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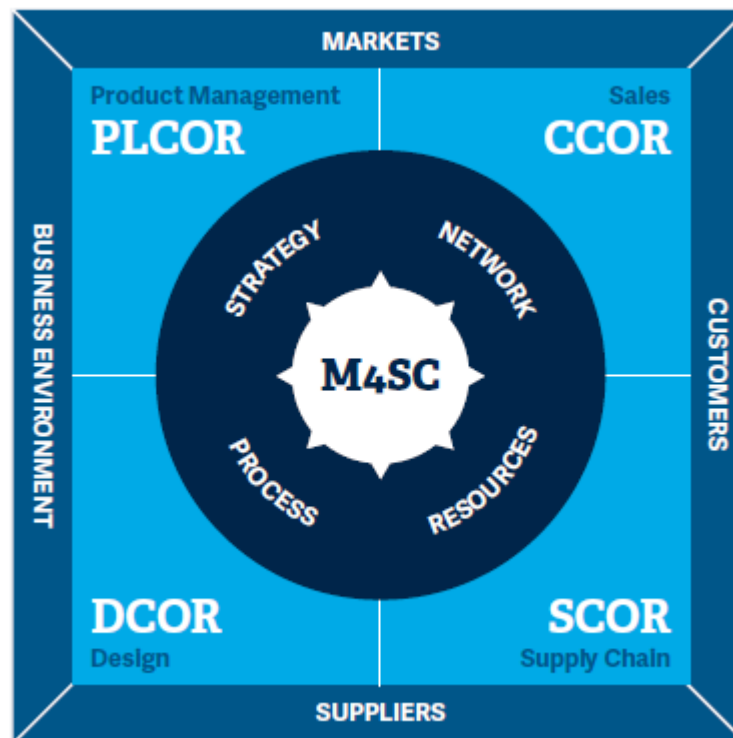
Graphic 1: APICS Frameworks and relationships; credit: Ericsson, Lars Magnusson

