
Supply-chain operations reference model (SCOR): the first cross-industry framework for integrated supply-chain management

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Abstract

The supply-chain operations reference model (SCOR) is the first cross-industry framework for evaluating and improving enterprise-wide supply-chain performance and management. The culmination of intensive work by 70 world-class manufacturers, SCOR provides standard process definitions, terminology and metrics. It will enable companies to benchmark themselves against others, and influence future applications development efforts to ensure fit with manufacturers' needs. The emerging process reference model concept is the logical extension of business process re-engineering and other process improvement efforts. SCOR, which is structured in four levels, is based on a plan, source, make, deliver framework.

Introduction: the importance of supply-chain integration

Managing supply-chain operations is critical to any company's ability to compete effectively. The supply chain has traditionally been managed as a series of simple, compartmentalized business functions. It was driven by manufacturers who managed and controlled the pace at which products were developed, manufactured and distributed. In recent years, however, customers have forced increasing demands on manufacturers for options/styles/features, quick order fulfilment and fast delivery. With the long-time competitive differentiator of manufacturing quality approaching parity across the board, meeting these customer demands has emerged as the next critical opportunity for competitive advantage.

Maintaining competitive advantage likewise forces constant redirection and enhancement of product features, quality, cost, options and services. Supply-chain effectiveness has therefore joined product quality and time-to-market as a key competitive differentiator. Success for many companies now depends on their ability to balance a stream of product and process changes with meeting customer demands for delivery and flexibility. Optimally managing supply-chain operations has therefore become critical to companies' ability to compete effectively in the global marketplace.

Data from Pittiglio Rabin Todd & McGrath's (PRTM's) 1996 integrated supply-chain benchmarking study shows that the performance gap between best-in-class and average companies is widening, and that companies unable to leverage effectively the outcome of an efficiently run supply chain are rapidly falling behind. Concurrent with the increased importance of the supply chain to a company's competitiveness has been a shift from traditional function-based (vertical) management to process-based (horizontal) management. As a result, the tight integration of management processes is increasingly important, and complex operations processes must be clearly defined and effectively implemented.

Release of SCOR

To assist companies in increasing the effectiveness of their supply chain, and to support

the move to process-based management, two consulting firms – PRTM and Advanced Manufacturing Research (AMR) – set out to consolidate within a process reference model their experience along with that of a group of senior operations, manufacturing and supply-chain managers from many of the leading companies. This group of companies, together with other leading US and multinational firms, joined together in 1996 to form the Supply-Chain Council (SCC). The SCC took the reference model and helped develop, test and finally release it, calling it the supply-chain operations reference model (SCOR). SCOR is the first cross-industry framework for evaluating and improving enterprise-wide supply-chain performance and management.

By its release in Europe in February 1997, SCOR represented the culmination of 12 months intensive work by 70 world-class manufacturers from diverse industry segments. 1997 has been defined as the “beta test” year for SCOR, during which the SCC will focus on making the model available, and encourage its use in implementation. The model has been positioned by the SCC to become the industry standard for describing and improving operational process effectiveness.

SCC members support SCOR as the standard process reference model for supply-chain management. It brings order to the diverse activities that make up the supply chain, and provides common terminology and standard process descriptions. The model allows companies to:

- evaluate their own processes effectively;
- compare their performance with other companies both within and outside their industry segment;
- pursue specific competitive advantages;
- use benchmarking and best practice information to prioritize their activities;
- quantify the benefits of implementing change; and
- identify software tools best suited to their specific process requirements.

The logical evolution of SCOR

A process reference model is the next logical step from the concept of business process re-engineering (BPR), which has developed along various paths since the late 1980s. Initially, companies rushed to capture the substantial perceived benefits to be gained

through reconfiguring businesses to meet shifting market demands and new strategic imperatives. Early BPR efforts, which were often based on information system design techniques, were used to derive desired “to be” business processes, aimed at eliminating non-value-added activities and improving the effectiveness of remaining activities. Due to BPR having a predominantly inward perspective, these early efforts often left executives confused about the real level of improvement and fearful of competitive gaps.

These concerns gave rise to the second wave of re-engineering, centred on benchmarking which focuses on measuring the “best of the best”. While “benchmarking visits” were enlightening, many of the observed practices proved difficult to transplant into other organizations. Gradually, benchmarking evolved to encompass “best practice” analysis, combining quantitative metrics with qualitative practices and allowing correlation of specific business practices to the resulting measurable outcome.

