


# Balanced Scorecards for Supply Chain Management

Cassandra E. O'Neill ■ Scott S. Haraburda, Ph.D.





For more than a decade, Crane Army Ammunition Activity (CAAA) has produced and provided conventional munitions to the warfighters, supporting them in winning battles in Iraq and Afghanistan. Its senior leaders continually strive to improve its logistics processes. Due to a rapidly changing environment, this Army Working Capital Fund organization began a dramatic transformation by replacing its operational processes, moving from the proven concepts of logistics to the more robust and flexible approaches of Supply Chain Management (SCM). Along the way, it had to renovate the way it measured its organizational performance. CAAA leaders now use this new balanced scorecard based upon SCM to make important organizational decisions.

### Supply Chain Management

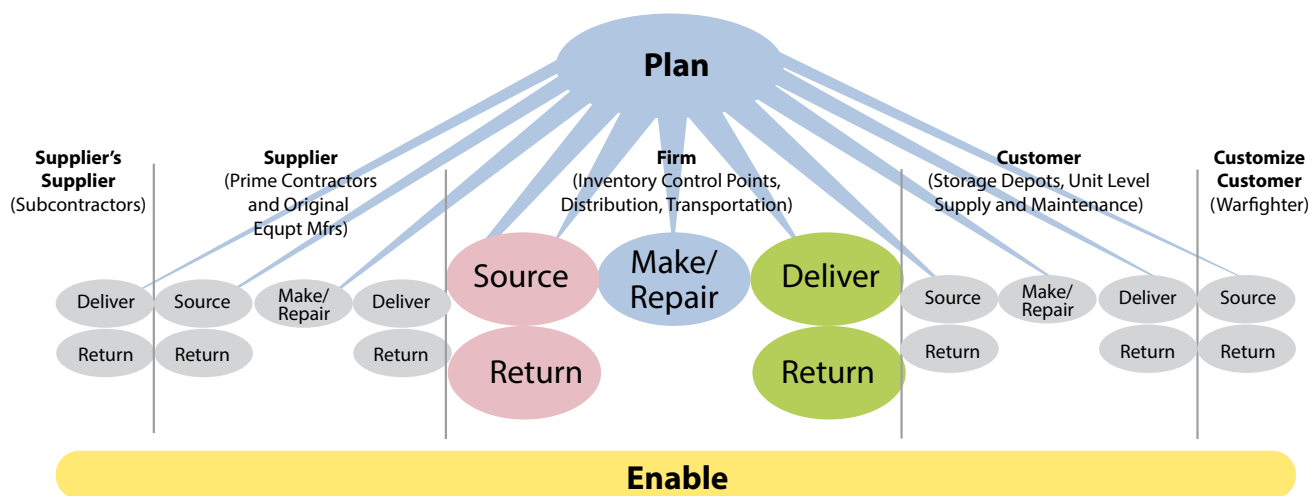
SCM has become a vital tool used in today's global economy to increase success and efficiency in the flow of products and services. The SCM process begins in the earliest stages of procuring materiel from distributors and suppliers, and it continues until the final delivery to the customer. The complete supply chain encompasses sourcing raw materiel and parts, manufacturing, warehousing, inventory management, customer service, and delivery of final product. Each element is critical for a fully developed, high-performing supply chain; one weak link can prove detrimental to the entire SCM process because all areas depend upon each other. SCM aims to collectively improve each stage of product acquisition, storage, development and delivery to ultimately maximize customer value and gain a more competitive advantage.

An established supply chain optimizes a business' operations by enhancing both speed and efficiency throughout the various stages, from obtaining raw materiel to delivering the final product. The collaborative efforts of the areas within the supply chain give companies a huge cost advantage due to the greater efficiency within each area of the organization. Advantages to implementing an effective supply chain include improved inventory management, better materiel distribution, higher visibility of assets, increased customer satisfaction, reduced waste, lower costs, predictable schedules, enhanced quality and better overall operational efficiency.

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*O'Neall is a Naval Surface Warfare Center-Crane Division contract specialist in Crane, Indiana. She holds a bachelor's degree in management from Indiana University-Purdue University Indianapolis and an MBA from Indiana Wesleyan University. Haraburda, a retired U.S. Army colonel, is the Crane Army Ammunition Activity Strategic Planner. He holds a doctorate degree in chemical engineering from Michigan State University and is DAWIA Level III certified in program management and engineering. He also is a certified Project Management Professional.*

**Figure 1. Phases of Military Supply Chains**



### SCM Implementation

An effective supply chain has a huge impact on an organization's profitability and customer satisfaction, and this leads to a greater need for SCM process improvement. SCM extends beyond traditional logistics to include suppliers and customers in the process, resulting in more involvement from outside stakeholders and better overall relationships. CAAA has begun initiatives to integrate a fully functioning supply chain system with the more engaging approaches offered by SCM.