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

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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.
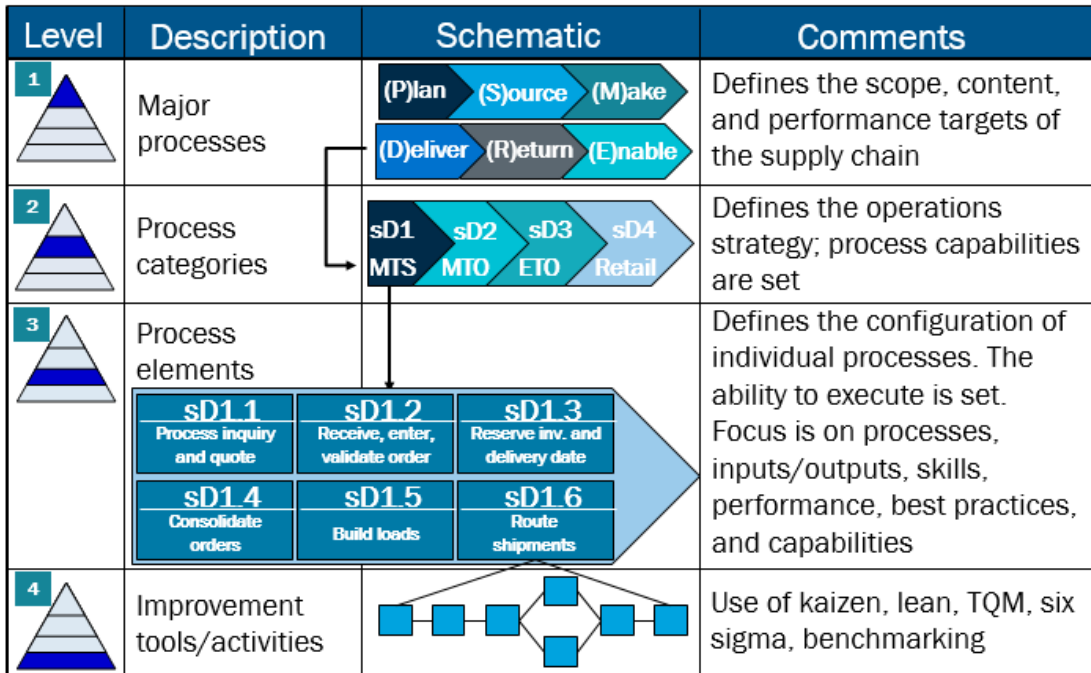
SCOR Process
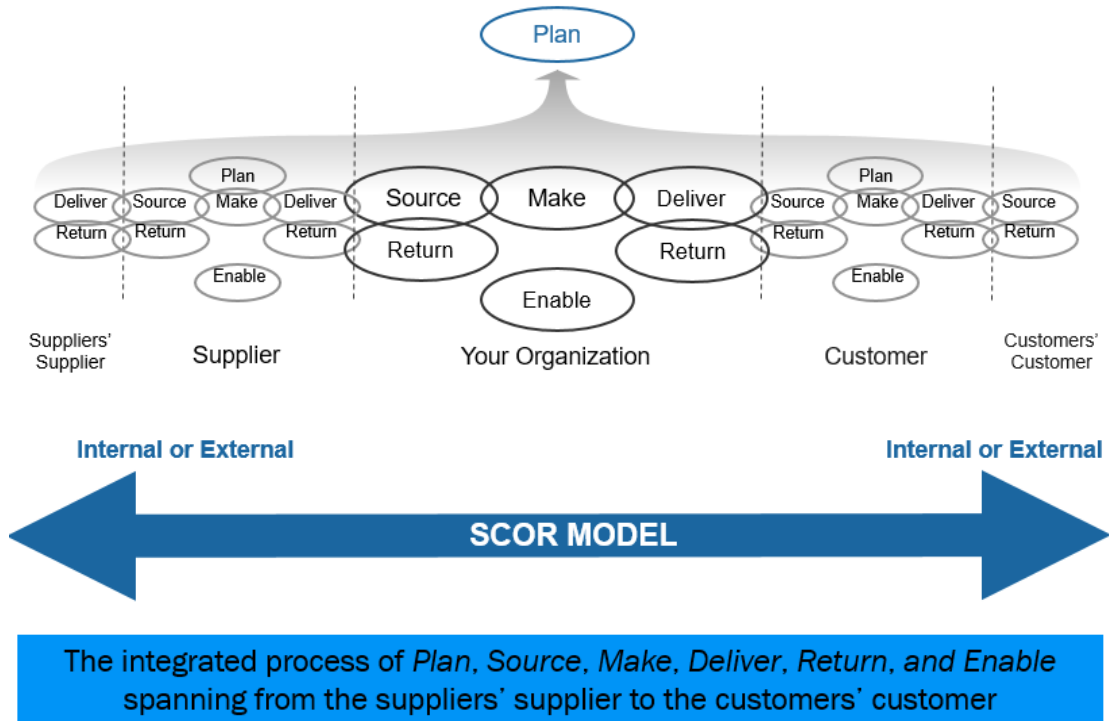
Graphic 3 - SCOR is organized around six major management processes

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

Level	Description	Schematic	Comments
1	Major processes	(P)lan (S)ource (M)ake (D)eliver (R)eturn (E)nable	Defines the scope, content, and performance targets of the supply chain
2	Process categories	sD1 sD2 sD3 sD4 MTS MTO ETO Retail	Defines the operations strategy; process capabilities are set
3	Process elements	sD1.1 Process inquiry and quote — sD1.2 Receive, enter, validate order — sD1.3 Reserve inv. and delivery date — sD1.4 Consolidate orders — sD1.5 Build loads — sD1.6 Route shipments	Defines the configuration of individual processes. The ability to execute is set. Focus is on processes, inputs/outputs, skills, performance, best practices, and capabilities
4	Improvement tools/activities		Use of kaizen, lean, TQM, six sigma, benchmarking