A process reference model approach allows management to be much more confident that the changes desired in business process performance are the “right” changes, and that performance improvements can be predicted, achieved and measured. But while benchmarking continues to be an excellent method for setting performance targets, many users have found that simply observing practices in other companies does not mean these practices will transplant easily to their own organizations. In addition, benchmarking lacked a common language and common measurements across and inside particular industries, making meaningful comparisons difficult.

A process reference model describes, characterizes and evaluates a complex management process. Such a model builds on the concepts of BPR, benchmarking and process measurement, by integrating these techniques into a cross-functional framework. Once a complex management process has been “captured” in a process reference model, it can be described unambiguously, communicated consistently, and redesigned to achieve competitive advantage. In addition, given the use of standard measurements for process elements and activities, the process itself can be measured, managed and controlled, and it may be refined to meet a specific purpose. SCOR is a process reference model developed

specifically for integrated supply-chain management.

Too often, the supply chain has been viewed as simply the process of inventory and logistics management. The plan, source, make, deliver framework (see section on SCOR process elements, below) defines a more strategic view of this critical management function, rather than just a set of independent tactics. SCOR allows manufacturers to “configure-to-order” their supply-chain process to target and attain specific competitive advantage. As market forces continue to shift, they can constantly “re-tune” their supply-chain process through benchmarking to retain their competitive edge.

SCOR overview

SCOR is designed to enable companies to communicate, compare and develop new or improved supply-chain practices from companies both within and outside of their industry segment. Its key components are:

- Standard descriptions of the process elements that make up complex management processes.
- Benchmark metrics used to compare process performance to objective, external points of reference.
- Description of best-in-class management practices.
- Mapping of software products that enable best practices.

SCOR spans:

- All customer interactions, from order entry through paid invoice.
- All physical material transactions, from the supplier's supplier to the customer's customer, including field service logistics.
- All market interactions, from the understanding of aggregate demand to the fulfillment of each order.

With SCOR, manufacturers can:

- Easily configure the internal and external supply chain; illustrate current supply-chain configuration and map ideal supply-chain process.
- Evaluate and communicate more effectively internally across functions, and externally with suppliers and distributors, via a common language and process definitions.
- Evaluate their own supply-chain processes and compare their performance with that

of companies within and outside their industry segment.

- Use benchmark and best practice data to prioritize their activities, quantify the potential benefits of specific process improvements, and determine financial justifications.
- Map available software products to the standard supply-chain processes to weigh product fit objectively against specific need; and work with vendors to identify needed product features.
- Measure ongoing process improvements and easily reconfigure and fine-tune efforts as needed.

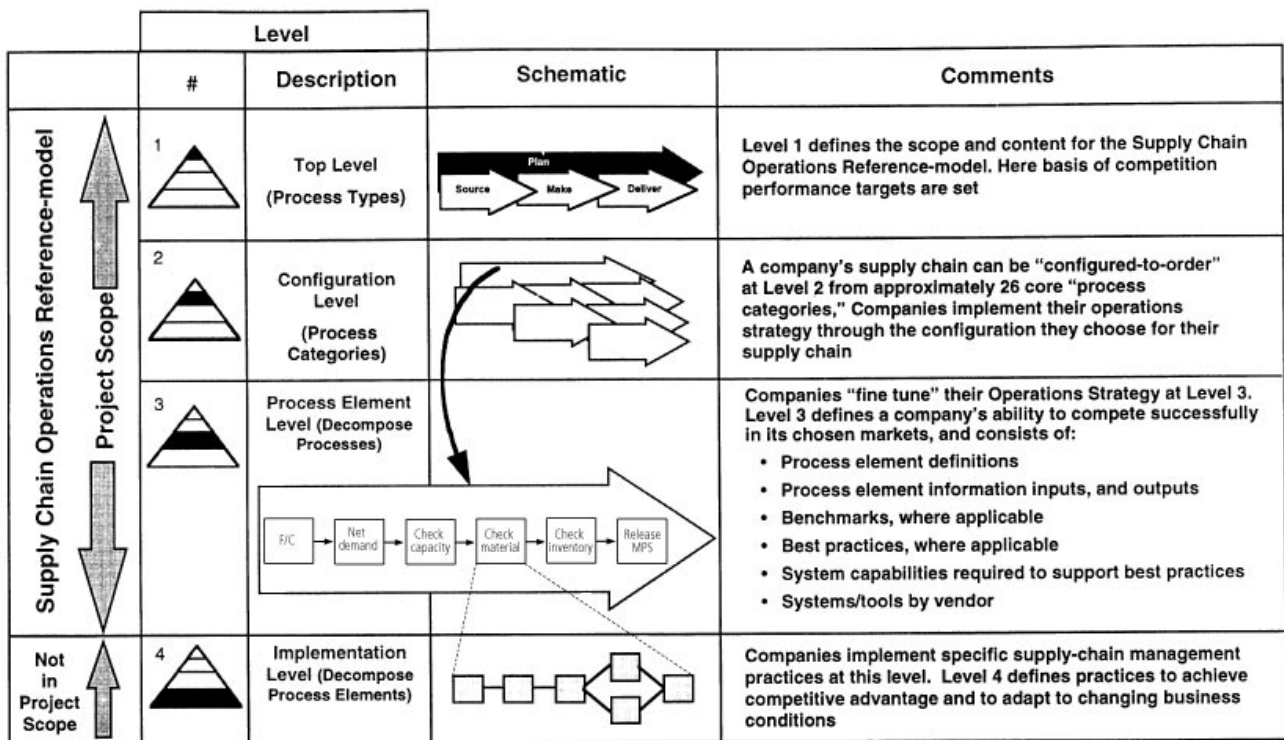
SCOR features four levels of supply-chain management (Figure 1):

