Guideline (2007) on *Managing Customer Value*. Most of the ideas presented there are relevant here in terms of the different types of relationship with customers and the associated management accounting techniques. Their basic five-step customer value management cycle (Figure 3.2), which the authors illustrated in particular with reference to Sagu, a software company located in Chicago, is useful in this context.

Figure 3.2: The customer value management cycle (Epstein and Yuthas, 2007)



The Customer Value Management Cycle (Epstein and Yuthas, CMA Canada/AICPA/CIMA, 2007)

Another good example of taking a value perspective is customer profitability analysis, if it is actually based on creating value for the customer:

“In the 1980s and 1990s, many enterprises jumped on the quality bandwagon and implemented TQM or Six Sigma programs. They worked hard to remove all of the causes of variance and defects from their business processes. For many enterprises, and even entire industries, this movement led to dramatic

Types of Customer Relationships

improvements in production efficiencies. However, what was often lost along the way was a focus on those things that matter at the point of competition – the customer. Unfortunately, for every enterprise that got Six Sigma right and applied it based on true customer requirements, there were many that blindly applied statistical tools and techniques to remove variances from their processes. The science of determining what customers really need and what they will pay for was often put to the side or omitted entirely. The leading enterprises are redesigning with the realization that processes impact each of the value creation processes.”

(Kothari and Lackner, 2006, p. 246)

Note that TQM (total quality management) is a management technique that aims directly at achieving the firm’s long-term success through customer satisfaction, while “Six Sigma” is a quality management technique that seeks to identify and remove the causes of defects and errors in manufacturing and business processes, to reduce costs and increase profits. The use of quality costing (see Section 5), alongside this management technique, can help to ensure “continuous improvement” in the firm and its supply chain.

In an article in the *Financial Times* (August 22, 2008), Keith Harrison, Head of Global Product Supply at Procter & Gamble, was introduced as the man in charge of the world’s largest supply chain. He particularly put forward the argument that supply chain improvements can be incorporated as part of a joint-value creation plan with leading international retailers:

“Historically, we’ve thought about joint-value creation in the context of brand initiatives of promotions or whatever... the concept of creating it through your supply chain has been new. So new, that it has also involved a ‘mindset shift’ for Procter & Gamble. It’s a culture shift for our sales organization because they haven’t thought about or understood supply chain capabilities. So this has been a learning curve for all of us. It’s getting traction now and it’s starting to go pretty well.”

(Keith Harrison talking to Jonathan Birchall, *Financial Times*, August 22, 2008)

Keith Harrison refers to “consumer-driven supply chain management,” and comments on the use of Retail Link data to speed up movement of the product from Procter & Gamble’s factory to a Wal-Mart’s store by about 10 days, and to create further inventory savings.

Different types of customer relationships can necessitate different types of management accounting techniques. Lind and Stromsten (2006) illustrate an application of customer accounting at Ericsson that takes into account the different nature of business-to-business technical and organizational interfaces with customers. They identify four types of customer relationship (transactional, facilitative, integrative, and connective) and link them to four different customer accounting techniques (customer segment profitability analysis, customer profitability analysis, lifetime profitability analysis, and customer valuation analysis). Figure 3.3 shows the relationships in a two-by-two matrix (adapted from Lind and Stromsten, 2006):

Figure 3.3: A framework on different customer relationships and resultant customer accounting techniques (adapted from Lind and Stromsten, 2006)

Technical interface to customers / Organizational interface to customers	High	Low
	High	Low
High	Integrative customer relationships: Lifetime profitability analysis	Connective customer relationships: Customer valuation analysis
Low	Facilitative customer relationships: Customer profitability analysis	Transactional customer relationships: Customer segment profitability analysis

It is useful to look a little more closely at what is meant by these terms, how they are linked, and what customer accounting technique is relevant to each.

Customer relationship	Management accounting technique
<p>Transactional (low technical and organizational interfaces) involve commodity products with standardized features, typified by a relationship where commodities are made available through standard outlets. Financially, these relationships are of minor importance for the firm, so it does not apply dedicated organizational units to work with such customers.</p>	<p>Customer segment profitability analysis – In this analysis, the object of measurement is a group or segment of customers. This method is suitable for transactional customer relationships because each customer only makes a minor contribution to total revenue, so they are not sufficiently important to measure and monitor individually. Instead they are analyzed as a segment.</p>
<p>Facilitative (low technical but high organizational interfaces) are about products that differ only marginally from standardized ones, so production facility interfaces are relatively standardized. Obtaining low costs is a high priority for the customer. Financially, these relationships are of great importance for the firm and have a significant effect on its short-term profitability. Contact between the firm and the customer is frequent, so it will dedicate organizational units to handle such a customer.</p>	<p>Customer profitability analysis measures customers' contributions to a firm's profits, and identifies the difference between revenues and costs over a specified period of time. As facilitative customer relationships are financially important, customer profitability is measured individually. It is important to make each such relationship profitable annually because of the lack of long-term investment.</p>
<p>Integrative (high technical and organizational interfaces) involve products that are dedicated to specific customers and are often developed in close cooperation with the customer. Thus, interfaces are adapted to meet specific customer needs, and the production facilities integrate with and cement customer relationships. The customer's technical interfaces are adapted to the firm's, and vice versa. Such customers represent a substantial part of the firm's short-term revenue, but they may be even more important for future revenue. The firm employs dedicated organizational units to work with its prioritized customers.</p>	<p>Lifetime customer profitability analysis extends the time horizon of revenue and cost analysis for a specific customer to include previous years and the future. Large upfront investments and close technical adaptations mean that the usual annual time horizon must be extended; an annual customer profitability analysis could report that a customer is unprofitable, but over an extended time period the customer could be reported as profitable. Because of the relationship's strategic importance, customer profitability must be tracked individually.</p>

Customer relationship	Management accounting technique
<p>Connective (high technical interface and low organizational interface) involve products that are customized to the customer's needs, so the firm invests a considerable amount of time and significant resources in the customer, including customizing its production facilities. However, in contrast to integrated customer relationships, the revenues in connective customer relationships are low, resulting in high direct costs but only low direct revenues. To be viable, therefore, the particular customer relationship needs to contribute indirectly to other customer relationships by, for example, being a lead user, generating important knowledge, or acting as a bridge to spin-off relationships with other customers.</p>	<p>Customer valuation analysis treats customers as assets that will yield revenue in the future. The economic value of a specific customer is represented by the present value of the future cash flows derived from the relationship with the customer. Connective customer relationships are the most demanding from a customer accounting point of view. Close technical adaptation creates large investments, but these investments are not associated with large revenue streams from customers. Instead, the firm invests in this customer because, as a result, future profitability may arise from other relationships. The appropriate customer accounting technique therefore extends beyond the annual time period, and incorporates indirect benefits from connected relationships.</p>

According to Lind and Stromsten (2006), the following relationships and customer accounting techniques were evident at Ericsson in the UK at the time of their study.

Facilitative customer relationships – The majority of Ericsson's customer relationships at Ericsson were of a facilitative nature. For such relationships, Ericsson measured sales and customer profitability on a quarterly and annual basis as well as evaluated customers informally over an extended time period.

