HOW DOES NIKE'S SUPPLY CHAIN WORK?

Posted by Wendy Ye (blog/author/wendy.ye) on May 12, 2020

As one of the most recognizable brands in the world, the American multinational is arguably the most influential player in the modern textile industry. Behind the hundreds of millions of shoes and other products Nike sells each year lies a highly complex supply chain. Their success has been attributed by many to the proactive approach of their supply chain management.

How Does Nike's Supply Chain Work?

Nike is the world's largest seller of running shoes and sportswear. As one of the most recognizable brands in the world, the American multinational is arguably the most influential player in the modern textile industry. Behind the hundreds of millions of shoes

(https://shoesops.com/how-many-shoes-does-nike-sell-a-year/) and other products Nike sells each year lies a highly complex supply chain. Although there are undoubtedly significant challenges involved in managing this complexity, Nike's proactive approach to supply chain management (https://info.esg.adec-innovations.com/blog/what-are-the-components-of-effective-supply-chain-management) has been credited by many as a significant contributor to its phenomenal success.

What is it that makes Nike's supply chain so unique and so effective?

The key principles behind Nike's supply chain are outsourcing and diversification. Nike contracts 100% of its manufacturing for footwear and apparel out to independent suppliers (https://marketrealist.com/2019/10/nike-manufacturing-and-supply-chain-strategies/). It was one of the earliest multinationals to adopt this approach. Thanks to effective management, Nike's supply chain team quickly learned to manage the additional logistical complexity involved in this outsourcing and have seen significant cost savings over the years as a result. Outsourcing is inherently a risky approach, but by extensively diversifying its supplier base, Nike successfully mitigated this risk from the beginning. In 2019, Nike's footwear components were supplied by 112 different factories in 12 countries, with no factory accounting for more than 9% of branded footwear. Not being overly reliant on any one site means Nike is less vulnerable to unpredictable occurrences, such as accidents and extreme weather events.

However, this distributed approach has its downsides. Sourcing components from so many different facilities presents a real challenge for quality control. To ensure its high quality standards are met at every step of production, Nike maintains continual communication with its suppliers, providing support through tools and training to initiate suppliers in its 'Lean Management' framework and Total Quality Management (TQM) approach (http://panmore.com/nike-inc-operations-management-10-decisions-areas-productivity). Challenges to this approach have also come from outside the supply chain. In the early stages of its pioneering approach to outsourcing manufacturing, Nike chose not to engage in centrally monitoring supplier practice. However, due to increasing consumer demand and changes in the market, Nike took a look at its sourcing approach and ultimately adapted a new strategy.

From around 1996, Nike started making significant progress towards bringing corporate social responsibility to the heart of its operations.

It set up a department tasked solely with improving the lives of factory workers, and in 1999 was instrumental in the creation of the Fair Labor Association (https://www.fairlabor.org/) (FLA). The FLA is a collaborative effort of companies, colleges and universities, and civil society organizations dedicated to improving conditions for factory workers worldwide. In the 20 years since the FLA's foundation, Nike has revamped its sourcing strategy (https://www.nike.com/gb/help/a/modern-slavery-act-disclosure) to prioritize suppliers that show demonstrable leadership in corporate responsibility and sustainability. Nike is also committed to transparency - in 2005 it became the first company in the apparel industry to publish a complete list of the factories in its supply chain (http://manufacturingmap.nikeinc.com/).

Today, Nike takes an ambitious approach to managing the impact of its supply chain (https://purpose-cms-preprod01.s3.amazonaws.com/wp-content/uploads/2020/02/11230637/FY19-Nike-Inc.-Impact-Report.pdf) that is as pioneering as its initial transition to 100% outsourced manufacturing was over 30 years ago. In 2019, Nike

sourced 93% of its products and materials from sustainably run factories, well on its way to its target of 100% by the end of 2020. It has also reduced the number of factories in its supply chain that inflict excessive overtime on their workers down to less than 2.5%.

Nike's supply chain functions around three core organizational principles: outsourcing, to save costs; diversification, to minimize risk; and corporate social responsibility, to manage its impact on the world it works in.Under focused and experienced management, its supply chain has grown from these principles into one of the most effective and responsible large international supply chains operating in 2020.

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As Customer Success Manager, Wenting (Wendy) Ye uses a data-driven approach to identify optimal sustainability solutions for organizations. She is skilled in collecting, normalizing, and analyzing data and synthesizing analysis outcomes in a comprehensive report to guide decision-making.

Wendy joined FCS as a Sustainability Coordinator in January 2016 to support the ESG team, focusing on CDP and ZDHC-related projects. Before joining FCS, Wendy has had years of experience in sustainability-related market research and quantitative analyses, business sustainability, and environmental accounting projects.

Wendy graduated from the Nicholas School of the Environment, Duke University with a Master's Degree in Environmental Management and concentrated in Energy & Environment. She also holds the Certificate of Sustainable System Analysis which is issued by Duke Energy Initiative, and earned her B.E. in Environmental Engineering at Donghua University in China.

Wendy has published four papers in national journals and international conferences. She was the winner of the Bayer Young Environmental Envoy award in 2012, one of the top 20 recipients in China by UNEP & Bayer Group. In the same year, she won the second Prize of Klaus Teopfer Environmental Innovation Student Competition awarded by UNEP and Germany Consulate in Shanghai.

Wendy has a strong interest in business sustainability and renewable energy.

'Supply chain challenges' hit revenues at Nike

posted by *Will Green*
in *Risk, Supply chain*
19 March 2021

Nike has said port congestion delayed inventory supply and held back the company's growth in North America.

The company said revenue dropped 10% in North America in the three months to 28 February 2021 due to "supply chain challenges", which included global container shortages and US port congestion.

In an earnings call Matt Friend, executive vice president and CFO, said: "Disruption in the global supply chain due to container shortages, transportation delays, and port congestion has interrupted the flow of inventory supply.

"The result has been supply shortages relative to continued strong marketplace demand.

"In North America specifically, inventory supply was delayed by more than three weeks, impacting the timing of wholesale shipments and growth in the quarter."

Nike said inventories were up 15% year-on-year to $6.7bn, largely because of "higher in-transit inventory in North America due to US port congestion and temporary store closures in EMEA".

Overall third quarter revenues were up 3% year-on-year to $10.4bn.

Friend said: "We continue to see the value of a more direct, digitally-enabled strategy, fueling even greater potential for Nike over the long term."

In February Peloton said it would be *spending $100m* on expedited shipping and increased use of air freight to manage a backlog of orders caused by port congestion.

Container traffic has been disrupted globally by the coronavirus pandemic and in November 2020 the US Federal Maritime Commission *launched an investigation* into the behaviour of shipping companies amid concerns about "potentially unreasonable practices" at jammed

In the UK trade bodies have *called for an inquiry* into port disruption and the shipping market, with reports that shipping costs have rise 170%.

Coronavirus | Shipping

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VERSION 12.0

QUICK REFERENCE GUIDE

SCOR

SUPPLY CHAIN OPERATIONS REFERENCE MODEL

APICS

SCOR Processes

The Supply Chain Operations Reference (SCOR) model describes the business activities associated with all phases of satisfying a customer's demand. The model itself is organized around the six primary management processes of Plan, Source, Make, Deliver, Return and Enable. Using these process building blocks, the SCOR model can be used to describe supply chains that are very simple or very complex using a common set of definitions across disparate industries. Today public and private organizations and companies around the world use the model as a foundation for global and site-specific supply chain improvement projects.

SCOR spans all customer interactions (quote to cash), all physical material transactions (procure to payment, including equipment, supplies, spare parts, bulk product, software, etc.) and all market interactions (manufacturing, from the understanding of aggregate demand to the fulfillment of each order).

The model is designed and maintained to support supply chains of various complexities and across multiple industries. The model focuses on three process levels and does not attempt to prescribe how a particular organization should conduct its business or tailor its systems or information flow.

People—Supply Chain Skills

The people section introduced in SCOR 10.0 provides a means for managing talent in the supply chain by incorporating a standard for describing the expertise required to perform tasks and manage processes. The SCOR skills management complements the existing process, metrics, and practice reference components by aligning people and their skills to the processes.

A Skill in SCOR is the capacity to deliver predetermined results with minimal input of time and energy, characterized by a standard definition with associated experience, aptitudes, and training.

Experience is the knowledge or ability acquired by observation or active participation, obtained by doing the work in a real life environment, and undergoing different situations that require different actions.

Training develops a skill or type of behavior through instruction.

All people skills are coded with a capital letter H followed by a capital letter representing the element: S for Skills, E for Experience and T for Training. These are followed by a period and a four digit number. Note: The number in the ID is a unique identifier and does NOT indicate any kind of priority, importance, or other meaning.

sP - Plan

sP1 Plan Supply Chain

sP1.1: Identify, Prioritize and Aggregate Supply Chain Requirements

sP1.2: Identify, Prioritize and Aggregate Supply Chain Resources

sP1.3: Balance Supply Chain Resources with SC Requirements

sP1.4: Establish and Communicate Supply Chain Plans

sP2 Plan Source

sP2.1: Identify, Prioritize and Aggregate Product Requirements

sP2.2: Identify, Assess and Aggregate Product Resources

sP2.3: Balance Product Resources with Product Requirements

sP2.4: Establish Sourcing Plans

sP3 Plan Make

sP3.1: Identify, Prioritize and Aggregate Production Requirements

sP3.2: Identify, Assess and Aggregate Production Resources

sP3.3: Balance Production Resources with Production Requirements

sP3.4: Establish Production Plans

sP4 Plan Deliver

sP4.1: Identify, Prioritize and Aggregate Delivery Requirements

sP4.2: Identify, Assess and Aggregate Delivery Resources

sP4.3: Balance Delivery Resources and Capabilities with Delivery Requirements

sP4.4: Establish Delivery Plans

sP5 Plan Return

sP5.1: Assess and Aggregate Return Requirements

sP5.2: Identify, Assess and Aggregate Return Resources

sP5.3: Balance Return Resources with Return Requirements

sP5.4: Establish and Communicate Return Plans

sS - Source

sS1 Source Stocked Product

sS1.1: Schedule Product Deliveries

sS1.2: Receive Product

sS1.3: Verify Product

sS1.4: Transfer Product

sS1.5: Authorize Supplier Payment

sS2 Source Make-to-Order Product

sS2.1: Schedule Product Deliveries

sS2.2: Receive Product

sS2.3: Verify Product

sS2.4: Transfer Product

sS2.5: Authorize Supplier Payment

sS3 Source Engineer-to-Order Product

sS3.1: Identify Sources of Supply

sS3.2: Select Final Supplier and Negotiate

sS3.3: Schedule Product Deliveries

sS3.4: Receive Product

sS3.5: Verify Product

sS3.6: Transfer Product

sS3.7: Authorize Supplier Payment

sM - Make

sM1 Make-to-Stock

sM1.1: Schedule Production Activities

sM1.2: Issue Material

sM1.3: Produce and Test

sM1.4: Package

sM1.5: Stage Product

sM1.6: Release Product to Deliver

sM1.7: Waste Disposal

sM2 Make-to-Order

sM2.1: Schedule Production Activities

sM2.2: Issue Sourced/In-Process Product

sM2.3: Produce and Test

sM2.4: Package

sM2.5: Stage Finished Product

sM2.6: Release Finished Product to Deliver

sM2.7: Waste Disposal

sM3 Engineer-to-Order

sM3.1: Finalize Production Engineering

sM3.2: Schedule Production Activities

sM3.3: Issue Sourced/In-Process Product

sM3.4: Produce and Test

sM3.5: Package

sM3.6: Stage Finished Product

sM3.7: Release Product to Deliver

sM3.8: Waste Disposal

sD - Deliver

sD1 Deliver Stocked Product

sD1.1: Process Inquiry and Quote

sD1.2: Receive, Enter, and Validate Order

sD1.3: Reserve Inventory and Determine Delivery Date

sD1.4: Consolidate Orders

sD1.5: Build Loads

sD1.6: Route Shipments

sD1.7: Select Carriers and Rate Shipments

sD1.8: Receive Product from Source or Make

sD1.9: Pick Product

sD1.10: Pack Product

sD1.11: Load Vehicle & Generate Shipping Docs

sD1.12: Ship Product

sD1.13: Receive and Verify Product by Customer

sD1.14: Install Product

sD1.15: Invoice

sD2 Deliver Make-to-Order Product

sD2.1: Process Inquiry and Quote

sD2.2: Receive, Configure, Enter and Validate Order

sD2.3: Reserve Inventory and Determine Delivery Date

sD2.4: Consolidate Orders

sD2.5: Build Loads

sD2.6: Route Shipments

sD2.7: Select Carriers and Rate Shipments

sD2.8: Receive Product from Source or Make

sD2.9: Pick Product

sD2.10: Pack Product

sD2.11: Load Product & Generate Shipping Docs

sD2.12: Ship Product

sD2.13: Receive and Verify Product by Customer

sD2.14: Install Product

sD2.15: Invoice

sD3 Deliver Engineer-to-Order Product

sD3.1: Obtain and Respond to RFP/ RFQ

sD3.2: Negotiate and Receive Contract

sD3.3: Enter Order, Commit Resources & Launch Program

sD3.4: Schedule Installation

sD3.5: Build Loads

sD3.6: Route Shipments

sD3.7: Select Carriers & Rate Shipments

sD3.8: Receive Product from Source or Make

sD3.9: Pick Product

sD3.10: Pack Product

sD3.11: Load Product & Generate Shipping Docs

sD3.12: Ship Product

sD3.13: Receive and Verify Product by Customer

sD3.14: Install Product

sD3.15: Invoice

sD4 Deliver Retail Product

sD4.1: Generate Stocking Schedule

sD4.2: Receive Product at Store

sD4.3: Pick Product from backroom

sD4.4: Stock Shelf

sD4.5: Fill Shopping Cart

sD4.6: Checkout

sD4.7: Deliver and/or install

sR - Return

sSR1 Source Return Defective Product

sSR1.1: Identify Defective Product Condition

sSR1.2: Disposition Defective Product

sSR1.3: Request Defective Product Return Authorization

sSR1.4: Schedule Defective Product Shipment

sSR1.5: Return Defective Product

sSR2 Source Return MRO Product

sSR2.1: Identify MRO Product Condition

sSR2.2: Disposition MRO Product

sSR2.3: Request MRO Return Authorization

sSR2.4: Schedule MRO Shipment

sSR2.5: Return MRO Product

sSR3 Source Return Excess Product

sSR3.1: Identify Excess Product Condition

sSR3.2: Disposition Excess Product

sSR3.3: Request Excess Product Return Authorization

sSR3.4: Schedule Excess Product Shipment

sSR3.5: Return Excess Product

sDR1 Deliver Return Defective Product

sDR1.1: Authorize Defective Product Return

sDR1.2: Schedule Defective Return Receipt

sDR1.3: Receive Defective Product (includes verify)