CAAA uses the Logistics Modernization Program (LMP), an Enterprise Resource Planning (ERP) software program, to manage the Army's materiel, monitor and increase inventory accuracy, reduce cycle time of purchase orders, and improve overall business functions. By using this system, CAAA's supply chain team conducted extensive research and collected vast amounts of data to move SCM integration forward.

New innovative supply chain processes were cultivated by looking outside the U.S. Government to industry leaders. In the earliest stages of SCM development, CAAA used the American Productivity and Quality Center (APQC) for information about best practices, benchmarking, performance improvement and other areas. CAAA also used the American Production and Inventory Control Society (APICS) for information regarding its supply chain operations reference (SCOR) model, which linked business processes, performance metrics, best practices and individual skills into one structure.

Used throughout the Department of Defense (DoD), the SCOR framework is organized around six primary processes of plan, source, make, deliver, return, and enable. Because this model is used to improve and communicate supply chain goals and processes, it assisted CAAA with metric identification and arrangement. It also has been further developed to apply to a DoD supply chain. As seen in Figure 1, for military supply chains, each phase targets specific areas—and they repeat

again and again throughout the entire process. CAAA selected metrics reflected in this model that focus on a unified SCM process from supplier delivery to customer acceptance.

CAAA initiated a key initiative to establish effective performance-based metrics and created a balanced scorecard to measure supply chain efficiency. It used this balanced scorecard as a performance measurement tool to provide leaders a complete view of organizational performance across various mission and support areas. This was done primarily through modifying the project management dashboards originally developed by one of the authors, described in "Leveraging Fidelity of Performance-Based Metric Tools for Project Management," an article in the January-February 2003 issue of *Program Manager*, the predecessor of *Defense AT&L* magazine.

### Identifying Supply Chain Metrics

Tracking supply chain metrics is always a strong starting point because the metrics allow organizations to identify weak areas and opportunities for performance improvement. Assisted by APQC information, CAAA identified an initial list of nearly 50 possible metrics to use in determining where an activity stands in terms of its SCM capability. Table 1 lists some of those metrics that focused on key performance indicators covering process efficiency, cycle time, staff productivity, cost effectiveness and other supplemental information. CAAA used the top quartile of industrial companies as benchmarked target values in its scorecard.

During the initial review, CAAA collected the appropriate data from the LMP database to analyze the activity's strength in the above key performance areas. CAAA leaders wanted to eliminate "Zombie Metrics" that were causing no action, even if they were easier to monitor. After completion of this initial assessment, the list was compressed to fewer than two dozen metrics to target the weakest areas, such as inventory management, supplier performance and schedule. Furthermore, the weaker links in the supply chain were paired with some of

CAA's business critical metrics such as productivity, quality, customer satisfaction, and revenue and expense planning. The final metrics were arranged into the elements of supplier, input, process, output, customer, and foundation (SIPOCF).

Used in developing the balanced scorecard for the complete supply chain, CAA's supply chain metrics were those composed of these SIPOCF elements, and used these in various process improvement projects. CAA pushed the SIPOCF diagram a step further by adding a foundation category to help view the entire organization's base performance. Each group within the SIPOCF diagram consists of key metrics that measure specific areas within the supply chain and contribute to completion of the overall balanced scorecard.

The supply element consists of the significant internal and external suppliers to the process. In Fiscal Year 2015, CAA had nearly 80 different vendors, both commercial and government, supplying more than 100 distinct components. The metrics used in this stage include Materiel Requirements Planning and product quality deficiency data. These supplier performance metrics are tied to key enterprise performance metrics and processes rather than a sole emphasis on establishing supplier performance targets without organizational considerations.

The input element consists of the materiel, resources, documents, information or any other significant data used to implement the organizational processes. CAA measures its significant inputs by analyzing inventory turns, days of supply, supply planning, and demand and supply forecasting. Regrettably, many DoD installations—CAA included—have increasing inventory levels, which complicates the supply chain process

**Table 1. Possible Supply Chain Metrics**

Category	Metric
Process Efficiency	Raw materiel inventory turns.
Cycle Time	Time to place a purchase order.
Supplemental Info	Percentage of procurement group with more than 3 years of experience.
Staff Productivity	Number of purchase orders processed per procurement group full time equivalent.
Cost Effectiveness	Total cost to process outbound transportation per \$1,000 in revenue.