Integrative customer relationships – Only a few relationships could be characterized as being integrative, an example being the relationship with Vodafone, which had been very strong since it was founded in 1983. The relationship consisted of very close technical and organizational interfaces, and Vodafone was considered to be a "flagship customer." Vodafone was accounted for by conducting a lifetime profitability analysis and an annual customer profitability analysis. In addition, some aspects of the relationship were monitored more regularly through quarterly measurement of account contribution, with some annual measurement in areas such as software features, hardware, end-customer services, and support services.

Connective customer relationships – It was hard to find examples of long-term connective customers in Ericsson, although the relationship with Telia was reported as integrative, having also some characteristics of a connective relationship. In terms of customer accounting, Telia was measured using both annual customer profitability and the longer-term perspective of lifetime customer profitability. Long-term investment, however, could only be judged on the possibility of generating other business relationships, so implicitly a customer valuation analysis had to take into account the possibility of generating future cash flows from other subsequent business relationships.

Transactional customer relationships – Lind and Stromsten did not report on any evidence of transactional customer relationships at Ericsson.

Finally, Lind and Stromsten (2006) emphasize that although their framework attempts to link customer accounting techniques with different business relationships, different companies (as illustrated by Ericsson) will combine some techniques in handling a particular relationship. That said, the framework is particularly useful, because it points out that different management accounting techniques will be used in different business relationships. This is particularly important when we look at SCMA techniques.

4. Identify Opportunities and Risks

The next step in the SCM model, and the last one to be considered separately in this Guideline, is the identification of opportunities and risk. The model calls for proper evaluation of supply chain risk in terms of resilience and vulnerability. SCMA techniques are important here; they should look at aspects of both demand-side (customer) and supply-side (supplier) risk, together with drivers of supply chain vulnerability.

Factors to consider here are (a) the level of supply chain maturity, (b) the opportunities this offers, and (c) the impact it can have on requirements for supportive management accounting practices.

McCormack et al (2008) make an interesting link between supply chain maturity and the *Supply Chain Operations Reference-Model* (SCOR) created by the Supply-Chain Council (see Figure 4.1). This model emphasizes process orientation (a horizontal focus) and de-emphasizes organizational or functional orientation (a vertical focus). The model is organized around the five primary management processes of Plan, Source, Make, Deliver, and Return.

Figure 4.1: SCOR Model (Version 9)

SCOR Process	Definitions
Plan	Processes that balance aggregate demand and supply to develop a course of action that best meets sourcing, production, and delivery requirements.
Source	Processes that procure goods and services to meet planned or actual demand.
Make	Processes that transform products to a finished state to meet planned or actual demand.
Deliver	Processes that provide finished goods and services to meet planned or actual demand, typically including order management, transportation management, and distribution management.
Return	Processes associated with returning or receiving returned products for any reason. These processes extend to post-delivery customer support.

Supply chain maturity models recognize different process maturity development stages, as identified by Lockamy III and McCormack (2004):

Ad Hoc	Characterized by poorly defined and unstructured practices.
Defined	The supply chain's basic processes are defined and documented.
Linked	Broad application of supply chain management principles occur.
Integrated	The company, suppliers, and clients strategically co-operate at the process level.
Extended	Competition is based on multi-organizational supply chains

This maturity model identifies the progressive development of supply chain management activities that can be utilized to further improve the competitiveness of a company's supply chain. Linking this to the SCOR Model also allows performance measurement, an important feature of management accounting systems, to be aligned to process improvement actions and the wider policies and strategies of the organization.

Another model of supply chain maturity was illustrated by Berry et al (2000) in their investigation of management accounting control practices in the UK in relation to the development of SCM. They identified relationships starting with firms that act autonomously, and then moving in sequencing to firms operating within the following different stages of cooperation identified as:

- serial dependence (dominant customer)
- reciprocal dependence (some forms of collaboration between customer and suppliers)
- mutual dependence (partnership models of collaboration arising out of mutual interests).

Lamming (1993) also constructed the following four-phase model of customer-supplier relationships that recognized different phases of development.

Traditional	The supplier with the lowest bid was awarded a contract by the firm
Stress	Favoured suppliers were encouraged to invest and gain benefits from competitive advantage available in new practices and plants, the firm's involvement with suppliers being driven by attempts to reduce costs.
Resolved	There was an increased recognition of the importance of relationships, resulting in more collaboration.
Partnership	Best practice was identified as being a partnership between two firms engaged in the relationship, showing respect and valuing each other's contribution

Maturity/development phase	Berry et al (2000)	Lamming (1993)
“Arm’s length” relationship	Autonomous firm	Traditional
Management of suppliers	Serial dependence	Stress
Collaboration with suppliers	Reciprocal dependence	Resolved
Systemic management	Mutual dependence	Partnership

The important message coming out from McCormack et al (2008), Berry et al (2000), and Lamming (1993) is that management accounting systems must facilitate supply chain relationships at different levels of maturity.

Where “arm’s length” relationships exist, SCMA techniques look for the lowest cost option that meets required quality standards. Tendering and on-off supply agreements may be the norm here, requiring traditional techniques of management accounting. As relationships move through the maturity/development cycle, different SCMA techniques will be used. By the time the mutual dependence/partnership phase is reached, techniques such as open book accounting become more acceptable, because the parties engaged in the relationship can mutually benefit from improvements to both cost and quality.

Two organizations can engage in relationships at different stages of development, depending on the specific circumstances of a particular business transaction. A firm could be in partnership with a supplier in a certain product area, while being in an arm’s length relationship with the same party in another product area. For example, large retail organizations frequently collaborate with competitors and suppliers in certain activities, while acting purely at arm’s length in other activities. Any SCMA techniques used should reflect the nature and maturity of the actual business relationship.

With regard to SCMA and supply chain risk, resilience, and vulnerability, Juttner (2005) suggests that most of the literature deals with single organizations. Given the changing nature of competition (supply chain versus supply chain), understanding these factors clearly needs to extend to complete supply chains. For example, outsourcing is viewed by some organizations primarily as a risk mitigation strategy (Peck, 2005), but the management accounting control mechanisms needed to monitor its costs and benefits indicate that this may be too simple an analysis.

However, some SCMA progress with respect to risk has been made. The SCOR Model Version 9 (May 2008) develops risk management capabilities using risk metrics that cover all levels of the supply chain.

Risk Management Now a Core Capability of SCOR

As enterprises' operations have become increasingly global and complex, the potential risks to which companies are exposed have grown accordingly. The need for risk management capabilities within SCOR was brought to the Council's attention by multiple SCC member organizations in government, industry, and academia. In 2006, the Supply-Chain Council organized a volunteer team from various industries in the United States, Europe, Asia, and Latin America to determine how to include risk management in the SCOR model and, therefore, provide an essential new tool for addressing risk and risk management in global supply chain operations.

The result of those efforts is a set of new capabilities in SCOR 9.0 that enables a company to (a) systematically identify, assess, and qualify potential supply chain disruptions, (b) control exposure to risk, or (c) reduce the negative effect of risk on supply chain performance.