sDR1.4: Transfer Defective Product

sDR2 Deliver Return MRO Product

sDR2.1: Authorize MRO Product Return

sDR2.2: Schedule MRO Return Receipt

sDR2.3: Receive MRO Product

sDR2.4: Transfer MRO Product

sDR3 Deliver Return Excess Product

sDR3.1: Authorize Excess Product Return

sDR3.2: Schedule Excess Return Receipt

sDR3.3: Receive Excess Product

sDR3.4: Transfer Excess Product

sE - Enable

sE1 Manage Supply Chain Business Rules

sE1.1: Gather Business Rule Requirements

sE1.2: Interpret Business Rule Requirement

sE1.3: Document Business Rule

sE1.4: Communicate Business Rule

sE1.5: Release/Publish Business Rule

sE1.6: Retire Business Rule

sE2 Manage Supply Chain Performance

sE2.1: Initiate Reporting

sE2.2: Analyze Reports

sE2.3: Find Root Causes

sE2.4: Prioritize Root Causes

sE2.5: Develop Corrective Actions

sE2.6: Approve & Launch

sE3 Manage Supply Chain Data and Information

sE3.1: Receive Maintenance Request

sE3.2: Determine/Scope Work

sE3.3: Maintain Content/Code

sE3.4: Maintain Access

sE3.5: Publish Information

sE3.6: Verify Information

sE4 Manage Supply Chain Human Resources

sE4.1: Identify Skills/ Resource Requirement

sE4.2: Identify Available Skills/Resources

sE4.3: Match Skills/ Resources

sE4.4: Determine Hiring/ Redeployment

sE4.5: Determine Training/Education

sE4.6: Approve, Prioritize and Launch

sE5 Manage Supply Chain Assets

sE5.1: Schedule Asset Management Activities

sE5.2: Take Asset Off-line

sE5.3: Inspect and Troubleshoot

sE5.4: Install and Configure

sE5.5: Clean, Maintain and Repair

sE5.6: Decommission and Dispose

sE5.7: Inspect Maintenance

sE5.8: Reinstate Asset

sE6 Manage Supply Chain Contracts

sE6.1: Receive Contract/ Contract Updates

sE6.2: Enter and Distribute Contract

sE6.3: Activate/Archive Contract

sE6.4: Review Contractual Performance

sE6.5: Identify Performance Issues/ Opportunities

sE6.6: Identify Resolutions/ Improvements

sE6.7: Select, Prioritize and Distribute Resolutions

sE7 Manage Supply Chain Network

sE7.1: Select Scope and Organization

sE7.2: Gather Input and Data

sE7.3: Develop Scenarios

sE7.4: Model/Simulate Scenarios

sE7.5: Project Impact

sE7.6: Select and Approve

sE7.7: Develop Change Program

sE7.8: Launch Change Program

sE8 Manage Supply Chain Regulatory Compliance

sE8.1: Monitor Regulatory Entities

sE8.2: Assess Regulatory Publications

sE8.3: Identify Regulatory Deficiencies

sE8.4: Define Remediation

sE8.5: Verify/Obtain License

sE8.6: Publish Remediation

sE9 Manage Supply Chain Risk

sE9.1: Establish Context

sE9.2: Identify Risk Events

sE9.3: Quantify Risks

sE9.4: Evaluate Risks

sE9.5: Mitigate Risk

sE10 Manage Supply Chain Procurement

sE10.1: Develop Strategy and Plan

sE10.2: Pre-Procurement / Market Test and Market Engagement

sE10.3: Develop Procurement Documentation

sE10.4: Supplier Selection to Participate

sE10.5: Issue ITT / RFQ

sE10.6: Bid / Tender Evaluation and Validation

sE10.7: Contract Award and Implementation

sE11 Manage Supply Chain Technology

sE11.1: Define Supply Chain Technology Requirements

sE11.2: Identify Technology Solution Alternatives

sE11.3: Define/Update Supply Chain Technology Roadmap

sE11.4: Select Technology Solution

sE11.5: Define and Deploy Technology Solution

sE11.6: Maintain and Improve Technology Solution

sE11.7: Retire Technology Solution

SCOR Practices

A practice is a unique way to configure a process or a set of processes. The uniqueness can be related to the automation of the process, a technology applied in the process, special skills applied to the process, a unique sequence for performing the process, or a unique method for distributing and connecting processes between organizations. All practices have links to one or more processes, one or more metrics and, where available, one or more skills.

SCOR Practices are classified to simplify identification of practices by area of interest:

- Business Process Analysis/Improvement
- Customer Support
- Distribution Management
- Information Management
- Inventory Management
- Material Handling
- New Product Introduction
- Order Engineering (ETO)
- Order Management
- People Management (Training)
- Planning and Forecasting
- Production Execution
- Product Lifecycle Management
- Purchasing/Procurement
- Reverse Logistics
- Risk/Security Management
- Sustainable Supply Chain Management
- Transportation Management
- Warehousing

Special Applications

SustainableSCOR

SustainableSCOR is based upon The GRI Sustainability Reporting Standards (GRI Standards) that are within scope of the SCOR model. GRI Standards are free to use and are available at **www.globalreporting.org/standards**. The following strategic environmental metrics allow the SCOR model to be used as a framework for environmental accounting:

- **Materials Used**
  (Weight or Volume)
- **Energy Consumed**
  (Joules,Watt-hours or Multiples)
- **Water Volume Withdrawn**
  (Gallons, Liters or Multiples)
- **Air Emissions**
  (Metric Tons or Equivalents)
- **Liquid and Solid Wastes**
  (Gallons, Liters or Multiples, Weight or Volume)

The SCOR framework ties emissions to the originating processes, providing a structure for measuring environmental performance and identifying where performance can be improved. The hierarchical nature of the model allows strategic environmental footprint goals to be translated to specific targets and activities.

SCOR Performance

The performance or metrics section of SCOR focuses on understanding the outcomes of the supply chain and consists of two types of elements: Performance Attributes and Metrics., and introduces the concept of Process/Practice Maturities.

A **performance attribute** is a grouping or categorization of metrics used to express a specific strategy. An attribute itself cannot be measured; it is used to set strategic direction. For example: "The LX product needs to be leading the competition in reliability" and "The XY-market requires us to be among the top 10 agile manufacturers". Metrics measure the ability to achieve these strategic directions. SCOR recognizes 5 performance attributes:

- Reliability
- Responsiveness
- Agility
- Cost
- Asset Management Efficiency (Assets)

A **metric** is a standard for measurement of the performance of a supply chain or process. SCOR metrics are diagnostic metrics (compare to how diagnosis is used in a medical office). SCOR recognizes three levels of pre-defined metrics:

Level-1 metrics are diagnostics for the overall health of the supply chain. These metrics are also known as strategic metrics and key performance indicators (KPI). Benchmarking level-1 metrics helps establishing realistic targets to support strategic directions.

Level-2 metrics serve as diagnostics for the level-1 metrics. The diagnostic relationship helps to identify the root cause or causes of a performance gap for a level-1 metric.

Level-3 metrics serve as diagnostics for level-2 metrics.

The analysis of performance of metrics from level-1 through 3 is referred to as metrics decomposition, performance diagnosis or metrics root cause analysis. Metrics decomposition is a first step in identifying the processes that need further investigation. (Processes are linked to level-1, level-2 and level-3 metrics).

Reliability

- RL.1.1 - Perfect Order Fulfillment
- RL.2.1 - % of Orders Delivered In Full
- RL.3.33 - Delivery Item Accuracy
- RL.3.35 - Delivery Quantity Accuracy
- RL.2.2 - Delivery Performance to Customer Commit Date
- RL.3.32 - Customer Commit Date Achievement Time Customer Receiving
- RL.3.34 - Delivery Location Accuracy
- RL.2.3 - Documentation Accuracy
- RL.3.31 - Compliance Documentation Accuracy
- RL.3.43 - Other Required Documentation Accuracy
- RL.3.45 - Payment Documentation Accuracy
- RL.3.50 - Shipping Documentation Accuracy
- RL.2.4 - Perfect Condition
- RL.3.12 - % Of Faultless Installations
- RL.3.24 - % Orders/Lines Received Damage Free
- RL.3.41 - Orders Delivered Damage Free Conformance
- RL.3.42 - Orders Delivered Defect Free Conformance
- RL.3.55 - Warranty and Returns

Responsiveness

- RS.1.1 - Order Fulfillment Cycle Time
- RS.2.1 - Source Cycle Time
- RS.3.8 - Authorize Supplier Payment Cycle Time
- RS.3.35 - Identify Sources of Supply Cycle Time
- RS.3.107 - Receive Product Cycle Time
- RS.3.122 - Schedule Product Deliveries Cycle Time
- RS.3.125 - Select Supplier and Negotiate Cycle Time
- RS.3.139 - Transfer Product Cycle Time
- RS.3.140 - Verify Product Cycle Time
- RS.2.2 - Make Cycle Time
- RS.3.33 - Finalize Production Engineering Cycle Time
- RS.3.49 - Issue Material Cycle Time
- RS.3.101 - Produce and Test Cycle Time
- RS.3.114 - Release Finished Product to Deliver Cycle Time
- RS.3.123 - Schedule Production Activities Cycle Time
- RS.3.128 - Stage Finished Product Cycle Time
- RS.3.142 - Package Cycle Time
- RS.2.3 - Deliver Cycle Time
- RS.3.16 - Build Loads Cycle Time
- RS.3.18 - Consolidate Orders Cycle Time
- RS.3.46 - Install Product Cycle Time
- RS.3.51 - Load Product & Generate Shipping Documentation Cycle Time
- RS.3.102 - Receive & Verify Product by Customer Cycle Time
- RS.3.110 - Receive Product from Source or Make Cycle Time
- RS.3.111 - Receive, Configure, Enter, & Validate Order Cycle Time
- RS.3.116 - Reserve Resources and Determine Delivery Date Cycle Time
- RS.3.117 - Route Shipments Cycle Time
- RS.3.120 - Schedule Installation Cycle Time
- RS.3.124 - Select Carriers & Rate Shipments Cycle Time
- RS.3.126 - Ship Product Cycle Time
- RS.2.4 - Delivery Retail Cycle Time
- RS.3.17 - Checkout Cycle Time
- RS.3.32 - Fill Shopping Cart Cycle Time
- RS.3.34 - Generate Stocking Schedule Cycle Time
- RS.3.97 - Pick Product from Backroom Cycle Time
- RS.3.109 - Receive Product at Store Cycle Time
- RS.3.129 - Stock Shelf Cycle Time
- RS.2.5 - Return Cycle Time

Agility

- AG.1.1 - Upside Supply Chain Adaptability
- AG.2.1 - Upside Adaptability (Source)
- AG.2.2 - Upside Adaptability (Make)
- AG.2.3 - Upside Adaptability (Deliver)
- AG.2.4 - Upside Return Adaptability (Source)
- AG.2.5 - Upside Return Adaptability (Deliver)
- AG.1.2 - Downside Supply Chain Adaptability
- AG.2.6 - Downside Adaptability (Source)
- AG.2.7 - Downside Adaptability (Make)
- AG.2.8 - Downside Adaptability (Deliver)
- AG.1.3 - Overall Value at Risk (VAR)
- AG.2.9 - Supplier's/Customer's/ Product's Risk Rating
- AG.2.10 - Value at Risk (Plan)
- AG.2.11 - Value at Risk (Source)
- AG.2.12 - Value at Risk (Make)
- AG.2.13 - Value at Risk (Deliver)
- AG.2.14 - Value at Risk (Return)
- AG.2.15 - Time to Recovery (TTR)

Cost

- CO.1.1 - Total Supply Chain Management Costs
- CO.2.1 - Cost to Plan
- CO.3.1 - Cost to Plan Supply Chain
- CO.3.2 - Cost to Plan (Source)
- CO.3.3 - Cost to Plan (Make)
- CO.3.4 - Cost to Plan (Deliver)
- CO.3.5 - Cost to Plan (Return)
- CO.2.2 - Cost to Source
- CO.3.6 - Cost to Authorize Supplier Payment
- CO.3.7 - Cost to Receive Product
- CO.3.8 - Cost to Schedule Product Deliveries
- CO.3.9 - Cost to Transfer Product
- CO.3.10 - Cost to Verify Product
- CO.2.3 - Cost to Make
- CO.3.11 - Direct Material Cost
- CO.3.12 - Indirect Cost Related to Production
- CO.3.13 - Direct Labor Cost
- CO.2.4 - Cost to Deliver
- CO.3.14 - Order Management Costs
- CO.3.15 - Order Delivery and / or Install Costs
- CO.2.5 - Cost to Return
- CO.3.16 - Cost to Source Return
- CO.3.17 - Cost to Deliver Return
- CO.2.6 - Mitigation Costs
- CO.3.18 - Risk Mitigation Costs (Plan)
- CO.3.19 - Risk Mitigation Costs (Source)
- CO.3.20 - Risk Mitigation Costs (Make)
- CO.3.21 - Risk Mitigation Costs (Deliver)
- CO.3.22 - Risk Mitigation Costs (Return)
- CO.1.2 - Costs of Goods Sold
- CO.2.7 - Direct Labor Cost
- CO.2.8 - Direct Material Cost
- CO.2.9 - Indirect Cost Related to Production

Asset Management Efficiency

- AM.1.1 - Cash-to-Cash Cycle Time
- AM.2.1 - Days Sales Outstanding
- AM.2.2 - Inventory Days of Supply
- AM.3.16 - Inventory Days of Supply (Raw Material)
- AM.3.17 - Inventory Days of Supply (WIP)
- AM.3.23 - Recycle Days of Supply
- AM.3.28 - Percentage Defective Inventory
- AM.3.37 - Percentage Excess Inventory
- AM.3.44 - Percentage Unserviceable MRO Inventory
- AM.3.45 - Inventory Days of Supply (Finished Goods)
- AM.2.3 - Days Payable Outstanding
- AM.1.2 - Return on Supply Chain Fixed Assets
- AM.2.4 - Supply Chain Revenue
- AM.2.5 - Supply Chain Fixed Assets
- AM.3.11 - Fixed Asset Value (Deliver)
- AM.3.18 - Fixed Asset Value (Make)
- AM.3.20 - Fixed Asset Value (Plan)
- AM.3.24 - Fixed Asset Value (Return)
- AM.3.27 - Fixed Asset Value (Source)
- AM.1.3 - Return on Working Capital
- AM.2.6 - Accounts Payable (Payables Outstanding)
- AM.2.7 - Accounts Receivable (Sales Outstanding)
- AM.2.8 - Inventory

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Computer-assisted supply chain configuration based on supply chain operations reference (SCOR) model

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Abstract

A supply chain is a network of facilities that procure raw materials, transform them into intermediate goods and then final products, and deliver the products to customers through a distribution system. To achieve integrated supply chain management, a number of researchers and practitioners have devoted their efforts in developing models to describe the elements and activities of a supply chain. The supply chain council, supported by over 650 member organizations (both academia and industry) worldwide, has developed the supply chain operations reference (SCOR) model. The SCOR model is a process reference model, which is intended to be an industrial standard that enables next-generation supply chain management. It contains a standard description of management processes, a framework of relationships among the standard processes, standard metrics to measure process performance, management practices that produce best-in-class performance, and a standard alignment to software features and functionality. This paper summarizes the SCOR model, its benefits along with illustrative case stories and describes a computer-assisted tool to configure supply chain threaded diagram per SCOR specification.