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
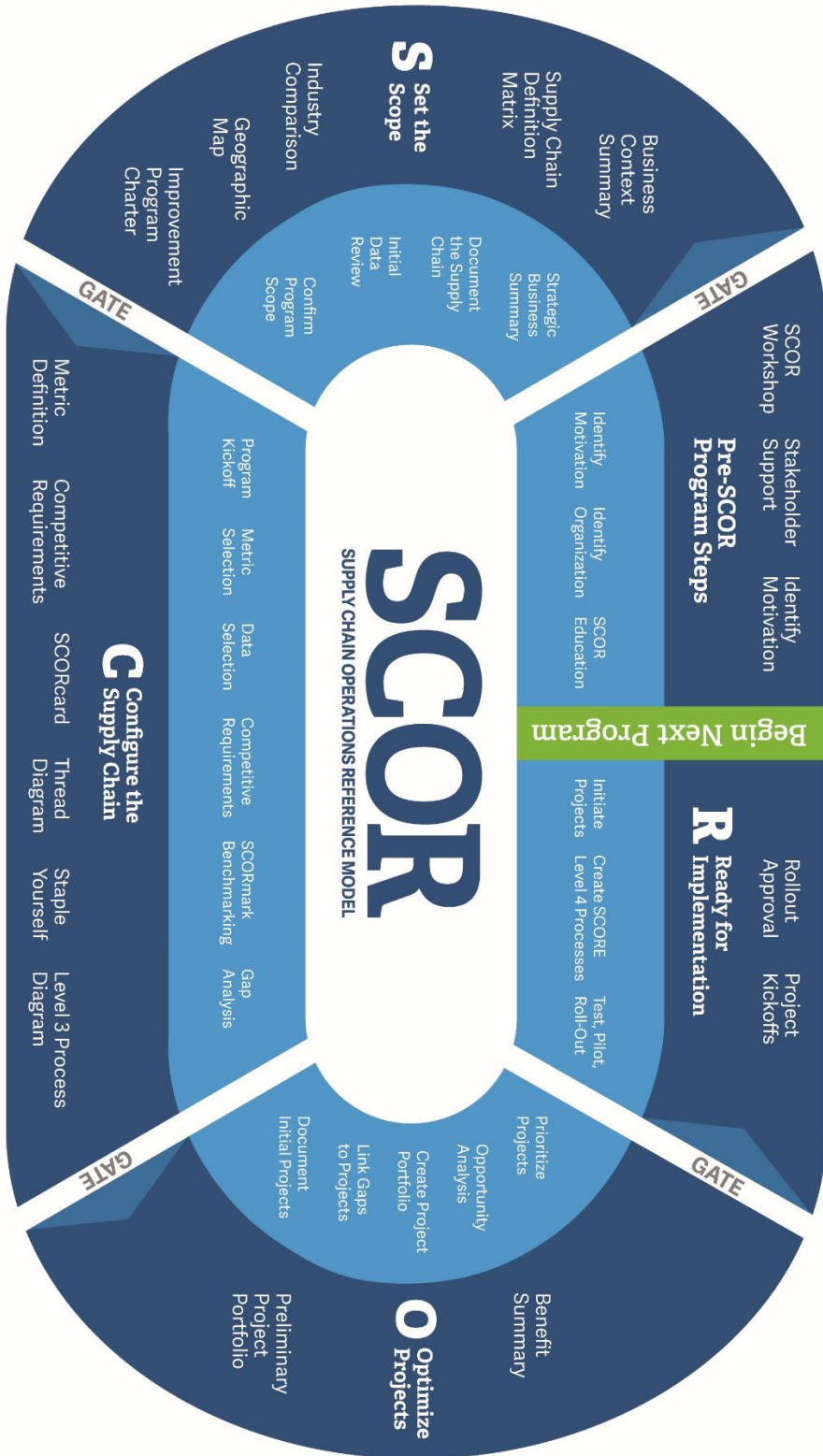
The methodology is described in 5 distinct steps:

- **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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