SCOR 9.0 has a comprehensive set of risk calculation metrics covering all levels of the supply chain, which enables a company more effectively to balance risk impact and costs of risk mitigation with overall supply chain management costs. For example, the two new higher level risk metrics included in SCOR 9.0 are "Value at Risk" and "Risk Mitigation Cost."

Supply-Chain Council (www.supply-chain.org)

Value at Risk (often expressed as VaR) is the sum of the probability of risk events, multiplied by the monetary impact of the events on all of the supply chain functions (e.g., plan, source, make, deliver, and return). Risk Mitigation Cost measures whether the cost of reductions in risk is proportionate to the derived benefit, based on the monetary value of preventing or mitigating an event.

The Supply Chain and the Environment

Finally, in relation especially to vulnerability, the SCOR Model Version 9 incorporates GreenSCOR, previously a stand-alone reference model, which recognizes the need to address environmental sustainability efforts. GreenSCOR capabilities include:

- industry best practices for making the supply chain more environmentally friendly, such as by collaborating with partners on environmental issues, reducing fuel and energy consumption, and minimizing and reusing packaging.
- metrics to measure the effects of greening, including carbon and environmental footprint, emissions cost per unit, energy costs as a percentage of production costs, waste disposal as a percentage of product produced, and returned products disposed of versus those remanufactured.
- processes to address waste management, such as how to collect and manage waste produced during production and testing (including scrap materials and non-conforming product).

This concern for issues relating to corporate social responsibility is reflected in the *IBM Global CEO Study* on “The Enterprise of the Future” (2008):

“CEO concern about environmental issues has doubled over the past four years globally. However, this concern is not evenly distributed worldwide. CEOs in the Americas are beginning to show more interest, but focus is increasing faster among European CEOs. Asia Pacific actually showed the most dramatic increase, with attention nearly tripling since 2004.”

(*IBM Global CEO Study*, “The Enterprise of the Future,” 2008)

This increasing emphasis on environmental and social effects in addition to economic performance – the “triple bottom line” (Elkington, 1998)¹ – means that performance measures relating to supply chain relationships need to incorporate economic, social, and environmental factors. For example, Marks and Spencer in the UK specifically refers to measuring aspects of social and environmental accounting in their “Plan A.” The full impact of this is found throughout the supply chain and cannot be done in isolation:

“Plan A is our five-year, 100 point ‘eco’ plan to tackle some of the biggest challenges facing our business and our world. It will see us working with our customers and our suppliers to combat climate change, reduce waste, safeguard natural resources, trade ethically and build a healthier nation.”

(Marks and Spencer Plan A website, 2008)

Aspects of both collaboration between competitors and the importance of triple bottom line thinking are also evident in this extract from the Unilever website, 2008:

“Working with our suppliers: there are 8,430 first-tier suppliers of raw materials and packaging and these suppliers represent 55.5% of the 28.2 billion Euros we spent on bought-in goods and services. We are looking to embed ‘supplier assessment’ procedures into routine supplier management processes and develop more experience of helping poorly performing suppliers to meet our requirements. This is a complex task, though one of increasing concern to consumers, retailers and many of our competitors. We are working with our industry peers to establish a joint approach as suppliers of all types are encountering difficulties with the multiplicity of information requests from customers like us. During 2006, Unilever and a group of peer companies set up a forum aimed at sharing a common approach and system to evaluate the social, economic and environmental performance of suppliers across common types of goods and services. The forum is still in its early stages and is considering the best options.”

(Unilever website, 2008)

For more detailed coverage of risk analysis and management, and the identification and management of both opportunities and risks, the reader should refer to the *Managing Opportunities and Risks* Guideline by Bekefi, Epstein, and Yuthas dated 2008.

5. Supply Chain Management Accounting Techniques

Having examined the initial stages of the supply chain management model as set out in Figure 1.2, this Guideline will now look closely at eight key SCMA techniques that can be used to support the supply chain developments that have been touched on.

Examples of How Management Accounting Supports Supply Chain Management

Open Book Accounting

Open book accounting basically involves sharing cost information about relevant processes both within each organization and across organizations in the supply chain. The purpose is to identify non value-adding processes that could be withdrawn without negatively affecting the customer; indeed withdrawal is likely to improve service to the customer. Disclosing such data to supply chain partners is a practice that first appeared with the development of “lean thinking” in management (basically the idea that expenditure of resources for any goal other than the creation of value for the end customer is wasteful, and thus a target for elimination). Companies are often reluctant to share information, for example because of (a) concerns over trust and loss of competitive advantage), and (b) some technical difficulties in doing so (e.g., accounting conventions within organizations). However, the argument in favour of open book accounting is that it enables margin improvement through cost reduction, a margin improvement that can be shared between the partner organizations in an agreed manner. Both supplier and customer must share process cost information, because this is more likely to ensure success in identifying non-value adding processes.

Example 5.1: Strategic Alliance (Seal et al, 1999)

Two British-owned manufacturing companies in the automotive industry were keen to establish a strategic supply partnership (strategic alliance). In the assembler company, materials accounted for 80% of manufacturing costs, so managing the supply chain was a crucial element of overall cost control. The company was seeking closer ties (involving information sharing and R&D collaboration) with a supplier of strategic components. For its part, the supplier wished to establish the degree of cooperation and trust that the two companies had realized in their US operations. In the UK, the two companies had been doing business for approximately 25 years, but until recently their relationship had been at arm’s length.

The initial supply agreement for the proposed strategic alliance was based on a document drawn up by the assembler, one that stressed an open and trusting relationship that “delivers tangible and measurable benefits to both sides over a long period, and allows the sharing of ideas and information.” The agreement had a cost reduction target of 6% per annum for controllable costs, but would accommodate changes in the price of raw materials and exchange rate movements by reference to agreed public data. The agreement specified areas that should be subject to (a) continuous improvement, (b) a management review process, and (c) a governance procedure. The proposed alliance would call for cross-company teams to seek out and design mutually beneficial technical

projects. These would be jointly funded, but the assembler would have first use of the developments for a predetermined period.

Subsequent amendment of the alliance agreement changed the 6% cost reduction to a reduction in "all-in-cost." Although this potentially made agreement with the component supplier easier, it raised technical challenges in respect of measuring the reduction and distributing the benefits between the parties. Moving some of the value-adding work to the component supplier was consistent with what happened in the US. However, there was a problem with timing, as it would not be politically acceptable to move work from the assembler before the core business had grown sufficiently to take up any slack created by outsourcing. To create an open book agreement on operational matters, the parties needed to negotiate:

- the boundaries of activities to be included in the shared accounting information
- how to demonstrate benefits that were quantitative but not necessarily financial

Differences and weaknesses in both firms' cost systems also presented technical difficulties for the open book agreement.

Role of the Management Accountant:

- The Procurement Director at the assembler played a leading role in the firm's worldwide procurement strategy; he felt it was vitally important to involve the management accountants in the strategic alliance discussions and the drafting of any agreements.
- A management accountant with the job description of Continuous Improvement Manager was therefore fully involved in drafting the agreement and in the discussions about implementing the open book agreement.
- The management accountant brought particular technical skills relating to cost information that were vital to the discussions.
- It was necessary for the management accountant to develop costing and performance measurement technologies that were understood by the non-accountants involved in the strategic alliance discussions.