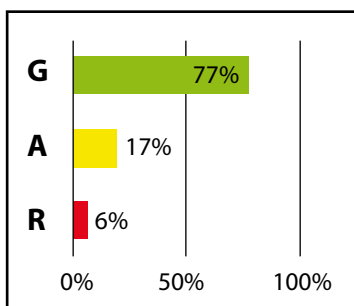
Source: American Productivity and Quality Center

and damages overall performance. Measuring and improving inventory management enhances supply and demand planning and the business' overall profitability.

The process element consists of the activities or procedures executed in an effort to convert inputs into outputs. The efficiency processes are measured through productive yield calculations, receipts and issues, inventory plan completion and scrap and rework costs. Process metrics allow CAA leaders to examine operations and productivity levels across multiple functions.

The output element consists of items produced in the process phase and intended for customer use. Metrics include the effectiveness of their outputs through the quality of end items, the number of projects completed, the schedule, orders

**Figure 2. Actionable Data From Supply Chain Metrics**



**Issues**

1. Issue 1 description (i.e., safety RIR).
2. Issue 2 description (i.e., expense plan).
3. Issue 3 description (i.e., revenue plan).

**Abbreviation Key:**

RIR=Recordable Incident Rate  
POC= Point of Contact

Metric	Last Month	This Month	Rating	Trend
Safety-RIR	6.20	4.57	R	↑
Direct Labor Hours	97%	103%	G	↑
Revenue Plan	1%	-2%	G	↓
Expense Plan	-3%	6%	A	↓
Storage Occupancy	84%	84%	G	↔
Overall				↑

**Action Plan**

Who	When	What	Status
POC	Date	Address Issue 1	Status
POC	Date	Address Issue 2	Status
POC	Date	Address Issue 3	Status

shipped on time, surveillance backlog and demilitarization execution. These provided leaders with an idea of the quality and timeliness of the various products generated by each project. Monitoring outputs also increases the visibility of process outcomes and provides an opportunity to continuously modify operating procedures to improve the quality and schedule of end products.

The customer element involves the recipient of the output from the process. CAAA has slightly more than two dozen different customers who receive its products. Metrics are applied to quality, timeliness and delivery. These impact future demand, ensure customer satisfaction, and identify opportunities to improve. These included customer feedback, especially their complaints. Perfect Order Fulfillment also is tracked to ensure products are supplied to the customer on schedule and meet all requirements agreed upon in the contract.

The foundation element refers to the enabling processes in the SCOR model. These metrics included such enabling processes as safety, direct labor hours, revenue and expense planning—along with storage occupancy levels.

### Balanced Scorecard

**Action-Based Reviews:** At least once each month, the CAAA directors review actionable information determined from an effective analysis of their supply chain metrics. The monthly metrics reviews include quad-charts similar to the chart in Figure 2, one for each of the six SIPOCF elements. These reviews include Green-Amber-Red (GAR) colors along with trending arrows to indicate changes from previous reports (↑↓↔). The GAR colors are based upon the target goals, either established by the command or from the performance of companies through benchmarking target data.

In the upper left block, a horizontal bar chart is displayed that shows a percentage of elemental metrics in each of the GAR rating. The upper right block contains the data for each of the elemental metrics, including the value from the previous reporting period. The bottom left block provides a textual list of the top issues in the supply chain element. And the bottom right block, as the most important one in the review, identifies the action plan to address the identified issues.

**Dashboard:** CAAA integrates the six SIPOCF elements into an integrated dashboard, similar to the balanced scorecard used by the Malcolm Baldrige National Quality Award. This shows its leaders the status of its organization in a quick glance. Cost, schedule and performance are the overarching three key business indicators that, as in project management, are displayed on the top of this dashboard. The foundation element is displayed on the bottom and the remaining five elements are displayed in the middle in sequential order. As in the action-based reviews, each of the elemental bar charts includes a trending arrow. Resembling a hamburger, this dashboard looks like the notional one in Figure 3.

### The Balanced Scorecard's Future

The balanced scorecard based upon SCM has developed into an integral part of CAAA's strategic and operational plans used by its leaders to make important organizational decisions throughout the month. It also provides a range of performance metrics that CAAA leaders use in making informed decisions involving supply chain design changes. Any organization, including service-oriented government agencies, can benefit by using a balanced scorecard of key performance metrics with industrial benchmarks in assessing organizational progress and identifying weaker links throughout its supply chains. &

The authors can be contacted at [casandra.e.oneall@navy.mil](mailto:casandra.e.oneall@navy.mil) and [scott.s.haraburda.civ@mail.mil](mailto:scott.s.haraburda.civ@mail.mil).

Figure 3. Supply Chain Dashboard (With Trends)