Keywords: Supply chain; Supply chain operations reference model (SCOR); Computer-assisted tool

1. Introduction

In today's rapidly changing global economy, some companies are able to change with the times to adapt and thrive in the increasing uncertain world of the early 21st century. They can be recognized by their ability to anticipate and understand changes in the market, to recognize new opportunities, to deliver new customer services, and to adapt their businesses rapidly to meet and exceed their customers'

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requirements. All these companies have recognized the importance of one key element, agility (or flexibility) to change fast. Agile businesses view themselves as the center, or hub of networks of material and information flows. These flows extend from the customer interface at marketing and sales through production and procurement to the building of relationship with suppliers. These businesses achieve agility through a constant review and realignment of these closely linked networks. Over the past decade, a new term, supply chain management (SCM), has been coined to a management approach to deliver this required agility to change while maintaining cost efficiency.

SCM is having profound impact on business results. It 'encompasses all activities associated with the flow and transformation of goods from the raw materials stage (extraction), through to the end user, as well as the associated information flow' (Handfield & Nichols, 1999). Clearly, the idea of SCM is to view the chain as a total system and to fine-tune the decisions about how to operate the various components (companies, functions, and activities) in ways, which will produce the most desirable overall system performance in the long run. Doing so is extremely difficult due to the number and complexity of the decisions to be made, as well as the inter- and intra-organization issues that must be addressed. Never has so much technology and brainpower been applied to improving supply chain performance. Examples include point-of-sale scanners that allow companies to capture the customer's voice. Electronic data interchange lets all stages of the supply chain hear that voice and react to it by using flexible manufacturing, automated warehousing, and rapid logistics. Concepts such as quick and accurate response, efficient consumer response, mass customization, lean manufacturing, and agile manufacturing offer models for applying new technologies to improve performance.

One can argue that a proliferation of interpretations of what SCM means has led to some confusion among researchers and practitioners. There should be some characteristics unique to supply chain management that differentiates it from past research that fell under the aegis of integrated logistics. Houlihan (1985) made it clear that the differentiating factor is the strategic decision making aspect in managing the supply chain. SCM reaches out beyond the boundaries of cost containment and links operating decisions to strategic considerations within and beyond the company. To assist organizations in achieving better strategic decision making, a number of researchers and practitioners have devoted their efforts to developing models to describe the elements and activities of a supply chain. Beamon (1998) provided a literature review on multi stage-supply chain modeling, which consists of four categories, namely, deterministic model (Voudouris, 1996), stochastic model (Tzafestas & Kapsiotis, 1994), economic model (Christy & Grout, 1994), and simulation model (Towill, 1991). The author proposed a research agenda for supply chain design and analysis: (1) the evaluation and development of supply chain performance measures, (2) the development of models and procedures to relate decision variables to the performance measures, (3) consideration of issues affecting supply chain modeling, and (4) the classification of supply chain systems to allow for the development of rules-of-thumb or general techniques to aid in the design and analysis of manufacturing supply chains.

Although various supply chain models have been proposed, most of them emphasize on inventory management and distribution logistic. As previously mentioned, strategic decision making is critical in supply chain management, which requires a framework model that can serve as an industry standard. The supply chain council (SCC), a not-for-profit organization established in 1996 that now has over 650 organization members worldwide, has taken the initiative in developing such a model—the supply chain operations reference (SCOR) model. The SCOR model is intended to be an industrial standard that enables next-generation supply chain management. It contains a standard description of management processes, a framework of relationships among the standard processes, standard metrics to measure

process performance, management practices that produce best-in-class performance, and a standard alignment to software features and functionality. This paper summarizes the SCOR model (Section 2), presents a computer-assisted tool to configure supply chain threaded diagram per SCOR specification (Section 3), demonstrates SCOR benefits with case history and illustrations (Section 4), discusses areas where the SCOR model can be improved (Section 5), and points out future research issues (Section 6).

2. The supply chain operations reference model

2.1. Background

The SCOR model is a process reference model. Specifically, it is a model that links process elements, metrics, best practice and the features associated with the execution of a supply chain in a unique format. It provides a balanced horizontal (cross-process) and vertical (hierarchical) view as compared to the classical process decomposition models, which are developed to address one specific configuration of process elements. It is designed to be (re)/configurable and aggregates a series of hierarchical process models. The use of a process reference model allows companies to communicate using common terminology and standard descriptions of the process elements that help understand the overall supply chain management process and the best practices that yield the optimal overall performance.

The SCOR model is the first model that can be used to configure the supply chain based on business strategy. It provides unambiguous, standard descriptions for the thousands of activities within the supply chain. It also identifies the performance measurements and supporting tools suitable for each activity. This process reference model enables all departments and businesses involved in developing and managing the integrated supply chain to collaborate effectively.

The SCOR model integrates the well-known concepts of business process reengineering, benchmarking, and process measurement into a cross-functional framework. It captures the 'as-is' state of a process and then derives the desired 'to-be' future state. It quantifies the operational performance of similar companies and establishes internal targets based on 'best-in-class' results. It also characterizes the management practices and software solutions that result in 'best-in-class' performance. The structural framework of the SCOR model is composed of the following elements:

- Standard descriptions of the individual elements that make up the supply chain processes.
- Standard definitions of key performance measures.
- Descriptions of best practices associated with each of the process elements.
- Identification of software functionality that enables best practices.

Since the model's introduction in 1996, SCOR has undergone several major revisions based on practical needs. The following paragraphs summarize the SCOR model based on materials presented in Stephens (2001) and SCC (2001).

2.2. SCOR processes and levels

The SCOR model is originally founded on five distinct management processes, namely, *Plan*, *Source*, *Make*, *Deliver* and *Return* which are called Level 1 processes. The processes are further

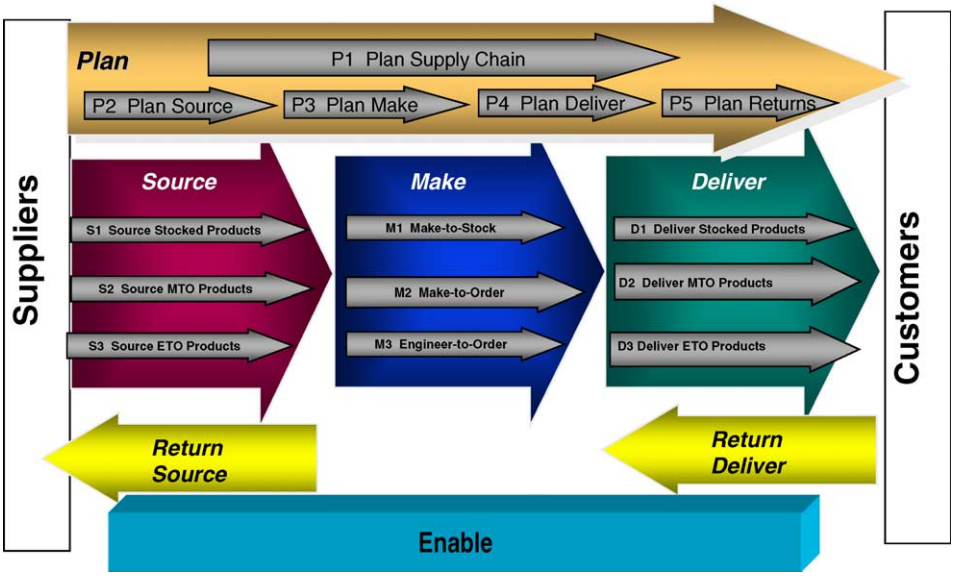

Fig. 1. The SCOR infrastructure (Stephens, 1999).

decomposed into process categories (Level 2) depending on the type of environment in which the SCOR model is applied. The process categories further contain process elements, which is the third and the last Level in the SCOR model. At Level 3, the elements model contains performance attributes, metrics, best practices and software features required for that element. Fig. 1 shows the infrastructure of the SCOR model, while Fig. 2 shows the process levels (Stephens, 2001).

The five management processes—Plan, Source, Make, Deliver and Return—are discussed first. The Plan process consists of processes that balance aggregated demand and supply to develop a course of action which best meets the business goals. Plan processes deal with demand/supply planning, which include the activities to assess supply resources, aggregate and prioritize demand requirements, plan inventory, distribution requirements, production, material, and rough-cut capacity for all products and all channels. The Source process contains processes that procure goods and services to meet planned or actual demand. Sourcing/material acquisition includes the jobs of obtaining, receiving, inspecting, holding, and issuing material. Management of sourcing infrastructure includes vendor certification and feedback, sourcing quality, in-bound freight, component engineering, vendor contracts, and vendor payments. The Make process includes functions that transform goods to a finished state to meet planned or actual demand. Make is the core process of the system in which actual production execution takes place. It includes the jobs of requesting and receiving material, manufacturing and testing product, packaging, holding and/or releasing the product eventually. The Deliver process consists of processes that provide finished goods and services to meet planned or actual demand. This typically includes the functions of order management, transportation management, and distribution management. Managing the deliver

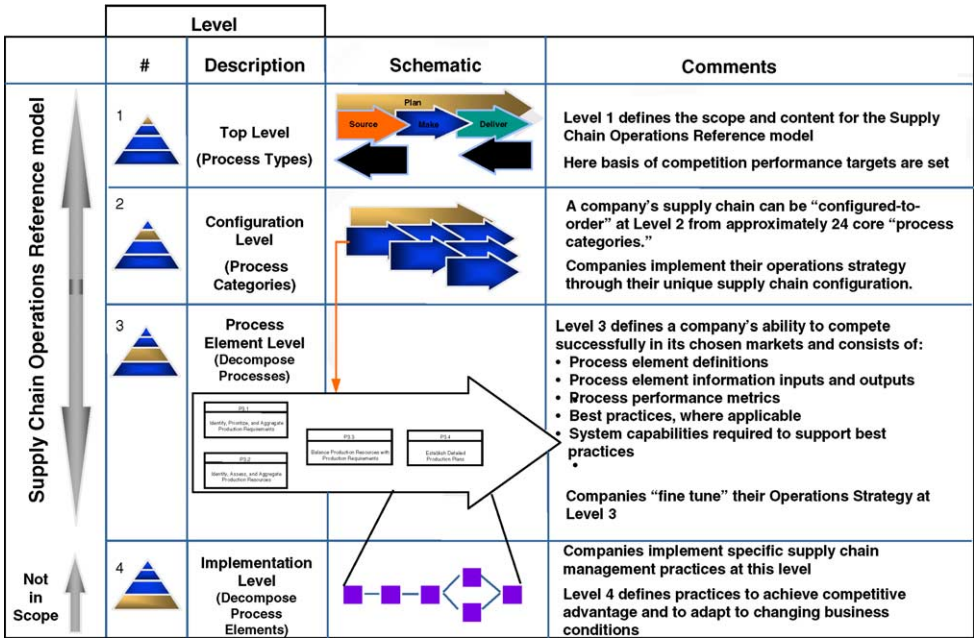

Fig. 2. The SCOR process levels (Stephens, 1999).

process includes managing channel business rules, ordering rules, managing deliver inventories, and managing deliver quality. Return is the latest addition to SCOR model. It deals with managing reverse flow of material and information related to defective, surplus and MRO products. This includes authorizing, scheduling, receiving, verifying, disposing and replacement or credit for the above types of materials. Each basic supply chain is a 'chain' of Source, Make, Deliver and Return execution process. Each interaction of two execution processes is a 'link' in the supply chain. Planning sits on top of these links and manages them.

As previously mentioned, the SCOR model contains three Levels of process detail. Level 1 is the top level that deals with process types. Level 2 is the configuration level and deals with process categories. Level 3 is the process element level and is the lowest level in the scope of the SCOR model. Implementation levels that are below Level 3, in which we decompose process elements into tasks and further activities in classical hierarchical manner, are not in scope of the SCOR model, but will be briefly mentioned here.

Level 1 defines the supply chain using five key processes: Plan, Source, Make, Deliver and Return. The SCOR model Level 1 metrics characterize performance from customer-facing and internal-facing perspectives. Therefore, at Level 1, basis of competition is defined and broad guidelines are provided to meet the competition. Specific tasks to be completed at Level 1 are: set business requirements and define basis of competition, evaluate the performance of current operation vis-à-vis required performance, set the SCOR model metrics and targets, and define the gap, set business priorities and state what needs to change. Also at Level 1, current supply chain is modeled considering asset, product volume and mix, and technology requirements and constraints.