Benefiting from open book accounting opportunities required jumping several hurdles. Kajuter and Kulmala (2005) identify a number of these hurdles in their work based on German and Finnish companies:

- Suppliers experience no extra benefits from openness, and main contractors do not offer win-win solutions.
- Suppliers think that accounting information should be kept in-house.
- Network members cannot produce accurate cost information and see no sense in sharing poor cost data.
- Suppliers are afraid of being exploited if they reveal their cost structure.

- Suppliers do not have capable resources or resource support from main contractors for developing accounting systems.
- Network members cannot agree on how to implement open book practice.

These factors need to be taken into account when implementing open book agreements to facilitate their successful execution.

A paper by Free (2008) provides an interesting study of SCMA and trust among UK supermarkets and suppliers. Reference is made to statements about relationships made by major retailers (taken from websites) operating in the UK supermarket sector (e.g., Tesco, Sainsbury, Safeway, Waitrose, Marks and Spencer, and the Co-Op). Although the paper builds on some of the techniques discussed in this Guideline, it warns about the need to guard against (a) heavy-handed forms of accountability, and (b) indiscriminate demands for open book accounting. Handled inappropriately, these are unlikely to create trust and, more worryingly, may provide strong incentives for manipulation of management accounting information.

Value Chain Costing

Value chain costing builds on Porter's value chain analysis, which was covered in Section 3. Porter makes the argument that competitive advantage in the marketplace ultimately derives from providing:

- better customer value for equivalent cost (a differentiation strategy), or
- equivalent customer value for lower cost (a cost leader strategy).

Because a series of activities or "links in a chain" occurs between a product's design and its distribution, value chain analysis involves identifying where (a) customer value can be enhanced, (b) costs can be lowered, or (c) differentiation can be achieved in the firm's segment of that value chain. A key "lean thinking" aspect to this is value stream mapping, in which the flow of materials and information currently required to bring a product or service to a consumer is analyzed with a view to identifying opportunities for improving time to market (lead time).

Value chain costing then acts as a useful extension of conventional cost analysis, taking into account benefits and cost savings embedded in the firm's links with suppliers and customers. It can be defined as an activity-based costing approach, where costs are allocated to activities required to design, procure, produce, make, distribute, and service a product or to provide a service.

It should be noted that (a) data problems may be significant when undertaking value chain costing, and (b) the answers will not always be precise, but there are considerable benefits to be gained from the debate that results from the costing process and from enhanced quantitative awareness of the external competitive arena and of the firm's part in it.

Close links obviously exist between value chain costing and open book accounting, because the latter will enhance the benefits available from the former.

Example 5.2: School Trends (Coad and Cullen, 2006)

As part of a value chain analysis project, a visit was arranged to a garment manufacturer. The purpose of the visit was to review the process of garment manufacture, from placing a purchase order by School Trends for shirts, to receiving the product in Sheffield, so as to identify how the process might be improved or activities eliminated. The visit enabled the Finance Director to produce a detailed process map of activities performed by the supplier, which was forwarded to the supplier for checking. This revealed a number of non-value adding activities. For example, after the shirt was completed, it was ironed, folded into a neat square, bagged in quantities of five, and then boxed for despatch. At School Trends, the opposite activities were performed. They unpacked the boxes for placing on shelves, the bags were ripped open and wasted, the garment was unfolded ready for decoration, and the ironed area was subjected to creasing during framing for decoration. The investigation resulted in suggested cost savings that benefited both parties. At the supplier, the activities and costs of ironing could be eliminated altogether. The shirts could be folded once and placed directly into a box for despatch. This activity could be further improved by the use of plastic crates, to eliminate the purchase cost of bags and flimsy cardboard boxes. At School Trends, the disposal costs of bags and boxes would be avoided, and the company decided to appraise the possibility of investing in an automated handling system for unpacking the crates.

Role of the Management Accountant:

- The Finance Director, who was a management accountant, was central to the mapping exercise that took place as part of the value chain project. He completed the process and value stream mapping exercise both inside his own organization and across organizational boundaries.
- The Finance Director identified the cost savings and benefits to both parties.
- Sharing cost information was an important part of this exercise.

Target Costing

Target costing means determining a target cost for a product or service following its initial design, as a way to satisfy a customer need. The target cost is arrived at by identifying the price at which the product or service can be sold, and subtracting the amount of profit margin required of that product or service by overall company long-term margin requirements. Target costing is implemented primarily during the development and design phases of the manufacturing or service process. After a target cost has been determined, if present processes will result in those costs being exceeded, then process changes to meet the target cost have to be identified. Techniques such as open book accounting will help to identify where process cost reductions across the supply chain can be made without diminishing the ultimate customer experience. An associated costing approach is “Kaizen” costing, which (a) takes target costing beyond the development and design stage, and (b) requires continuing efforts to secure further cost savings through continuous improvement. These philosophies can be identified as strategic management accounting, because

they move management accounting away from a desire for accurate monitoring and towards a costing philosophy that is both forward-looking and closely linked to the pursuit of competitive advantage. This external focus signifies a move to market-led costing rather than cost-led pricing.

Example 5.3: Agricultural Machinery Producer (Everaert et al, 2006)

“Case B is a world leader in the fields of agricultural and construction equipment. Supported by 11,400 dealers in 160 countries, it brings together the knowledge and heritage of its brands with the strength and resources of its worldwide commercial, industrial, product support and finance organizations.”

(Company brochure)

In this competitive market, customer satisfaction and intensive cost management during design (target costing) are considered key factors for survival. The Head Engineer suggested that between 70-80% of the product cost is committed during the New Product Development (NPD) stage. This NPD stage starts with customer clinics involving existing and potential customers from different markets, who (a) discuss the functionalities of current products, (b) comment on competitors' offerings, and (c) provide feedback on early prototypes. A formal evaluation program is used to determine what characteristics of the product are important to the different markets. After discussions on the functionalities, volume, and selling price, a project book is established with input from all involved parties, such as engineering, marketing, finance, design, and purchasing. The profit margin is determined based on the margin of current products and the profit plan. The selling price is determined by the market, and the target cost is identified by subtracting the required profit margin from the anticipated selling price of the product.

In Case B, the focus is on direct cost reduction during NPD. Target cost attainment is monitored very closely by the design cost analysts and the cost reduction team. The target cost is subdivided into target costs for sub-assemblies, and detailed cost information is provided during NPD to support cost reduction. An important feature of the target costing process is the involvement of cross-functional teams (including finance). Top management at the organization will not certify a project book if the target cost is expected to be too hard to reach.

Role of the Management Accountant:

- Being an important member of a cross-functional team.
- Providing specialist accounting knowledge and skills to complement engineering, design, and marketing skills.
- Playing a business adviser role within these management teams.
- Producing relevant reports that drive continuous cost reduction while maintaining customer-identified attributes.