- *Level 1* provides a broad definition of the plan, source, make, deliver process types, and is the point at which a company establishes its supply-chain competitive objectives (see section on SCOR process elements, below).
- *Level 2* defines 26 core process categories that are possible components of a supply chain. A company can configure both its actual and ideal supply chain by selecting from these core processes.
- *Level 3* provides a company with the information it needs to plan and set goals successfully for its supply-chain improvements through detailed process element information for each level 2 category. Planning elements include process element definitions, diagnostic metrics, benchmarks, best practices, and system software capabilities to enable best practices.
- *Level 4* focuses on implementation, when companies put specific supply-chain improvements into play. Since changes at level 4 are unique to each company, the specific elements of the level are not defined within the industry-standard model.

When applying SCOR, users will typically consider two supply-chain improvement perspectives:

- *Internal improvement:* SCOR is implemented to improve internal process issues. In such applications, best practices are viewed as means to compete more effectively. Scope is generally from immediate supplier to immediate customer.
- *External improvement:* SCOR is implemented to resolve partner-related process issues.

Figure 1 Supply-chain operations reference model structure: definition of levels



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Best practices are viewed as means to improve total supply-chain performance through improved co-ordination. Scope is generally from immediate supplier's supplier to immediate customer's customer, in a "chain of chains".

SCOR process elements

Plan, source, make, deliver are the four principal components of the supply chain, extending across all parts of the manufacturing and delivery process. In PRTM's experience, companies that integrate every process involved in producing and delivering a final product, from the supplier's supplier to the customer's customer, are most likely to emerge as the new success stories in the global marketplace. The four basic processes – plan, source, make, deliver – define at level 1 the processes that encompass the supply chain, and extend across all parts of the manufacturing and delivery process (Figure 2).

SCOR focuses on four basic supply-chain processes:

(1) Plan:

- *Demand/supply planning:* Assess supply resources; aggregate and prioritize demand requirements; conduct

inventory planning; assess distribution requirements; determine production, material, and rough-cut capacity for all products and all channels.

- *Plan infrastructure:* Make/buy decisions; supply-chain configuration; long-term capacity and resource planning; business planning; product phase-in/phase-out; manufacturing ramp-up; end-of-life management; product line management.

(2) Source:

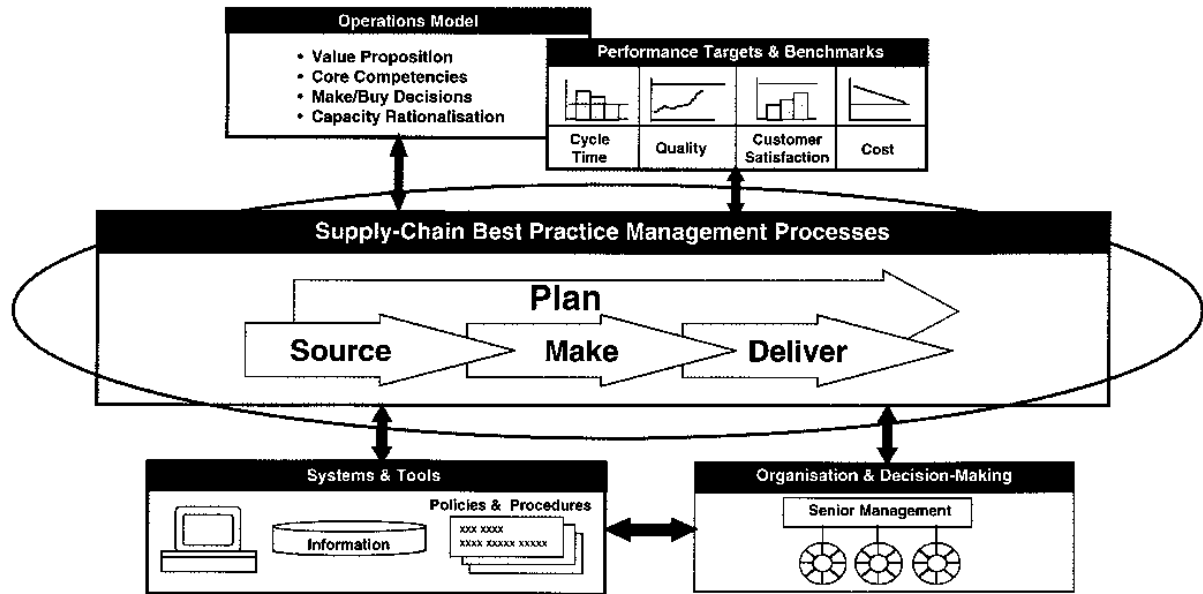
- *Sourcing/material acquisition:* Obtain, receive, inspect, hold and issue material.
- *Source infrastructure:* Vendor certification and feedback; sourcing quality; inbound freight; component engineering; vendor contracts; initiation of vendor payment.

(3) Make:

- *Production execution:* Request and receive material; manufacture and test product; package; hold and/or release product.
- *Make infrastructure:* Engineering changes; facilities and equipment; production status; production quality; shop scheduling/sequencing; short-term capacity.

Figure 2 The SCC has agreed on a process-centred view of supply-chain management

Truly successful companies “design in” supply-chain performance to achieve competitive advantage



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(4) *Deliver*:

- *Demand management*: Conduct forecasting; plan promotions; plan projects; plan sales campaigns; collect and analyse point of sale (POS) data and actual customer orders; promote products; price products; measure customer satisfaction; execute efficient customer response (ECR).
- *Order management*: Enter and maintain orders; generate quotations; configure product; create and maintain customer database; manage allocations; maintain product/price database; manage accounts receivables, credits, collections and invoicing.
- *Warehouse management*: Receive and stock finished goods; pick and pack; configure products; ship products; create customer specific package labelling; consolidate orders.
- *Transportation management*: Manage traffic; manage freight; manage product import/export.
- *Installation management*: Schedule installation activities; perform installation; verify performance.
- *Deliver infrastructure*: Channel business rules; order rules; management of deliver inventories; management of deliver quantity.

Using SCOR to achieve operational improvement

SCOR becomes the starting point for improved supply-chain management. Focused on key process terms and measurement tools, the model is not a step-by-step guide on how to improve supply-chain management. Rather, it is designed to be used in a change management process of configure, compare and implement. The plan, source, make, deliver model provides manufacturers with information on how to create goals and measures against industry best practices, and how to determine the financial costs and return on specific improvements.

Although using SCOR is not a substitute for developing a comprehensive operations strategy, it is a tool for ensuring that the operations strategy has the desired outcome. Before using the model, a company must clearly define the basis of competition and make sure it is well understood by the entire management team. In addition, the operations strategy must be consistent with the company's overall business strategy. Once the operations strategy has been clearly defined, the supply-chain process categories aligned with this strategy are modelled.

When the basic modelling is complete, the company can begin comparing its

performance and practices to the model references. Key metrics are measured against best-in-class targets and management practices are compared to the documented industry best practices. At the same time, the company can begin identifying software products that will facilitate process execution in alignment with demonstrated best practices. The company can use the model to compare its current processes to the documented best practices and identify the differences.

The final step is implementing and fine-tuning the systems and management practices described in the model. The company can selectively prioritize practice implementation based on strategic importance. At the same time, the company will set performance targets, identify associated information requirements, and align functional/organizational linkages.

Conclusion

There are several critical success factors for effectively using SCOR. A company's operations strategy must be consistent with and support the business strategy. The business must be organized to support rapid decision making, and management practices must be facilitated by appropriate systems and information technology, not defined by them.

Finally, the performance metrics and targets that are put in place must motivate behaviour that produces the required outcome. When these conditions are met, using the model allows companies to compare their processes to those of other companies, benchmark themselves, and compare their own practices to demonstrated best practices. Most importantly, users of the model are able to establish clearly and meet management expectations for supply-chain integration efforts.