Level 2 defines different categories within the Level 1 processes. At this level, processes are configured in line with supply chain strategy. At Level 2, internal redundancies can be identified and eliminated:

- A business that has grown through acquisition typically finds multiple redundancies at this level, such as overlapping planning processes, duplicated purchasing, or excessive intra-manufacturing transfers.
- Some businesses discover that customer orders are delayed at many points in the supply chain, indicating a need for customer and supplier integration.
- Others may find that the same planning process is carried out both internally and by the customer. One of them should be eliminated.

The goal at Level 2 is to simplify the supply chain and enhance its overall flexibility. At Level 2, the SCOR model provides a tool kit of 22 process categories (version 5.0), as shown in Table 1. Any supply chain configuration can be represented with this tool kit. Here the company should reconfigure the supply chain configured in Level 1 to determine the expected performance. At Level 2, market constraints, product constraints and company constraints are considered to configure the inter- and intra-company process categories.

Level 3 allows businesses to define in detail the processes identified, as well as performance metrics and best practices for each activity. The software functionality required to support best practices is also identified, as well as the commercial software and tools currently providing required functionality.

Table 1
SCOR Level 2 process categories

Notation	Process category
P1	Plan supply chain
P2	Plan source
P3	Plan make
P4	Plan deliver
P5	Plan return
EP	Enable plan
S1	Source stocked products
S2	Source make-to-order products
S3	Source engineer-to-order products
ES	Enable source
M1	Make-to-stock
M2	Make-to-order
M3	Engineer-to-order
M0	Make infrastructure
ED	Enable deliver
D1	Deliver stocked products
D2	Deliver made-to-order products
D3	Deliver engineered-to-order products
R1	Return defective product
R2	Return MRO product
R3	Return excess product
ER	Enable return

Inter- and intra-company process elements are also defined. Performance levels and practices are defined for these process elements. Benchmarks and the required attributes for the enabling software are also noted at this level. Specific tasks to be performed at this level include: develop process models that support strategic objectives and work within the new supply chain configuration developed at Level 2, set process metrics and performance targets, establish business practices at operating level, build system requirements that support the supply chain configuration, processes and practices, and finally select appropriate systems. At Level 3, inputs, outputs, and basic logic flow of process elements are captured.

Level 4 describes the detailed tasks within each of the Level 3 activities. These tasks, and their interactions, are unique to each business. This level of detail is needed to implement and manage the supply chain on a day to day basis. Level 4 process definition equates to quality process definition (e.g. ISO 9000) in most companies. At Level 4, implementation of supply chain processes takes place. At this level, immediate goals are set, intra- and inter-company supply chain improvements take place, priorities are set and rapid results are expected and studied.

There are three types of processes in the SCOR model: planning, execution and enable. Planning processes plan the whole chain along with planning specific type of execution process. Execution processes cover all process categories of Source, Make, Deliver and Return except the enable process categories. Enable process of a particular process type defines the constitution of that particular process element. Using the four levels of the SCOR model, a business can quickly and unambiguously describe its supply chain. A supply chain that is defined using this approach can also be modified and re-configured rapidly as business and market requirements change. The SCOR model has a powerful role in implementing supply chains. The SCOR model Levels 1 and 2 metrics keep management focused, while Level 3 metrics support on-going diagnosis.

2.3. Metrics

Operating a supply chain is far different from running a stand-alone company, and so are the metrics. The supply chain can be looked at as an externalization of business processes toward greater profitability. Trading partners, to a greater or lesser degree of formality, are linking their productive assets to gain efficiencies in cycle times, procurement, inventory, logistics, and cash flow. Given these relationships, how the partners measure effectiveness of their intertwined processes becomes quite different than assessing internal operations. Their shared metrics needed to achieve this balance call for accepted common standards in the field, as well as issues of change management and company culture for all partners.

The SCOR model endorses 13 performance metrics. A company cannot be best in all 13 of the Level 1 metrics, so it should wisely target its strength in several, those by which it differentiates itself in the market, while ensuring that it stays competitive in the others. In practice most companies typically choose among four to six of the 13 performance metrics to focus on. Those chosen tend to fall into five defining categories: supply chain reliability, supply chain responsiveness, supply chain flexibility, supply chain costs, and efficiency in managing assets (working and fixed capital) in the supply chain, as shown in Table 2. A brief description of these metrics is given as follows:

- *Delivery performance*. Percentage of orders delivered on time with respect to the total number of orders delivered. The components of delivery performance include total number of orders received, number of orders scheduled to customer's request date, total number of orders delivered, percentage

Table 2
SCOR model level I performance metrics

Delivery reliability
Delivery performance
Fill rates
Perfect order fulfillment
Responsiveness
Order fulfillment lead times
Flexibility
Supply chain response time
Production flexibility
Cost
Cost of goods sold
Total supply chain management cost
Value-added employee productivity
Warranty/return processing costs
Assets
Cash-to-cash cycle time
Inventory days of supply
Asset turns

of orders delivered on time (to request date), number of orders delivered on-time to commit date, and percentage of orders delivered on-time to customer commit date. It affects the balance sheet on accounts receivable.

- *Fill rate*. Fill rate is percentage of ship-from-stock orders shipped within 24 h of order receipt. The fill rate affects the balance on accounts receivable and is calculated as: [number of orders filled from stock shipped within 24 h of order receipt]/[total number of stock orders].
- *Order fulfillment lead time*. The average actual lead time consistently achieved from customer authorization of purchase order to final installation/order completion at customer end. It affects the inventory on balance sheet. It is calculated as: [sum of lead time required for each order fulfillment from purchase order authorization to final installation]/[total number of orders].
- *Perfect order fulfillment*. The percentage of orders meeting deliver performance and with complete and accurate documentation with no shipping damage. Components of perfect order fulfillment include all items and quantities delivered on-time (using customer's definition) and documentation for packing slips, bills of lading, and invoices. It is calculated as: [total orders shipped on time and in full-orders without faulty documentation—orders with shipping damage]/[total orders].
- *Supply chain response time*. The time it takes the integrated supply chain to respond to abnormal (significant) change in demand. It is calculated as [order fulfillment lead time + source cycle time] and it affects the inventory on the balance sheet.
- *Production flexibility*. Production flexibility can be seen in two parts, upside flexibility and downside flexibility. Upside flexibility is number of days required to achieve an unplanned sustainable 20% increase in production. Downside flexibility is percentage order reduction sustainable at 30 days prior

to delivery with no inventory or cost penalties. The production flexibility is dependent upon internal manufacturing capacity, direct labor and material availability and affects inventory on balance sheet.

- *Total logistics management cost*. The sum of supply chain related costs for order management, material acquisition, inventory carrying, finance and planning, and MIS costs. It is calculated as sum of the costs. To see the cost elements in detail of categories mentioned here please consult official documentation of the SCOR model (SCC, 2001).
- *Cost of goods sold*. The cost associated with buying raw materials and producing finished goods. This cost includes direct cost (labor, material) and indirect cost (overhead)
- *Value added productivity*. It is calculated as: [Total Product Revenue − Total Material Purchases]/ Total Employment (in full time equivalents).
- *Warranty cost or returns processing cost*. It includes materials, labor, and problem diagnosis for product defects. A warranty cost has impact on inventory on balance sheet.
- *Cash-to-Cash cycle time*. Cash-to-Cash cycle time is a measure of the time required in days to convert cash paid to suppliers into cash received from customers, including the inventory required. It is calculated as [Inventory days of supply + days sales outstanding − days of payables]. It impacts inventory, accounts payable, accounts receivable, and total assets on the balance sheet.
- *Inventory days of supply*. Total gross value of inventory at standard cost before reserves for excess and obsolescence.
- *Asset turns*. Total turns of capital employed. It impacts inventory, accounts payable, accounts receivable, and fixed assets on the balance sheet. It is calculated as total gross product revenue divided by total net assets.

3. A computer-assisted configuration tool

The SCOR model can help upper management of an organization in designing and reconfiguring its supply chain to achieve desired performance. The implementation consists of four steps as guided by the roadmap shown in Fig. 3 (Stephens, 2001). The four steps are:

1. Analyze basis of competition.
2. Configure supply chain.
3. Align performance Levels, practices, and systems.
4. Implement supply chain processes and systems.

Supply chain configuration (Step 2) is one of the core concepts in supply chain management philosophy. The configuration defines the structure of supply chain, which is one of the key success factors in achieving desired supply chain performance. A computer-assisted tool has been developed to configure ‘as is’ thread-diagram or ‘to be’ thread-diagram (per SCOR specification) of a particular supply chain based on the user’s input. In the hands of supply chain professionals, this computer-assisted tool can play an important role in making decisions regarding dynamics and structure of the chain. The customized supply chain configuration diagram generated from the tool will help upper management understand the interaction of the particular company with its alliances and partners.

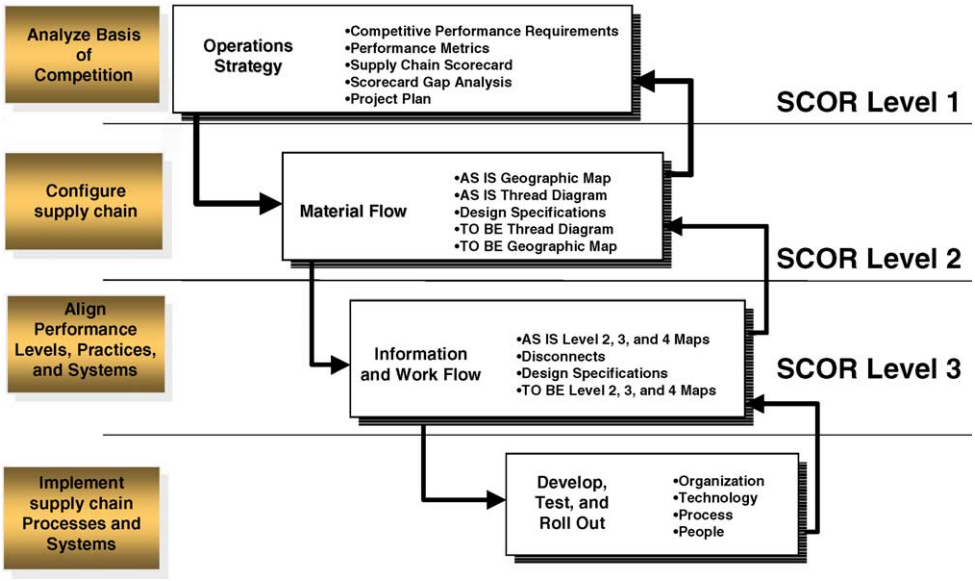

Fig. 3. The SCOR project roadmap (Stephens, 2001).

An example, the ALPHA Company taken from SCC's SCOR workshop material, is used to illustrate the computer-assisted configuration tool. When running the configuration tool, a welcome screen appears first. The welcome screen contains general instructions along with the welcome message. It also contains a button that, when clicked, leads to another screen where the user can develop a customized SCOR Level 2 supply chain configuration. The user is prompted to enter the name of the company for which the supply chain is to be designed. Once the user enters the company name, ALPHA, and clicks the continue button, the screen shown in Fig. 4 appears. The screen is divided into three zones and marked with name messages displayed in each zone, one each for the company, its suppliers, and for its customers or warehouses, respectively. In this particular example, the warehouse is the downstream node and is considered as the customer of the manufacturing facility. Here, the user gets to select the type of manufacturing facility from three types, Make-to-Stock, Make-to-Order, and Engineer-to-Order, as classified by the SCOR model.

In this example, the manufacturing facility type is Make-to-Stock (M1). It is placed on screen and the information about the sourcing activity of the facility is requested. A particular type of manufacturing may require any of the three types of sourcing activities classified by the SCOR model, i.e. source stocked materials, source make-to-order materials, and source engineer-to-order products. The user has the choice of selecting one or more of the options available depending on requirements of the particular manufacturing facility.

In this example, two types of material are sourced for the make to stock manufacturing facility, namely, source stocked materials (S1) and source make-to-order materials (S2). As the user inputs the number of suppliers and clicks the continue button, the sources are generated based on the user input (Fig. 5). The user is prompted with the question if he has information about the supplier's manufacturing facility. If the answer is no then the next part is skipped. In our example, the information about supplier is available. The user is then prompted to input the number of sources for ALPHA'S suppliers.

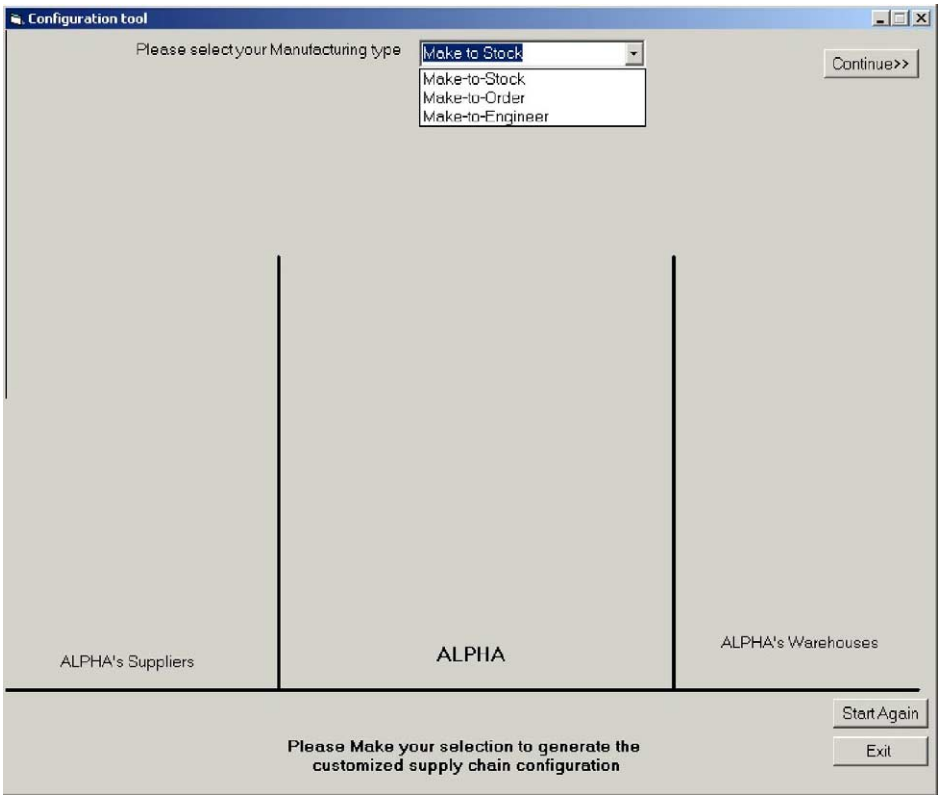

Fig. 4. Snapshot of manufacturing type selection screen.