Quality Costing

Quality costing is an important management accounting technique that aims to help improve quality, both within an organization and across organizations in a supply chain. The key drivers are twofold: (a) to reduce quality costs, and (b) to increase the quality offering to the ultimate customer. Quality costs can be classified into:

- the cost of conformance (costs of prevention and costs of appraisal), and
- the costs of non-conformance (costs of internal and external failure).

The idea is to reduce poor quality and waste by improved preventative measures that reduce the incurrence of failure costs and improve the customer experience.

Management accounting has a significant role to play, because even individual organizations are often unaware of the costs of failure. Clearly, therefore, it is even more important when extended through the supply chain. Associated techniques, such as open book accounting and value chain analysis and costing, can be used in conjunction with quality costing. Their use supports efforts to gain competitive advantage, particularly in respect of "supply chain versus supply chain."

Example 5.4: Quality costing implementation at Halfords plc (Bernon and Cullen, 2007)

A presentation on *Reverse Logistics: A Vision for Best-Practice Returns Process* was made by the Head of Quality and Cost Reduction to the Board of Halfords (a leading UK retailer of motoring products). The presentation identified the key drivers of retail product returns and the current position at Halfords. This was particularly important for the firm, as it had increased the unit price of its product offering with a strategic focus on more high-valued products such as satellite navigation systems. The presentation referred to significant levels of "no fault found", particularly with new strategic products such as satellite navigation systems, and outlined the potential impact this would have on bottom line performance and customer service. It emphasized the opportunities that improved reverse logistics processes would have for improving margins and customer service.

As part of the Reverse Logistics project, the management accountants at Halfords embraced the analysis of prevention, appraisal, and failure costs. Examples of identified failure costs included stock write-offs, staff time involved, transport costs associated with returns, warehouse space utilized for returns, administration costs (e.g., failed debit notes), cost of supplier contracts, triple handling, customer dissatisfaction, and potential loss of customers. Examples of identified expenditures on prevention included (a) the issuing of clearer instructions to both stores staff and customers, (b) increased training of staff to prevent customer returns, (c) process improvements through increased collaboration with other members of the supply chain, (d) supplier agreements, and (e) increased transparency through further monitoring and behavioral controls.

The key point here is that the preventative measures and associated costs were considerably less than the failure costs associated with product returns. Possibilities of working with other partners in the supply chain, including customers, were at the heart of the potential improvements. Although some of the improvements could be made within the organization itself, many of the improvements required collaboration with others, and this needed to be identified in the accounting figures.

A particularly good example of the use of quality costs was found in the treatment of satellite navigation systems. The firm found significant “no fault found” returns, because the customers simply did not understand the product. This led to an unacceptable level of failure costs. As part of the changes Halfords introduced, it incurred additional prevention costs in the form of detailed instructions to staff (manuals), and increased time taking customers through the installation process. Not only did this decrease the number of returns, but it also became an attribute of the company’s customer service. Returns avoidance was seen as an important key to reducing reverse logistics costs, increasing customer satisfaction, and reducing the environmental impact of returns.

The Head of Quality and Cost Reduction at Halfords identified the following lessons for other organizations:

- Engage the Finance Director early in the process
- Gain commitment from senior management
- Get visibility of issues
- Seek out quick wins
- Take bite-sized chunks
- Produce regular progress reports for senior management
- Seek support to keep your motivation/energy
- Take benchmark approaches
- Create a dedicated resource (self-funding)

Role of the Management Accountant:

- The management accountant developed transparent information (performance measurement reports) about the costs and opportunities associated with changes in reverse logistics processes.
- This created new lines of investigation with suppliers, and initiation of root cause analysis. This is an iterative process that aims to correct or eliminate root causes of problems, as opposed to merely addressing the immediately obvious symptoms, thereby minimizing the chances of problem recurrence. Note that root cause analysis is frequently viewed as a technique of continuous improvement
- Adoption of the quality costing approach led to a reduction in overall costs and an improvement in value for the customer.
- The engagement of the finance team was seen to be a crucial factor in the change process.

In the Halfords example, improvements in reverse logistics processes also positively affected the level of CO₂ emissions, because of fewer lorry miles. Performance metrics focusing on environmental factors were therefore introduced as part of the transparent performance measurement reports developed by the firm.

Performance Measurement

Performance measurement needs to take place throughout the supply chain, and should incorporate both financial and non-financial measures. The balanced scorecard can be extended to include supply chain partners, because the objective is to create a supply chain that is much more competitive than the alternative supply chain providers of that product or service. The balanced scorecard has its greatest impact when it is used to drive the change process in support of the organization's strategic intentions.

A traditional balanced scorecard consists of measures in four areas (financial perspective; customer perspective; internal perspective; innovation and learning (and growth) perspective). Some firms may introduce other perspectives (e.g., sustainability perspective), because the point is to measure performance in relation to the key strategies being followed by the firm. A key feature of the balanced scorecard is the cause and effect relationship between its different perspectives. For example, how do training programs impact on the financial performance of the organization, or on its supply chain?

The challenge from an SCMA perspective is how to extend the concept of the balanced scorecard across supply chain members. Such an extension demands excellent understanding of the key performance areas that will drive competitive advantage.

Gunasekaran et al (2004) produced a framework for organizations developing supply chain performance metrics, a framework that was linked to different supply chain activities/processes (plan, source, make/assemble, deliver), and different levels of organizational decision making (strategic, tactical, operational), as seen in Figure 5.1.

**Figure 5.1: Supply chain performance metrics framework
(Gunasekaran et al, 2004)**

Levels of Decision Making Supply Chain Activities/Process	<i>Strategic</i>	<i>Tactical</i>	<i>Operational</i>
<i>Plan</i>	Level of customer perceived value of product Variances against budget Order lead time Information processing cost Net profit vs productivity ratio Total cycle time Cash-to-cash cycle (see below) Product development cycle time	Customer query time Product development cycle time Accuracy of forecasting techniques Planning process cycle time Order entry methods Human resource productivity	Order entry methods Human resource productivity
<i>Source</i>		Supplier delivery performance Supplier lead time against industry norm Supplier pricing against market Efficiency of purchase order cycle time Efficiency of cash flow method Supplier booking-in procedures	Efficiency of purchase order cycle time Supplier pricing against market
<i>Make/Assemble</i>	Range of products and services.	Percentage of defects Cost per operation hour Capacity utilization Utilization of economic order quantity.	Percentage of defects Cost per operation hour Human resource productivity index.
<i>Deliver</i>	Flexibility of service system to meet customer needs Effectiveness of enterprise distribution planning schedule	Flexibility of service system to meet customer needs Effectiveness of enterprise distribution planning schedule Effectiveness of delivery invoice methods Percentage of finished goods in transit Delivery reliability performance	Quality of delivered goods On-time delivery of goods Effectiveness of delivery invoice methods Number of faultless delivery notes invoiced Percentage of urgent deliveries Information richness in carrying out delivery Delivery reliability performance

An interesting supply chain performance metric to expand on is cash-to-cash cycle.

Example 5.5: Cash-to-cash cycle (Farris II and Hutchison, 2002)

Farris II and Hutchison (2002) discuss the concept of a cash-to-cash (C2C) cycle or the cash conversion rate, and describe it as an important supply chain management metric. The C2C cycle basically reflects the length of time between cash payment for supplies and the collection of accounts receivable generated by the sales of these goods.