After the sources are generated, the user is prompted to enter the information about the warehouses (Fig. 6). If the manufacturing facility supplies to multiple warehouses, the number of warehouses is shown by the multiple arrows for the sourcing activity of warehouse and delivery activity of the company. In addition to that, the number that is shown in the label (enclosed in the parenthesis) indicates the number of warehouses.

As the user enters the warehouse information, in this particular example which is one, and clicks the continue button, the customized supply chain configuration is generated without placement of the planning activities. Fig. 7 is the screen capture of the supply chain configuration of ALPHA. Now the user is prompted to place the Level 2 planning activities. P2 is placed on the sourcing activities, P3 on make and P4 is placed on the delivery activities of ALPHA. The user is now prompted for the final step, the placement of Level 1 planning activities. Fig. 8 shows the final screen capture which contains the supply chain configuration for ALPHA along with Level 2 planning activities. The final step of placing plan supply chain (P1) activity is completed here. P1 is placed in two zones—inter- and intra-company. Intra-company P1 activity gets input from other Level 2 planning activities from the facility, whereas inter-company P1 activity crosses the boundary of enterprise and reaches the alliances and partnerships, which is the heart of supply chain management philosophy.

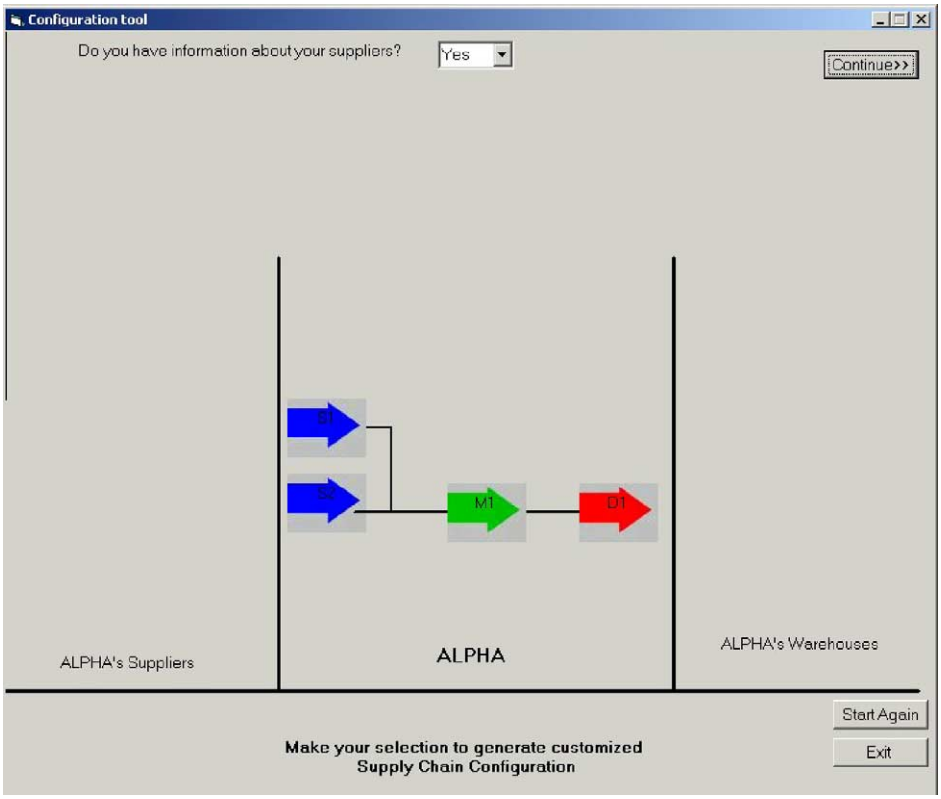

Fig. 5. Snapshot of supply chain configuration—make.

4. SCOR benefits

The advantages of SCOR model has been widely publicized by Supply Chain Council with illustrative case histories. The condensed generalized achievements of SCOR implementation in wide range of industries worldwide can be cited as follows (Bolstorff & Rosenbaum, 2003):

- Cost reduction and customer service improvement, offering on average 3% rise in total operating income.
- Within 12 months of project implementation, almost 2–6% improvement in return on investment (ROI).
- Noticeable improvement in return on assets (ROA) because of cognizant decisions in capital investment.
- Standard supply chain definitions and interpretations facilitating use of standard features of IT systems, reducing the operating costs drastically.
- 1–3% profit step up through continuous improvements in supply chain management.

More specifically, Intel is one of the SCOR beneficiaries worldwide that were forced to improve their complex and dynamic virtual supply chain networks, because of emergence of Business to Business

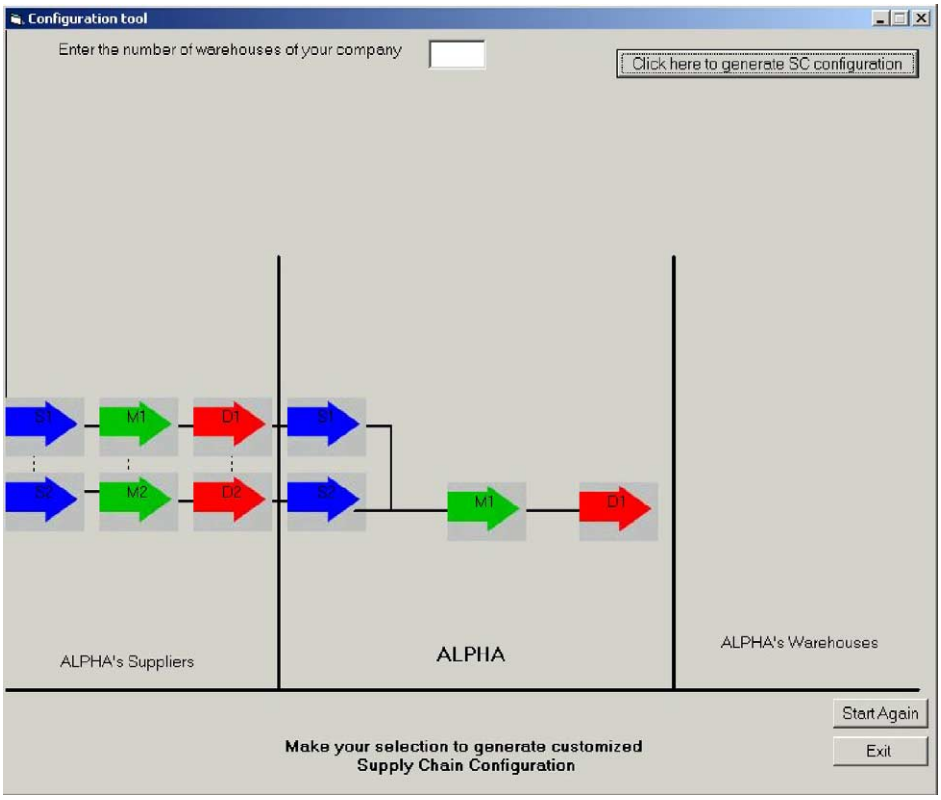

Fig. 6. Snapshot of supply chain configuration—make and source.

Integration (B2Bi). Intel Corporation suitably adapted and seamlessly integrated SCOR methodology in their supply chain improvement efforts (Intel 2002). SCOR initiatives at Intel were intended to achieve following objectives:

- Documentation of the supply chain and process improvement efforts currently in place.
- Identification of short term improvements.
- Identification of owners for long term improvements.
- Most importantly, learning and incorporating the SCOR methodology in the improvement efforts.

Intel developed SCOR BKM ('Best Known Method'), their own methodology to implement SCOR project road map. It consists of four face to face (FTF) meetings of cross-functional team members. The members have to finish assigned tasks offline in between two meetings. SCOR based simulation studies are introduced at early stage of projects to explore alternate configurations and improvements.

The methodology facilitates mechanism for Intel to set benchmarks using best in class industry performers. Performance indicators are aligned and customized at various operational and strategic levels. Scorecard is used as standard mean for identifying performance improvement opportunities.

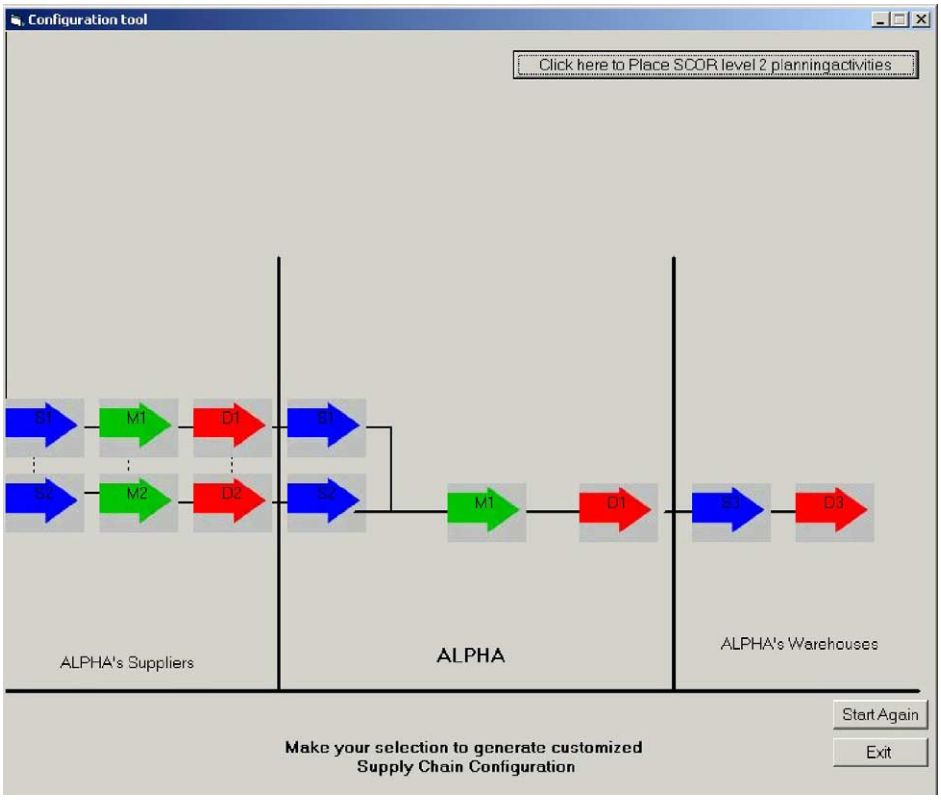

Fig. 7. Snapshot of supply chain configuration—make, source, and deliver.

SCOR BKM created a structured way to identify and prioritize supply chain improvements. It gave the management clear visibility across the supply chain which helped them prioritizing and expediting the improvements projects currently in place. One of such projects, which dealt with restructuring geographic inventory management and improving delivery performance, achieved great results. SCOR facilitated managing geographic inventory levels through min–max control limits, daily review, scheduling replenishment shipments, and assigning customer orders to the best point of supply based on lead time and availability. It also provided the required delivery capability and reliability in meeting customer commitments by improving planning of throughput time and operating calendars, and by changing carrier contracts and execution to delivery date requested by the customer.

In short, SCOR implementation improved Intel's customer responsiveness and reliability, delivery performance, and factory agility focused on building the right product, reducing the inventory carrying and obsolescence costs and resource/space fluctuations.

Similarly, many other organizations like Avon, LEGO, Siemens Medicals to name a few, pursued SCOR methodology and road map to achieve significant improvements in their supply chains. Table 3 summarizes their achievements along with the best practices utilized by these three organizations.

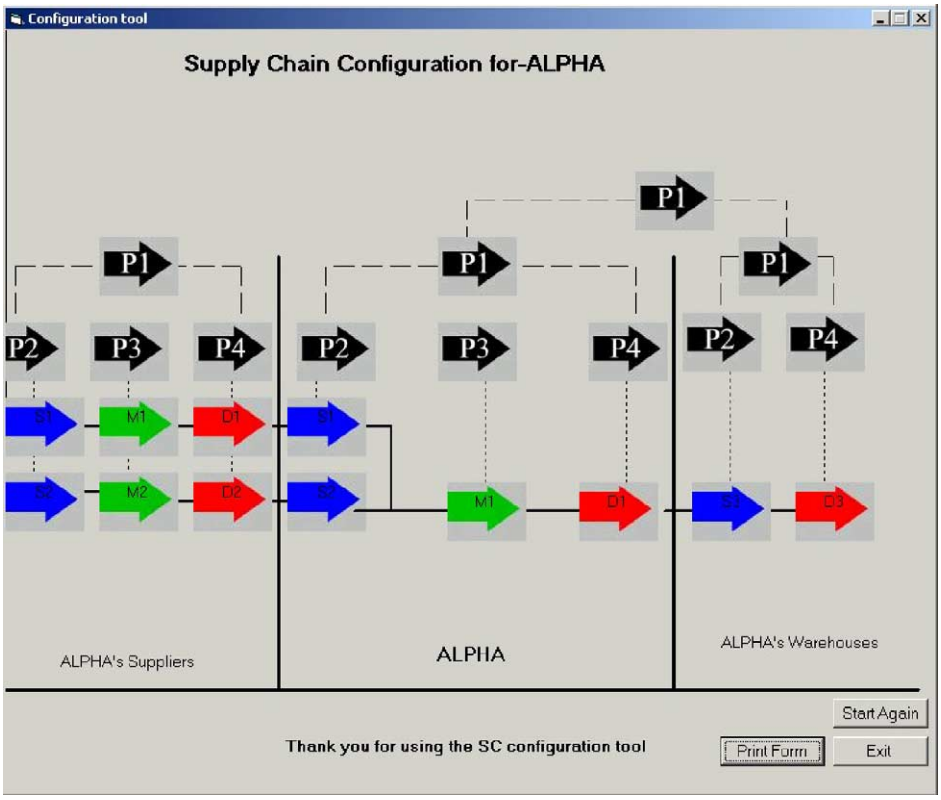

Fig. 8. Snapshot of final supply chain configuration.