Cash-to-cash cycle = Days cash is locked up as inventory + days cash is locked up in receivables – days cash is free because the business has not paid its bills

Managing the C2C cycle involves both a cross-functional approach within the firm and a collaborative approach throughout the supply chain. Farris II and Hutchison quote significant benefits gained by both Dell Computer Corporation and Cisco Systems through use of this approach. In broader terms, they report that companies with best-in-class supply chain management practices outperform their average performing competitors with 10% to 30% higher on-time delivery performance, 40% to 60% shorter C2C cycle time, and 50% to 80% less inventory.

C2C cycle is a way of introducing “lean thinking” into the way the firm is using its operating capital, by calculating how long cash is out of its reach. The argument is that the speedier the C2C cycle for a particular firm, the fewer days there are where cash is unavailable to support value creation by the firm.

When applying and interpreting the C2C cycle, it is important that, as a customer, the firm does not force suppliers out of business. This will not help to maintain sustainable supply chains and is an inappropriate use of power. The objective is to engage in more competitive supply chains; therefore improvements in C2C cycle need to take sustainability into account.

One organization that has applied C2C philosophy is Lexmark, a leading developer, manufacturer, and supplier of printing and imaging solutions for businesses and homes. The firm supplies products such as laser printers, inkjet printers, multifunction devices, associated supplies, services, and solutions. Its main customers are dealers, retailers, and distributors worldwide. In 2006, Lexmark reported \$5.1 billion in revenue and served business and consumers in more than 15 countries.

In 2001, Lexmark embarked on a supply chain strategy aimed at improving competitive advantage. This strategy comprised the three Cs: Customer loyalty, reducing Cash cycle, and focusing on the best total Cost.

“While the supply chain strategy is relatively simple, execution of this strategy brings a competitive advantage. Lexmark have been able to drive service level improvements for customers, reduce total cost, and reduce the cash-to-cash cycle. Driving customer loyalty through improved service levels and metrics

such as delivery performance and cycle time drives revenue growth. Reducing total cost year on year allows Lexmark to be the low cost leader across the supply chain. This is important in a market where prices can decrease at 20% or greater year on year. In addition, reducing the cash-to-cash cycle allows for cash to be invested in new initiatives for Lexmark.”

(Saenz et al, 2006)

A key part of Lexmark’s strategy was to align more closely with its customers and supplier channel partners. The success of this strategy was clearly illustrated in 2007 when Ingram Micro Inc., the world’s largest technology distributor, recognized Lexmark with its 2007 Manufacturer Award of Excellence in the peripherals category:

“The award was designed to recognize technology manufacturers for outstanding information technology channel performance and partnerships, as well as achievements against measurable objectives such as revenue, profitability, marketing programs, solution provider support and services.”

Lexmark works with Ingram Micro to distribute its inkjet and laser products to consumers, small- and medium- sized businesses, and large enterprise customers through solution providers and value-added resellers. “Lexmark is a best-in-class example of an Ingram Micro partner in excellence,” said Scott Zahi, vice president of vendor management for systems/storage, components, and peripherals at Ingram Micro. “Lexmark is a marketing thought leader, always investigating new ways of doing business, and every level of the Lexmark organization supports the partnership and relationship.”

“We want to ensure that our customers have access to the printing technology that will help them improve productivity in their unique environment – whether it is a small business or a very large enterprise – and distributors like Ingram Micro help make that happen,” said Marty Canning, Lexmark vice president and president of its Printing Solutions and Services Division. “The channel is an integral part of Lexmark’s success, and this recognition is a reflection of our strong commitment to our partner.”

(Press Release, 10/12/2007)

Lexmark therefore used C2C metrics to improve competitive performance in a way that recognized the need to work in close partnership with its customers and suppliers. In terms of C2C cycle, the ongoing strategy led to the following improvements over a four-year period from 2001 (Saenz et al, 2006):

Quantitative results:

- A 45% decline in C2C days
- A 300% increase in the cash flow from operations during a four-year period
- A 32% reduction in inventory days
- A 975% increase in factory direct shipments
- A 15% improvement in service delivery

Qualitative results:

- Improved relationships with customers
- Better working relationships with suppliers/partners
- Better utilization of Lexmark's resources.

Supply chain cash flow risks should be considered alongside the C2C cycle. Tsai (2008) provides statistical evidence about using asset-backed securities to finance accounts receivable as a means of shortening the C2C cycle and lowering the cash inflow risk. Support is given to the use of information technologies by supply chain members to allow them to share the physical flow of information. Tsai also recognizes the value of timely and accurate supply chain information in improving credit ratings, leading to a lower financial cost.

Role of the Management Accountant:

- Management accountants have the skills to develop relevant C2C performance measures, and to work with their colleagues on interpreting information and promoting positive action plans so as to improve C2C cycle time.
- Management accountants must go beyond their own organizational boundaries to ensure that their company benefits fully from supply chain relationships.

In Section 4, the developing requirement to recognize social and environmental impacts, as well as the economic impact, of organizational strategies was examined. A Statement on Management Accounting (SMA) produced in 2008 by the Institute of Management Accountants on *The Evolution of Accountability – Sustainability Reporting for Accountants* provides extensive coverage of the key points. In terms of SCMA, management accountants need to develop performance metrics that recognize sustainability. A good example, taken from the 2008 SMA, is the use by Wisconsin Energy of a metric covering relationships with suppliers. The metric is “% of invoices paid late versus contract terms.” This recognizes the importance of ensuring the continued operation of suppliers, and links to the point already made about suppliers in the C2C example given above.

Make Versus Buy (Outsourcing)

Traditional management accounting techniques such as “make versus buy” are often used in a supply chain context, particularly in relation to identifying opportunities for outsourcing. However, care must be taken; outsourcing decisions must be made in the strategic contexts of (a) satisfaction of the ultimate customer, and (b) preservation of the firm's core competences (briefly, what it needs to be able to do to survive). Although outsourcing is often seen as a risk mitigation strategy, management accounting control mechanisms should be used to monitor its associated costs and benefits, and to make sure that the customer value proposition is recognized and still capable of being delivered to the ultimate customer.

The customer value proposition consists of the value provided to the customer by:

- the products and services
- the brand, and
- the relationship with the firm or the firm's supply chain.

Outsourcing, where it takes place, should enhance the ultimate customer proposition. "Make versus buy" accounting therefore needs to take this broader requirement into account.