5. Discussion

The SCOR model is developed to describe the business activities associated with all phases of satisfying a customer's demand. It uses a common set of definitions to describe supply chains that are across multiple industries and are of various complexities. Therefore, it has the potential to become an industry standard that can facilitate decision making by executive managers of a company. In contrast to the mathematical models reviewed by Beamon (1998), the SCOR model is a framework model for strategic decision making. It does not prescribe how a particular company should conduct its business. We believe this is a wise decision by SCC since different companies have different supply chain strategies that dictate their operations. After discussing the advantages of the SCOR model in Section 4, now we will focus on discussing its weakness and providing insights on how SCC can enhance the SCOR model. Specifically, we will address the two issues here, namely, customization/extension and internet presence.

5.1. Customization and extension

The SCOR model needs to be provided as per the needs of a particular company. Not every company is that capable and willing to explore opportunities offered by the SCOR model. This is the reason for

Table 3
SCOR benefits illustrations

Company	Achievements	Prior	Later	Best practices
AVON	Perfect order rate	62%	90%	• Simplified processes and networks
	Cycle time	Reduction by 50%		• Optimizing the manufacturing locations of different products • Centralized managed inventories • Rationalized supplier base
LEGO	Delivery performance	70%	90–99%	• Global ATP/Product allocation
	Inventory days of supply	55 days	75 days	• Performance measurement
	Capacity	Increase by 10%		• Integration of IT • Vendor managed inventory • Automated order processing
Siemens medicals	Delivery lead times	22 weeks	2 weeks	• More direct distribution systems
	Delivery reliability	65%	99.5%	• Increased percentage of made to order goods • KANBAN system

SCC's moderate performance and slow acceptance of the SCOR model. Therefore, SCOR model should be made easy to understand and implement. SCC website should provide a customized version of the SCOR model for a particular company along with other supply chain services. The key customized services that SCC needs to provide are:

- *Customized organization structure*. Every company has its unique organizational structure and responsibilities assigned to individuals, in spite of the requirement of performing similar industry operations. The SCOR model should be able to generate a customized organization structure for individual companies.
- *Customized task assignment*. Supply chain management requires special expertise and needs input from different departments of a company. Once the customized organizational structure is defined based on the SCOR model, the tasks of supply chain management should be assigned accordingly.
- *Customized supply chain configuration*. Supply chain configuration is one of the core concepts in the SCM philosophy. The configuration of a chain is affected by conditions in every department of a company. This is an area where the SCOR model has its strength, since standardization is desirable. The configuration might require expertise of geographical data and Internet security for data transmission, which requires outsourcing from the SCC.
- *Customized metrics*. Operating a supply chain is far different from running a standalone organization, and so are the metrics. The SCOR model defines 13 Level I metrics. In practice, most companies typically choose among four to six to focus on. The selection of level I metrics will vary from company to company and SCC needs to facilitate this customized performance measure over the Internet.

In addition to customization, the SCOR model should provide extension capability. With the rapidly growing ease of communication, the global markets cannot be ignored. Globalization is changing the fabric of business from a patchwork of discrete national and regional markets to a global market. The opportunities for growth and profit are growing exponentially; so are the potential risks. Companies wishing to compete in this environment must adopt a global supply chain management operating strategy. The principles to guide supply chain leaders in their new challenge are focusing on how to satisfy the emerging global customer through supply chain integration and responsive operations. SCC needs to pay special attention to companies doing business across the globe. Once certain models developed in different parts of the world are adopted in different countries and/or regions, the task of standardization becomes more difficult, because of varying marketing conditions and legal restrictions among others. This timeliness is of utmost importance for SCC to provide a global SCOR model.

5.2. Internet presence

The Internet has emerged as the latest technology-enabling tool. Web technologies continue to be developed which facilitate trade and simplify many business processes. Visibility between customers and suppliers has been significantly enhanced, opening up opportunities for reduced response time and significant savings for all players. The pace at which the Internet is reaching the customer base along with the factors just mentioned urges us to believe 'e-business or out of business.' This principle also applies to the SCOR model. The SCOR model in its current form is not easily understood and may not be customized by a company. Almost all companies need human assistance in implementing the SCOR model, which in turn put a huge burden on SCC in terms of highly skilled 'technical managers.' This need can be significantly reduced through the adoption of Internet technologies.

We recommend that the SCC provide all services related to the SCOR model over the Internet. Along with other factors, timeliness is extremely important. If the companies adopt their own models for different supply chain networks, the SCOR model is going to miss the first mover advantage, which is critical in Internet commerce. Standard and customized SCOR model description and supply chain configuration generation should be provided over the Internet by SCC. Also, maintenance of the SCOR model by SCC over the Internet will provide one common place to find all information about the SCOR model. Model maintenance will be much easier as SCC needs to update at one place, as compared to take care of numerous customer companies.

In addition, SCC should become a one-stop shop to help promote the SCOR model. Specifically, SCC should use its expertise in supply chain, information technology, and strategic capabilities to provide support service while endorsing the SCOR model as an industry standard. The important services that SCC can provide to its customer companies are training and secure access to customer company's resources. Training has always been an important enabling concept in every kind of industry. It assumes more important role in the complex field of supply chain management. SCC should bear the responsibility for training its customer companies not only the SCOR model but also the related essential concepts.

6. Conclusion

The SCOR model, provided by SCC, is a useful strategic tool in the hands of upper management to tackle the complexity in supply chain management. It provides a common supply chain framework,

standard terminology, common metrics with associated benchmarks, and best practices; and can be used as a common model for evaluating, positioning, and implementing supply chain application software. It is in its growing stage of life cycle and enjoys a leverage to become a standard in supply chain management.

Supply chain configuration is an integral part in SCOR project implementation. Currently, the configuration of 'as-is' or 'to-be' threaded-diagram describing a supply chain is done manually. To automate this process, a computer-assisted configuration tool has been developed and described in this paper. The configuration tool can so far only deal with a single manufacturing facility of a company. It does not take into account the interactions among multiple manufacturing facilities. This problem will be dealt with in our future research and development effort. Furthermore, we will investigate how to optimize supply chain configuration based on certain performance measures. Specifically, based on a set of criteria, how to automatically generate 'to-be' threaded-diagram from 'as-is' threaded-diagram to optimize supply chain performance.

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APICS
Supply Chain Operations Reference Model
SCOR

Version 12.0

Visit **apics.org/scor** for more information regarding the SCOR framework. The SCOR v12 framework is available via free digital download to all APICS members on the APICS website at **apics.org/myapics**.

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Introduction

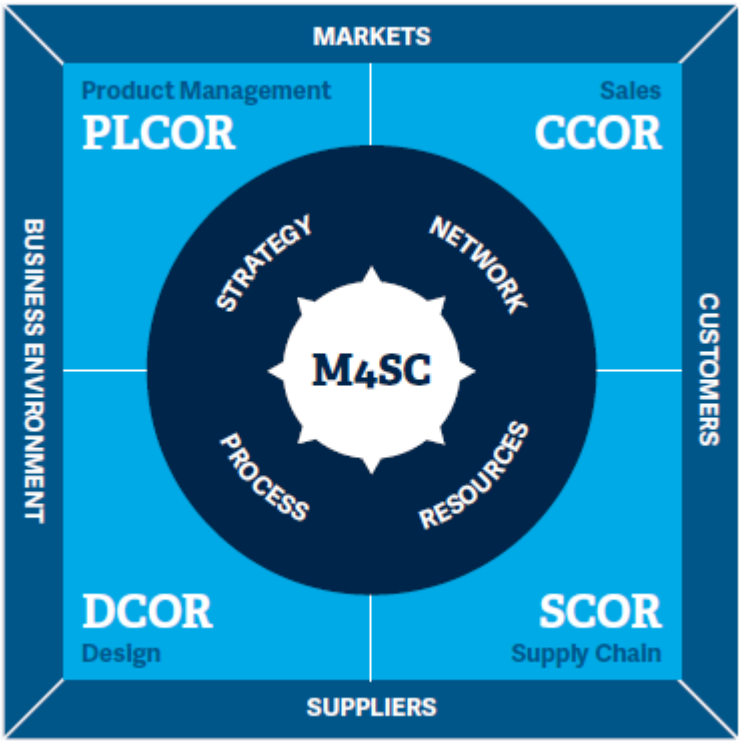
Introduction to SCOR

The Supply Chain Operations Reference model (SCOR) provides methodology, diagnostic and benchmarking tools that help organizations make dramatic and rapid improvements in supply chain processes. The world of supply chain management never stops advancing, and nor do supply chain professionals and their organizations. Supply chains require savvy operators, supervisors and leaders with the knowledge and know-how on the global standards and practices that move the needle on supply chain performance. APICS is the industry authority that develops supply chain talent and elevates end-to-end supply chain performance. From education and certification, to benchmarking and best practices, APICS sets the industry standard.

SCOR is a part of the APICS body of knowledge used to foster the advancement of end-to-end supply chain management.

APICS Frameworks

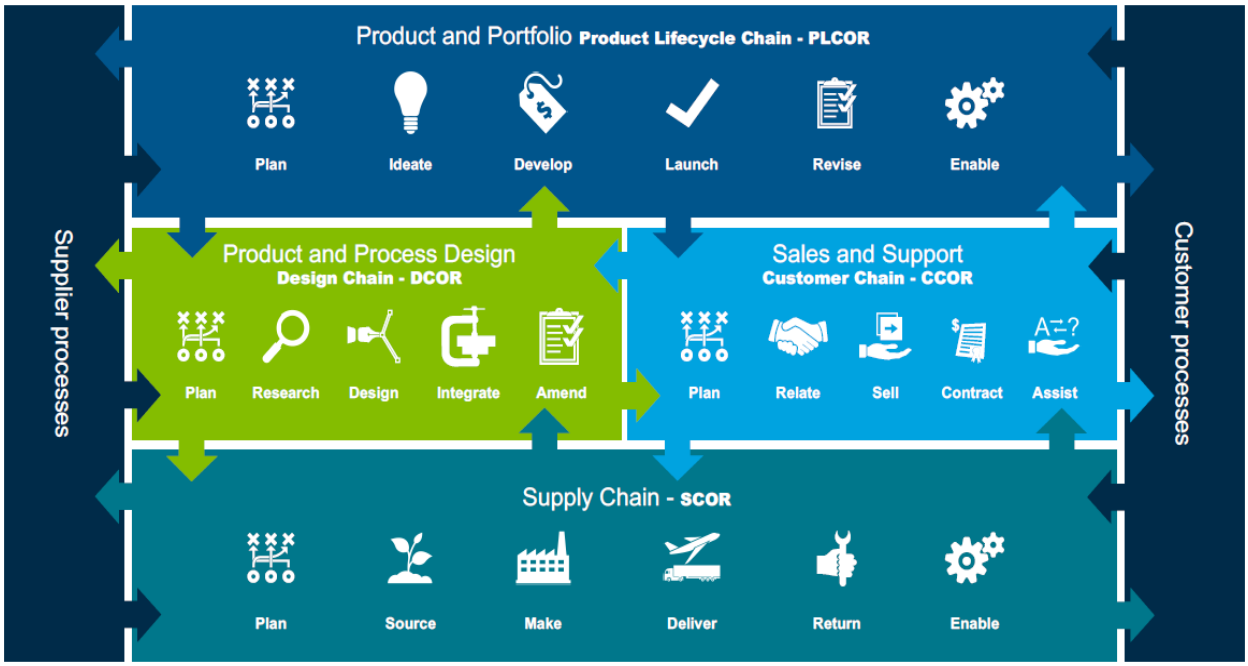
The SCOR model is part of an enterprise portfolio describing the critical elements in a value chain. Including SCOR, the APICS framework portfolio consists of the Product Life Cycle Operations Reference model (PLCOR), Customer Chain Operations Reference model (CCOR), Design Chain Operations Reference model (DCOR), and Managing for Supply Chain Performance (M4SC). For more information, services, and training related to these frameworks, please contact APICS Corporate Development at corporatedevelopment@apics.org.



Graphic 1: APICS Frameworks and relationships; credit: Ericsson, Lars Magnusson

The key focus of the APICS frameworks are:

- Product Life Cycle Operations Reference model – **PLCOR**
  - Manages the activities for product innovation and product & portfolio management – idea-to-portfolio
  - Key capabilities: Plan, Enable, Ideate, Develop, Launch, Revise
- Customer Chain Operations Reference model – **CCOR**
  - Manages the customer interaction process – lead-to-contract
  - Key capabilities: Plan, Relate, Sell, Contract, Assist
- Design Chain Operations Reference model - **DCOR**
  - Manages the product and service development process – portfolio-to-solution
  - Key capabilities: Plan, Research, Design, Integrate, Amend
- Supply Chain Operations Reference model - **SCOR**
  - Manages the business activities associated with all phases of satisfying a customer's demand – opportunity-to-payment
  - Key capabilities: Plan, Source, Make, Deliver, Return, Enable
- Managing for Supply Chain Performance – **M4SC**
  - The process that translates business strategies into supply chain execution plans and policies – strategies-to-plans and procedures
  - Key capabilities: Align Strategy, Networks, Processes, Resources



Graphic 2: This graphic illustrates the Level 1 processes for APICS frameworks

SCOR Summary

The Supply Chain Operations Reference model (SCOR) is the product of APICS following the merger between Supply Chain Council and APICS in 2014. The SCOR model was established in 1996 and updated regularly to adapt to changes in supply chain business practices. SCOR remains a powerful tool for evaluating and comparing supply chain activities and performance. SCOR captures a consensus view of supply chain management. It provides a unique framework that links business process, metrics, best practices and technology into a unified structure to support communication among supply chain partners and to improve the effectiveness of supply chain management and related supply chain improvement activities.