Example 5.6: School Trends (Coad and Cullen, 2006)

The supplier of decorative embroidery had been a subcontractor for much of the life of School Trends Ltd. Prior to his visit, Derry Mather, the Financial Controller, had performed an internal value chain analysis of School Trends, and identified opportunities for improvement of the boundary-spanning routines with the supplier. A major focus was to be on turnaround time, and how that could be improved so as to benefit School Trends' customers, School Trends, and the supplier. The visit to the supplier enabled Derry Mather to observe processes (process mapping) from the receipt of a purchase order from School Trends, through decorative embroidery, to transportation of the finished products to customers. A beneficial side effect was the opportunity for School Trends to benchmark its own decorative embroidery processes against those of an outside producer. Analysis of the inter-organizational processes identified opportunities for improvements in purchase ordering, and a new timetable for deliveries and embroidery. This cut the turnaround time from 12 days to 8 days, and the use of revised packaging and transportation arrangements cut costs for both School Trends Ltd and the supplier. Cost benefit analysis played an important part in the decisions being made. Following the value chain analysis project, School Trends took a major strategic decision to outsource the majority of its decorative embroidery activities. Part of the logic of this decision was to re-focus on what it considered to be its core competences, which it identified as relational marketing activities with schools, and its abilities to design customized decoration. The company operates a no-redundancy model, and employees previously engaged in decorating were redeployed in other revenue-generating operations in the company. In terms of results, the decision to outsource most of its decorating and print activities reduced variable costs by about 20%, and improved services to customers by reducing turnaround times.

Role of the Management Accountant:

- The management accountant (Financial Controller) carried out process mapping, both within and outside the organization.
- This enabled costs and process times to be identified and comparisons to be made with external providers.
- The management accountant was involved in the benchmark exercise with the supplier organization.

- The management accountant produced the cost benefit analysis used in the decision related to outsourcing.

Some of the potential problems associated with outsourcing, and the potential role of management accountants with regard to outsourcing and project risk, have been well-illustrated in the problems facing Boeing and the development of its Dreamliner aircraft:

“Unbelievably, although nearly 900 of the aircraft have been sold, its profitability is in question as the firm’s global supply chain cracks up. At the heart of the problem is the ‘Dell model’ (after the computer manufacturer) applied to the project’s funding and management. Industry researchers say that Boeing’s attempt to minimize financial risks by maximizing the number of development partners has had the opposite effect; outsourcing on this scale (80%, including large and complicated components) has actually increased the risk of project and management failure.”

(Simon Caulkin, “Supply Chains Should be Kept on a Short Leash,” *The Observer*, April 27, 2008)

“The 787 program has been delayed three times as Chicago-based Boeing struggled with supply chain difficulties, a shortage of parts and other problems, pushing back first delivery by about 14 months.”

(Monica Gutschi, “Boeing Sticks to Dreamliner Goal.” *The Wall Street Journal*, July 16, 2008, p. 84)

A further point to note is that there are considerable costs involved in reversing any outsourcing decision, both of time and of restoring the core competences lost due to the outsourcing.

Benchmarking

Benchmarking can be used to compare performance of one organization against the “best in class” in terms of providing a particular product, process, or service. This can be extended to benchmark performance across supply chains (e.g., different supplier performance or different customer performance in terms of the use of a particular product or service), using both financial and non-financial performance indicators. Benchmarking is often used in conjunction with other SCMA techniques identified here. For example, there are numerous examples of firms using activity-based costing and benchmarking together; from a supply chain perspective, “cost-to-serve” comparisons are also a useful feature.

Example 5.7: Cost-to-serve

“Cost-to-serve” is targeted at identifying the cost of serving particular customers and channels of distribution. The focus is on profit and loss of the whole supply chain rather than of any particular function. This is linked to concepts of customer profitability and incorporates activity-based costing analysis to ensure that the

cost object is centered on processes rather than functions. Distribution channels in particular are very important in the modern business environment, where a whole range of ways of doing business have emerged (e.g., internet trading, auctions, etc.) Understanding interdependence throughout the supply chain is crucial when looking at cost and customer service performance:

“Maintenance and labour costs make up the majority of the six leading UK suppliers’ cost-to-serve, but cutting staff in the contact centre can drive up costs in other departments. Understanding these interdependencies is key in managing costs whilst maintaining quality service.”

(UK Utilities Residential Cost-to-Serve Benchmarks and Metrics – Unravelling the Cost Drivers, Datamonitor, January 2005)

A company that has embraced the cost-to-serve model is Ontex, a European market leader in hygienic disposables for the private label sector based in Belgium. Ontex redesigned their supply chain because of sharp price competition coming from one of the most important manufacturers in the branded sector of the industry (*Business Logistics Magazine*, January 2007). Ontex wanted to undertake a thorough analysis of its cost structure, and they utilized a cost-to-serve model to bring together manufacturing and network costs:

“Most companies calculate their cost structure using the classic components in the manufacturing cost price, such as materials, salaries, variable overhead, fixed overhead, unused capacity and the warehouse and freight costs linked to a specific plant. But very often companies have no idea what it costs to get a product through the entire network to the client and how much cost that product accumulates as it goes through. We now have a picture of those costs per client, per product group, per plant and per machine. We can use that picture to determine accurately which costs have the largest impact on a specific plant or distribution centre. By combining manufacturing costs with network costs you can calculate the savings potential yielded by relocating machinery or volumes. You can also get an idea of how feasible such plans are and you can build a picture of their financial implications.”

(Van den Eede, Logistics Process Manager, Ontex, Equazion White Paper, January 2007).

Cost-to-serve involves developing supply chain profit and loss accounts using activity-based costing, together with cost objects such as customers or distribution channels.

Cost-to-serve benchmark comparisons can also be used to determine an organization’s relative position in terms of serving particular customers and channels of distribution.

Role of the Management Accountant:

A recent job advertisement from Innocent Drinks, recognized as one of the most exciting and fastest growing Fast Moving Consumer Goods (FMCG)

businesses in the UK, illustrates the role that a management accountant can play in producing cost-to-serve reports:

Job 1 – Supply Chain Controller in the UK Finance Team

Innocent's supply chain is varied and includes fruit procurement, manufacturing and logistics and this role will take full financial responsibility for the supply chain, ensuring that the operations teams is supported by accurate and reliable information.

Key responsibilities will include:

- Supply chain financial reporting
- Budgeting and forecasting
- Acting as the Finance business partner to the Supply Chain team, providing commercial decision support
- Managing a team of Analysts
- Developing systems and processes

The successful candidate will be relied upon to drive processes, controls and systems whilst providing project and commercial support to the business. The ability to appraise different costing methodologies and to explain the supply chain P&L to non-financial people is essential.

This is an outstanding opportunity for the ideal candidate, who will be a qualified accountant with great communication skills, experience of developing and implementing processes, excellent logic skills and the ability to use initiative to problem solve.

Therefore the role of the management accountant is:

- to use technical skills to produce relevant accounting reports for supply chain activities
- to produce comparative data that can be used for benchmarking
- to support supply chain operational teams in making supply chains more efficient and effective
- to provide commercial support

Activity-based Costing

Activity-based costing is an approach to costing that focuses on processes rather than functions. Managers can only manage costs by managing the activities that cause the costs. The key aspect, therefore, is to identify the cost drivers and to allocate costs to an activity (process) on the basis of that cost driver. Together with the indirect costs of an organization, costs across organizational boundaries can be included in the supply chain context. Traditionally, indirect costs have been allocated to costs or services on the basis of some very arbitrary allocation of overhead absorption.

Activity-based costing collects data that cuts across traditional organizational functional boundaries, and can be used alongside continuous improvement programs (e.g., Six Sigma, Kaizen) to create leaner and more responsive organizations and supply chains. It can also be used alongside open book accounting and quality costing to take out non-value adding processes. In terms of supply chains, the important feature is that activity-based analysis is undertaken both inside and outside traditional organizational boundaries.

Example 5.8: Application of activity-based costing to improve supply chain performance (Whicker et al, 2006)

The case company was a circa \$10 billion revenue organization and market leader in its area of branded fast-moving consumer goods. The organization's key operations were based in the Americas, Europe, and Asia, and employed about 20,000 employees. Products were distributed to market via retailers, grocers, and wholesalers.

The challenge – The total supply chain time from inbound operations to delivery to customer was found to be, on average, 36 days, while the actual manufacturing time took one hour. The percentage of non-value adding time was found to be 97%, with a major component of that time being the double handling characteristics of outbound distribution.

Cost profile – Direct costs accounted for just 56% of the total costs, leaving 44% of the costs allocated using absorption costing. The cost reporting system masked the real costs of supply chain activities. For example, the cost of delivering a pallet was different for every customer, due to individual characteristics, and an average cost was not appropriate.

Using activity-based costing – By reallocating the indirect costs associated with the products using activity-based costing, costs were redirected to supply chain activities using cost drivers. The costs were then assigned to processes identified through process mapping exercises.

Combining time and cost data – Although time-based process mapping was useful in identifying areas for reducing non-value adding activities, it was not possible to evaluate these options based on potential cost savings, because the existing cost reporting system did not align itself to processes. The development of a cost-based process map graphically represented the cumulative costs of the processes and, when combined with the time-based process maps, allowed comparisons of time, waste, and cost.

Why is the relationship between time and cost important?

- Cost optimization undertaken in one functional area can lead to cost increases in another functional area.
- Time and cost in supply chain processes typically have a non-linear relationship.

- An hour of non-value adding time in one process will typically have a different cost associated with it than an hour of non-value adding time in another process.
- The ability to reduce costs associated with non-value adding activity in the short term will generally depend on the fixed cost component of that activity.

Role of the Management Accountant:

- The management accountant can work with supply chain colleagues to prepare cost-based process maps using activity-based costing information.
- Such cost-based process maps should be prepared with the objective of creating value for the end customer.

One of the aspects of SCMA that has become clear in this Guideline is that many of the techniques identified are, in practice, used together. Dekker (2003) reports on the use at J Sainsbury plc of activity-based costing for benchmarking suppliers as part of a value chain analysis. Suppliers were analyzed into three categories depending on the volume that they delivered and the strategic importance of their products to J Sainsbury plc. The three categories were core suppliers, middle to large suppliers, and small suppliers. Activity-based costing information was developed, mainly with core suppliers, to provide benchmark data and identify opportunities for improvement. Thus, when readers of this Guideline are considering applying some of the techniques identified here, they should not think about the techniques in isolation. Rather, they should think about what techniques could be applied to create value for the end-customer, and they should be aware that almost certainly this will entail a combination of SCMA techniques.

6. Putting Supply Chain Management Accounting Lessons into Practice

After identifying the key SCMA techniques that can be used by organizations, it is now useful just to reflect briefly on (a) the process used by two of the organizations identified in the illustrations, (b) the lessons learned, and (c) their applicability to an organization from a different industrial context. The two organizations concerned are School Trends Ltd and Halfords plc.

The process followed in their respective supply chain projects were as follows:

School Trends Ltd	Halfords plc	Halfords plc
<p>Step 1: Identification of strategic positioning.</p> <p>Step 2: Map the existing processes both internally and externally throughout the value chain.</p> <p>Step 3: As a result of the value mapping exercise, identify current weaknesses, bottlenecks, and potential improvements.</p> <p>Step 4: Implement changes.</p> <p>Step 5: Performance measured against original strategic targets for improvements in supply chain performance.</p> <p>Step 6: Key lessons learned</p>		<p>Step 1: Identification of strategic positioning.</p> <p>Step 2: Identification of the size of the risk and the justification for change.</p> <p>Step 3: Identification of potential opportunities for improvements.</p> <p>Step 4: Implement changes.</p> <p>Step 5: Greater transparency through focused performance measurement reports.</p> <p>Step 6: Key lessons learned</p>

The key lessons learned in each case, and their applicability to an organization from a different context (a local authority procurement network in the construction area), are as follows:

School Trends Ltd	A local authority procurement network in the construction area
Active engagement with all members of the supply chain	Extend partnering beyond client/contractor level
Benchmarking activities and sharing information throughout the supply chain	Identify some best practice examples from existing members and share through Local Authority Procurement Network. Question the present ways of doing things. Challenge ongoing routines and behaviors, and the current “who does what” in the supply chain. Think about possibilities of standardization
Use quality costing to identify waste and non-value adding activities	Identify failure costs through the supply chain and implement preventative or avoidance activities to reduce overall costs and improve supply chain performance from a customer perspective.
Identify strategic targets for supply chain performance improvement	Measure performance across organizational boundaries and not just in terms of individual organizations.

Halfords plc	A local authority procurement network in the construction area
Holistic approach to supply chain improvement.	Need to think in terms of process rather than just individual parts of the supply chain. Lead time (time to market) improvements can be made by considering parts of the supply chain that have not previously been considered significant.
Benchmarking activities and sharing information throughout the supply chain.	See School Trends Ltd. Think about alternative procurement routes that take out non-value adding activities. Challenge existing supplier agreements.
Talk substantively to suppliers and other members of the supply chain. Identify positive supplier agreements that result in a “win-win” situation for the parties.	Engage with members of the supply chain to identify revenue-gaining opportunities for partner members. Challenge existing relationships, and share accounting information to improve supply chain performance.
Identify strategic targets for supply chain performance improvement.	See School Trends Ltd Use speedy performance measures to change behaviors in a constructive manner, and beware of potential dysfunctional performance measures (“what you measure is what you get”).

The steps highlighted above link to the Supply Chain Management Framework discussed at the beginning of this Guideline, especially Steps 4 to 7. In particular, continuous improvement comes from building on key lessons and constantly reviewing progress in terms of supply chain relationships and the pursuit of competitive advantage.

Conclusion

In a changing world, management accounting has to keep pace with changing business models. It is clear from the evidence that new management accounting practices, or different ways of using some fairly long-standing techniques, are needed. It is also important to take a systemic view of what is happening throughout the whole supply chain. Although it is often argued that it is global players who introduce innovations in operations and processes, there are many smaller organizations that are important partners in the supply chain. Management accountants working in these organizations need to carefully consider the practices outlined in this Guideline, because their sustainability may well depend on their ability to work with larger organizations as part of their supply chain.

There is a growing interest in the area of SCMA. Some organizations have made great progress, while others have not really combined operational and financial concerns effectively. Failure in this respect may result in a loss of competitiveness and ultimate lack of sustainability, and the challenges ahead also extend to incorporating triple bottom line thinking into the supply chain metrics. The skills possessed by management accountants fit with the enablers identified for supply chain management professionals (see Figure 1.1), so management accountants have significant parts to play in enhancing competitive performance through improved supply chain management processes.

Endnote

- ¹ John Elkington, *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*, New Society Publishers, 1998.

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