The APICS member base represents a broad cross-section of industries, including manufacturers, distributors, and retailers. The vast APICS network is also comprised of technology suppliers and implementers, academics, and government organizations that participate in APICS activities and the development and maintenance of the SCOR model.

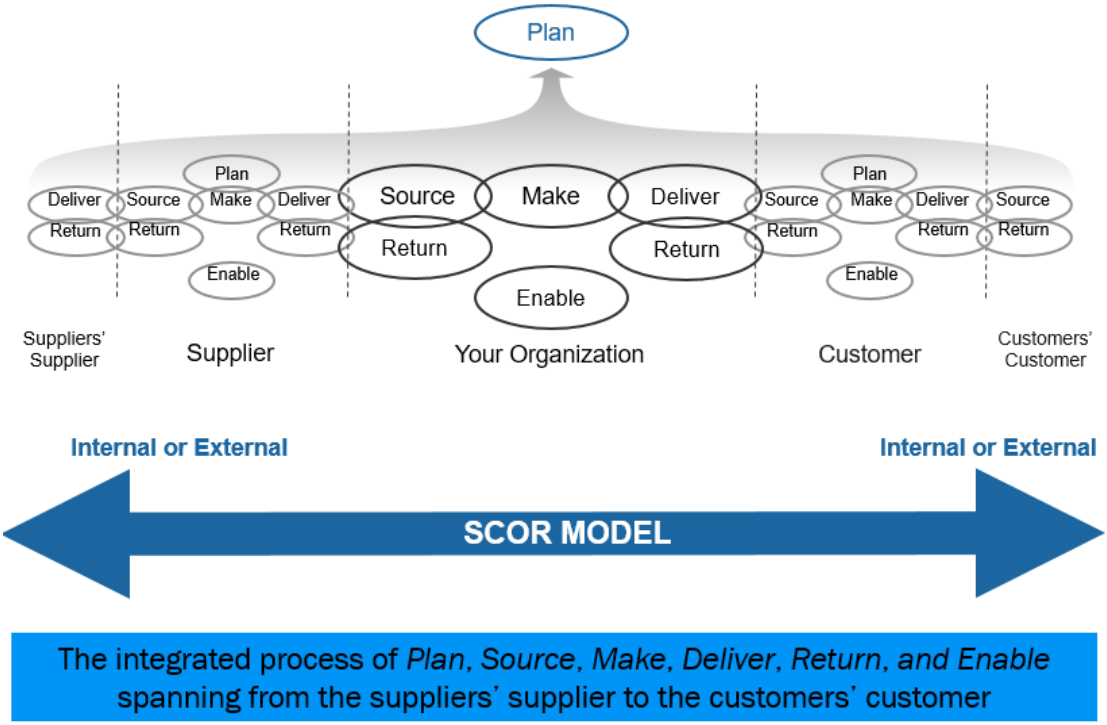
APICS is interested in providing the widest possible dissemination of SCOR, as the wide-spread use of the model enables communication using common definitions and measurements, results in better customer-supplier relationships, software systems that better support members through the use of common measurements and terms, and the ability to rapidly adopt common practices.

Specific changes in Version 12.0 from 11.0 are outlined later in this Introduction.

Scope of SCOR

The SCOR model has been developed to describe the business activities associated with all phases of satisfying customer demand. The model itself contains multiple tabbed sections and is organized around the six primary management processes of Plan, Source, Make, Deliver, Return and Enable (shown in Graphic 3). By describing supply chains using these process building blocks, the model can be used to describe supply chains that are very simple or very complex using a common set of definitions. As a result, disparate industries can be linked to describe the depth and breadth of nearly any supply chain. The model has been able to successfully describe and provide a basis for supply chain improvement for global projects as well as site-specific projects.

SCOR Process

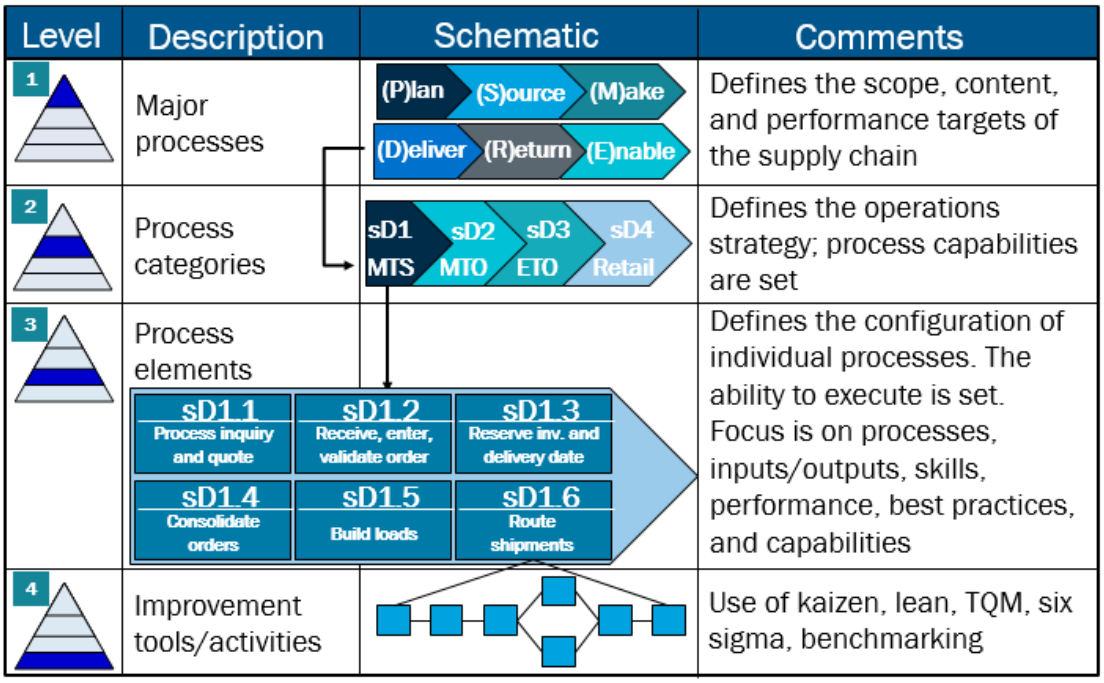


Graphic 3 - SCOR is organized around six major management processes

SCOR spans: all customer interactions (order entry through paid invoice), all physical material transactions (supplier's supplier to customer's customer, including equipment, supplies, spare parts, bulk product, software, etc.) and all market interactions (from the understanding of aggregate demand to the fulfillment of each order). It does not attempt to describe every business process or activity. Specifically, SCOR does not address: sales and marketing (demand generation), product development, research and development, however, these areas are covered in detail in the other APICS frameworks.

As shown in Graphic 4, the model is designed to support supply chain analysis at multiple levels. APICS has focused on the top three process levels, which are industry neutral. SCOR does not attempt to prescribe how an organization should conduct its business or tailor its systems/information flow. Every organization that implements supply chain improvements using SCOR will need to extend the model, at least to Level-4, using industry, organization, and/or location-specific processes, systems, and practices.

SCOR Process Hierarchy



Graphic 4 - SCOR is a hierarchical process model

It is important to note that this model describes processes not functions. In other words, the model focuses on the activity involved; not the person or organizational element that performs the activity.

SCOR Structure

SCOR is a process reference model. The purpose of a process reference model, or business process framework, is to define process architecture in a way that aligns with key business functions and goals. Architecture here references how processes interact and perform, how these processes are configured, and the requirements (skills) on staff operating the processes.
The SCOR reference model consists of 4 major sections:

- Performance: Standard metrics to describe process performance and define strategic goals
- Processes: Standard descriptions of management processes and process relationships
- Practices: Management practices that produce significant better process performance
- People: Standard definitions for skills required to perform supply chain processes.

The SCOR model also contains a section for special applications. Section 5, Special Applications, is used for suggested SCOR additions that have not yet been tested thoroughly for integration into the model, but that APICS believes would be beneficial for SCOR users.

Performance

The performance section of SCOR focuses on the measurement and assessment of the outcomes of supply chain process execution. A comprehensive approach to understanding, evaluating, and diagnosing supply chain performance consists of three elements: Performance Attributes, Metrics, and Process / Practice Maturity. Elements, as distinct from the Levels in the Process and Metrics hierarchies, describe different aspects or dimensions of performance:

- **Performance Attributes:** Strategic characteristics of supply chain performance used to prioritize and align the supply chain's performance with the business strategy
- **Metrics:** Discrete performance measures, themselves comprised of levels of connected hierarchy
- **Process/Practice Maturity:** Objective, specific descriptions used a reference tool to evaluate how well supply chain processes and practices incorporate and execute accepted best-practice process models and leading practices.

Performance Attribute	Definition
Reliability	The ability to perform tasks as expected. Reliability focuses on the predictability of the outcome of a process. Typical metrics for the reliability attribute include: On-time, the right quantity, the right quality.
Responsiveness	The speed at which tasks are performed. The speed at which a supply chain provides products to the customer. Examples include cycle-time metrics.
Agility	The ability to respond to external influences, the ability to respond to marketplace changes to gain or maintain competitive advantage. SCOR Agility metrics include Adaptability and Overall Value at Risk
Costs	The cost of operating the supply chain processes. This includes labor costs, material costs, and management and transportation costs. A typical cost metric is Cost of Goods Sold.
Asset Management Efficiency (Assets)	The ability to efficiently utilize assets. Asset management strategies in a supply chain include inventory reduction and in-sourcing vs. outsourcing. Metrics include: Inventory days of supply and capacity utilization.

Table 1 - The SCOR Performance Attributes

Reliability, Responsiveness, and Agility are considered customer-focused. Cost and Asset Management Efficiency are considered internal-focused. All SCOR metrics are grouped within one of the performance attributes.

Each Performance Attribute has one or more level-1/strategic metrics. These level-1 metrics are the calculations by which an organization can measure how successful it is in achieving its desired positioning within the competitive market space.

Performance Attribute	Level-1 Strategic Metric
Reliability	• Perfect Order Fulfillment (RL.1.1)
Responsiveness	• Order Fulfillment Cycle Time (RS.1.1)
Agility	• Upside Supply Chain Adaptability (AG.1.1) • Downside Supply Chain Adaptability (AG.1.2) • Overall Value at Risk (AG.1.3)
Cost	• Total Supply Chain Management Costs (CO.1.1) • Cost of Goods Sold (COGS) (CO.1.2)
Asset Management Efficiency	• Cash-to-Cash Cycle Time (AM.1.1) • Return on Supply Chain Fixed Assets (AM.1.2) • Return on Working Capital (AM.1.3)

Table 2 - The SCOR Level-1 Metrics

The SCOR metrics are organized in a hierarchical structure. SCOR describes level-1, level-2 and level-3 metrics. The relationships between these levels is diagnostic. Level-2 metrics serve as diagnostics for level-1 metrics. This means that by looking at the performances of the level-2 metrics; performance gaps or improvements for level-1 metrics can be explained. This type of analysis of the performance of a supply chain is referred to as metric decomposition or root-causing. Similarly, level-3 metrics serve as diagnostics for level-2 metrics. The level of a metric is included in the codification of the metric itself.

Metrics codification starts with the performance attributes: Reliability - RL, Responsiveness - RS, Agility - AG, Cost - CO, and Asset Management - AM. Each metric starts with this two-letter code, followed by a number to indicate the level, followed by a unique identifier. For example: Perfect Order Fulfillment is RL.1.1 - a level-1 metric within the Reliability attribute. Perfect Condition is RL.2.4, a Reliability metric at level-2.

Process / Practice Maturity provides a qualitative comparison of supply chain processes and practices to descriptive representations of different levels of process and practice adoption and implementation. This evaluation measurement of supply chain process and practice effectiveness typically follows widely used models for Practice Maturity (sometimes referred to as Capability Maturity Models). Numerous maturity models exist for supply chain management, which typically follow a “Stages of Maturity” scale where “High Maturity” processes employ, and often extend, best practice and are implemented with a high degree of discipline and compliance, while “Low Maturity” processes are characterized by outdated practices and/or lack of discipline and consistency. SCOR does not currently embed a prescribed maturity model framework and content directly into the SCOR model document. The Performance section provides an overview of this important element of Supply Chain Performance, and the SCOR user is encouraged to draw upon existing maturity models to develop and tailor the content to their industry and company.

Processes

The Process section in SCOR provides a set of pre-defined descriptions for activities most companies perform to effectively execute their supply chains. The six macro-level SCOR processes Plan, Source, Make, Deliver, Return and Enable are well-known and widely adopted. SCOR identifies 2 more levels of process. Level here indicates the span of the process: A level-3 process is focused on a more detailed activity. A level-1 process spans multiple level-3 processes. Graphic 4 shows the levels within the SCOR model processes.

Level-2 process categories determine the capabilities within the level-1 processes. The key level-2 processes are Make-to-Stock vs. Make-to-Order vs. Engineer-to-Order for Source, Make and Deliver processes and Defective vs. MRO vs. Excess for the Return process. Level-3 processes are process steps that are performed in a certain sequence in order to plan supply chain activities, source materials, make products, deliver goods and services and handle product returns.

Companies may develop standard process descriptions of activities within the level-3 processes -- so called level-4 processes. Level-4 processes are generally industry, product, location and/ or technology specific. For example: Most if not all companies need to perform a task known as "receive, enter and validate a customer order". This is a level-3 process (for example sD1.2). The level-4 processes would describe the steps how the order was received. Examples would be EDI, fax, telephone, and walk-in. Each of these may require a unique level-4 process description. Another step you would describe how the order was entered. EDI maybe automatically loaded by certain software, fax and phone orders are entered by the order desk, walk-ins are processed at the checkout counter. And so on.

The level at which processes need to be described depends on the project. For most projects level-2 process diagrams help identify structural issues in the supply chain: "Why do we have a warehouse feeding a warehouse, feeding a warehouse?" or "Lead-time are long due to where we source some of these materials". Level-3 process diagrams help identify decision points, triggers and process disconnects. For example: A sourcing model where I only take inventory ownership after I shipped it to my customer -- a.k.a. "consignment inventory" -- is described at level-3. Another sourcing alternative vendor managed inventory is also defined at level-3. Both need the standard level-3 processes, but the way these processes are sequenced and who performs them is the differentiator.

Process codification differs by level. Level-1 processes are represented by a capital letter preceded by the letter “s” (stands for SCOR): sP for Plan, sS for Source, sM for Make, sD for Deliver and sR for Return. Level-2 processes add a number for most level-2 processes: sD1 for Deliver Stocked Products, sP3 for Plan Make. Level-3 processes add a period followed by a unique number: sD1.1 for Process Inquiry and Quote, sD1.2 for Receive, Enter and Validate Order. Exceptions exist for Return processes: Level-2 Return processes are split into Source Return (sSRx) and Deliver Return (sDRx) processes to acknowledge the difference between returning something yourself or receiving a return from your customer. The level-3 processes are aligned with these codes: sDR1.1 is Authorize Defective Product Return.

Practices

The practices section, formerly known as 'best practices', provides a collection of industry-neutral practices companies have recognized for their value. A practice is a unique way to configure a process or a set of processes. The uniqueness can be related to the automation of the process, a technology applied in the process, special skills applied to the process, a unique sequence for performing the process, or a unique method for distributing and connecting processes between organizations.

SCOR recognizes that several different qualifications of practices exist within any organization (SCOR ID):

- Emerging practices (BP.E)
- Best practices (BP.B)
- Standard practices (BP.S)

SCOR recognizes the qualification of a practice may vary by industry or geography. For some industries a practice may be standard, whereas the same practice may be considered an emerging or best practice in another industry. The SCOR classification of practices has been established based on input from practitioners and experts from a diverse range of industries. All SCOR practices have been mapped to one or more classifications. SCOR 12 recognizes 21 classifications. Classifications help identify practices by focus area, for example: inventory management or new product introduction.

People

The People section of SCOR was introduced in SCOR 10 and provides a standard for describing skills required to perform tasks and manage processes. Generally, these skills are supply chain specific. Some skills identified may be applicable outside the supply chain process domain.

Skills are described by a standard definition and association to other People aspects: Experiences, Trainings and Competency level. Competency level is not included in the framework descriptions. SCOR recognizes 5 commonly accepted competency levels:

- Novice: Untrained beginner, no experience, requires and follows detailed documentation
- Beginner: Performs the work, with limited situational perception.
- Competent: Understands the work and can determine priorities to reach goals.
- Proficient: Oversees all aspects of the work and can prioritize based on situational aspects.
- Expert: Intuitive understanding. Experts can apply experience patterns to new situations.

These competency levels are used similarly as process or practice maturity levels. The person or job specification is evaluated on the found (person) or desired (job specification) level of competency.

Codification within the People section consists of coding of the Skills as well as the Experiences and Training that define the Skills. All People elements start with a capital letter H followed by a capital letter representing the element: S for Skills, E for Experiences and T for Trainings. These are followed by a period and a four-digit number. For example, HS.0046 is the code for “ERP Systems” skill, HT.0007 is the code for APICS CSCP training.

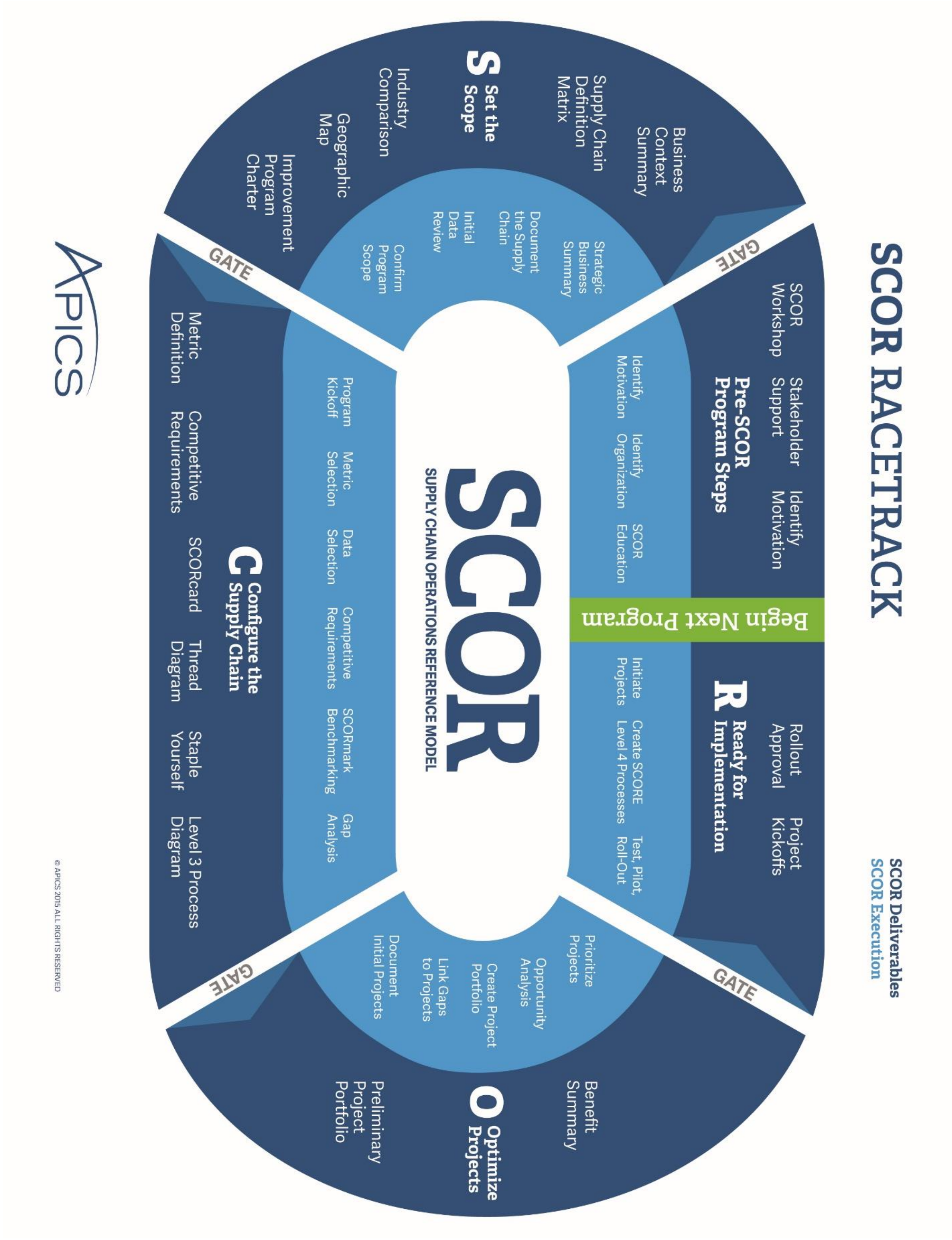
SCOR Improvement Program and SCOR Racetrack

The SCOR Racetrack model describes how to organize a SCOR improvement program using the SCOR process and supporting methodologies

The methodology is described in 5 distinct steps:

- **Pre-SCOR Program Steps:** Prepare the organization for the mission critical SCOR improvement program
- **Set the Scope:** Understand the business environment and define the scope of the supply chain for a SCOR improvement program
- **Configure the Supply Chain:** Determine the performance metrics and processes of the SCOR improvement program
- **Optimize Projects:** Establish the project portfolio including process scope, priority, and anticipated benefits.
- **Ready for Implementation:** Implement projects in the portfolio and commence benefits realization.

Please see Graphic 5 on the next page to see the SCOR Racetrack model in detail. The SCOR Improvement methodology is currently described in full in the SCOR-P Training material.



Graphic 5 - SCOR Racetrack

SCOR v12 Updates

The SCOR model is developed and maintained by the voluntary efforts of APICS members and supply chain industry subject matter experts. APICS depends on the contributions of its members to actively advance the state of knowledge in supply chain by identifying required model changes, researching and validating those changes, and developing the consensus regarding the proposed changes. Similar to the Job Task Analysis (JTA) process that is used to update APICS certification content, a research survey was distributed to nearly 60,000 supply chain professionals worldwide to gauge wide-spread industry acceptance and/or adoption for new business process methodologies and their associated activities. All SCOR framework updates were determined as a direct result of the field's importance ratings and the combined efforts of the subject matter expert task force.

The following updates were included in this revision of the SCOR framework.

Performance

Reliability

- Perfect Order Fulfillment, RL.1.1, was definitionally updated to align with APICS Dictionary

Responsiveness

- Return Cycle Time, RS.2.5, was added as a Level 2 metric

Agility

The SCOR Agility Attribute hierarchy was updated due to duplicative nature in measuring agility as a percentage as well as in a time frame.

- Upside Supply Chain Flexibility and supporting Level 2 metrics were omitted
- New Agility hierarchy now consists of:
  - AG.1.1 Upside Supply Chain Adaptability
  - AG.1.2 Downside Supply Chain Adaptability
  - AG.1.3 Overall Value at Risk
- Time to Recovery, AG.2.15 was added as a Level 2 metric under Overall Value at Risk (VaR), AG.1.3

Cost

The SCOR Cost Attribute hierarchy was updated due to the complexity of accurately measuring Total Cost to Serve and its elements in a consistent fashion as cost allocations can significantly differ by company.

- Total Cost to Serve was replaced with Total Supply Chain Management Costs
- New Cost hierarchy now consists of:
  - CO.1.1 Total Supply Chain Management Costs
  - CO.1.2 Costs of Goods Sold (COGS)

Process

All SCOR processes now have process workflows developed by the SCOR BPM Accelerator, powered by ARIS and Visual Enterprise Architecture (VEA). This ensures all inputs, outputs, and objects are accurately mapped. These new workflows will also now be included in the BPM Accelerator. For more information on the BPM Accelerator, please contact APICS Corporate Development at corporatedevelopment@apics.org.

sM - Make

- Section definitions were updated to better align with the service industry and digital environment

sD - Deliver

- New Best Practice, Omni-channel – BP.176, was aligned with all Deliver Process activities under the associated Process hierarchy tables

sE – Enable

- Manage Supply Chain Network, sE7, was updated to include suppliers as a network element
- Enable Supply Chain Procurement, sE10, was developed in in conjunction with procurement standards outlined by the Chartered Institute of Procurement & Supply (CIPS). For more information on globally recognized procurement and supply practices please visit the CIPS website at www.cips.org
- Enable Supply Chain Technology, sE11, was developed to define, deploy, and manage technology enablement in the supply chain.

Practices

All practices listed in v11 were carefully reviewed and rearranged into the appropriate section – Emerging, Best, or Standard. Some practices were determined to be "declining" and were deleted for the SCOR v12 update. All changes were validated by fielding supply chain subject matter experts.

The following new practices were introduced in this version update:

Emerging Practice
BP.176 Omni-channel
BP.177 Additive Manufacturing
BP.178 Block Chain
BP.179 Demand Driven MRP
BP.180 Demand Driven S&OP
BP.181 Digital Supply Chain
BP.182 Internet of Things
BP.183 Integrated Business Planning
BP.184 Scenario Planning
BP.188 SCM Object Synchronization – "3/4-way Match"

Best Practice
BP.173 Supply Chain Risk Monitoring
BP.174 Supply Chain Risk Assessment
BP.175 Metadata
BP.185 Cost of Quality
BP.186 Data / Analytics
BP.187 Supply Chain Finance

People

Major updates in the SCOR People section include:

- Removal of Aptitudes
- Numerological lists were created for Experiences and Trainings
- Skills associated with the APICS CLTD body of knowledge adopted
- Additional APICS Certifications and Trainings adopted:
    - APICS CLTD – Certified in Logistic, Transportation and Distribution
    - APICS Principles trainings
        - Distribution and Logistics
        - Inventory Management
        - Managing Operations
        - Manufacturing Management
        - Operations Planning

Special Application Update

GreenSCOR replaced by SustainableSCOR

SustainableSCOR is based upon The Global Reporting Initiative's (GRI) Sustainability Reporting Standards (GRI Standards) that are within scope of the SCOR model. The GRI Standards were chosen as a reference because GRI has created a common language for organizations and stakeholders, with which the economic, environmental, and social impacts of organizations can be communicated and understood. The GRI Standards are designed to enhance the global comparability and quality of information on these impacts, thereby enabling greater transparency and accountability of organizations. GRI Standards are free to use and are available to the public at - www.globalreporting.org/standards.

SustainableSCOR uses the GRI definitions and measures when dealing with the sustainability environmental topics (GRI 300 series topic-specific Standards). This approach is being used to help supply chain professionals gain visibility of the environmental topics that are in their supply chain network and value chain network, and enable them to model and manage these impacts. A value chain covers the full range of an organization's upstream and downstream activities, which encompass the full life cycle of a product or service, from its conception to its end use.

Only GRI metrics that are within the realm of supply chain management, sourcing, and managing the risk related to supply chain operations will be included in the scope of the SCOR model.

When the SCOR model uses an element that aligns with a GRI disclosure, the specific GRI disclosure number will be cross-referenced. Please note that the GRI reporting guidelines shall be followed when making any reporting claims by organizations.

SCOR 12.0 replaces GreenSCOR with an updated and expanded environmental accounting framework (SustainableSCOR) that is based upon the GRI Standards. Care should be taken when transitioning from GreenSCOR to SustainableSCOR.

The only metric that directly links from one framework to the other is Total Air Emissions. However, GreenSCOR's definition was not as precise as the SustainableSCOR definition for Total Air Emissions.

Other metrics to pay close attention to are as follows:

The Carbon footprint metric from the GreenSCOR model is similar to GHG emissions, but not completely the same. SustainableSCOR, following the GRI Standards, has scope 1, 2 and 3 GHG emissions. Additionally, there are also emissions of ozone-depleting substances (ODS).

GreenSCOR uses a % recycled metric. Recycled and reclaimed definitions that are used in SustainableSCOR are very different than GreenSCOR and follow the GRI Standards.

GreenSCOR has liquid emissions. SustainableSCOR, following GRI, liquid emissions can be in the form of water discharge, hazardous or non-hazardous emissions.

GreenSCOR measures solid emissions. SustainableSCOR, following the GRI Standards, measures hazardous or non-hazardous emissions.

Contributors to SCOR v12.0

The development of SCOR depends on the support and input from SCOR practitioners, subject matter experts, and APICS members. The following individuals have devoted time and effort to the development of SCOR v12. Thank you!

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