How does SCOR measure up?
A user’s perspective on SCOR metrics

by Peter Bolstorff

“To keep on schedule,” I told a design team at the kickoff of a SCOR project, “we’ve got four weeks to identify and define the number of SCORcards and appropriate supply chain metrics, collect data, identify sources and collect appropriate benchmark data, define competitive requirements for performance, calculate performance gaps, and determine financial opportunity.” For those of you who have not been down the project roadmap, this hit-the-ground-running work effort represents the key tasks to produce a SCORcard gap analysis in four weeks.

As anxiety set in, the team members turned to the SCOR model documentation, which contains more than 200 alphabetically arranged definitions in the v. 5.0 metrics glossary. “Which ones do we use?” one team member asked. They remembered from previous education that SCOR suggests 13 metrics to represent Level 1 supply chain performance. A more serious question came from the company’s controller, who asked, “What do we do with the rest?”

The SCOR model does a good job defining Level 1 metrics — and there are good, easy access benchmark sources for most of these — but the model does not address many shareholder metrics, and the breakdown of Level 1 metrics to their Level 2 and 3 components is not standardized. So my objective in this article is to discuss a more comprehensive SCORcard template based on my experiences working with many project teams.

The SCORcard template
The SCORcard template (see table, opposite page) summarizes the important dimensions of the supply chain performance metrics needed to build a SCORcard. The Level 1 metrics are organized by three broad categories and seven performance attributes:

Customer-facing metrics measure supply chain delivery reliability, responsiveness and flexibility with respect to customers and suppliers.

Internal-facing metrics measure supply chain cost and asset management efficiency.

Shareholder-facing metrics measure profitability, effectiveness of return and share performance.

For each Level 1 performance metric, the template includes a working definition, benchmark sources, main Level 2 components, main Level 3 components, and a simple data query used to calculate the actual performance.
” Not Hardwired Yet “ indicates that in over 30 projects, no standard consistent metric has surfaced to support multiple companies and industries. It does not mean that there aren’t useful Level 3 metrics; I’ve tried to point to good sources of potential Level 3 metrics.

It is important to note that while the SCORcard gap analysis only focuses on the Level 1 metrics results, Level 2 metrics are required for many of the calculations. The remaining sections will provide lessons learned on the decomposition logic for Level 2 (material flow) and Level 3 (work and information flow).

Customer-facing metrics
Delivery performance is an example of a Level 1 metric that does not decompose to Level 2 by simple calculation. Rather it decomposes to the relative “on time and complete delivery” measures for suppliers, factories, warehouses and transportation providers. Level 3 decomposition is varied by the locations of Level 2 roles and the service goals of the departments in the location. Fill rate is another customer facing metric with a relative Level 2 decomposition; forecast accuracy is defined as the fill rate cascade.

The logic for many design teams is that for a stock item to be on the shelf at the time of order receipt, good planning needs to have taken place. Good planning is measured by forecast accuracy attained through a solid sales and operations planning process and/or leading practices like collaborative planning, forecasting and replenishment (CPFR).

In some projects, steering teams have elevated forecast accuracy to Level 1 status. In other projects, the design team defined it as a Level 2 decomposition subordinate to inventory days of supply. Level 3 decomposition is varied by the department’s role in the forecast process and the goals for improvement.

Perfect order decomposes to Level 2 identical to delivery performance with the added component of payable match. From the customer’s perspective, a perfect order is delivered on time and complete with a perfect item number, quantity and price match of their receipt and purchase order with your invoice. This works in a similar manner when grading suppliers on their ability to fulfill perfect orders.

Level 3 decomposition is varied by the department’s role in the match process and the...
Performance Attribute or Category | Performance Metric | Working Definition | Benchmark Sources | Supplier to Customer Level 2 Components | Main Level 2 Components | Main Level 3 Components | Typical Query Customer
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Supply Chain Delivery Reliability | Delivery Performance Measurement (see ISM/Loyalty for definitions of all metrics) | Delivery Performance measure the percentage of on-time deliveries to customer request date and/or to time windows. | PMG, seen www.marketguide.com | Supplier on time and in full | Not Hardwired Yet. These are departmental and/or diagnostic measures supporting delivery performance goals. | Customer Orders Delivered On Time and In Full (Total Number of Customer Orders), the PMG survey as a guide.

RF Ratio | RF Ratio measures the percentage of ship from stock orders shipped within 24 hours of order receipt. | Many companies use/line item. RF ratio as an alternative metric measured by the percentage of lines within filled “promised” 24 hours of order receipt. | No Source identified. Most companies have their own internal gauge as to their competitive ratio for line item RF ratio. | Forecast Accuracy has been assigned level 2 requirements to be a ratio of 72% or 72% of Days Supply. | Not Hardwired Yet. These are departmental and/or diagnostic measures supporting forecast process performance goals. | Customer Lines Delivered On Time and In Full Quantities.

Perfect Order Fulfillment | Perfect Order Fulfillment measures the number of orders delivered on time in full to customers request date and hardly waste of machine of purchase, order, invoice, and receipt. | No Source identified. This is a very important but difficult to get good statistical benchmark comparisons. | In addition to Delivery Performance components, Supplier Match % and Customer Match %. | Not Hardwired Yet. These are departmental and/or diagnostic measures supporting perfect order fulfillment performance goals. | Customer Orders Delivered On Time and In Full with 100% match of price, item, and quantity on the invoice, packing slip, and customer PO/Item with the PMG survey as a guide.

Supply Chain Responsiveness | The velocity at which a supply chain provides products to the customer. | | | | | |

Order Fulfillment Lead Time | Order Fulfillment Lead Time measures the number of days from order receipt to the customer service department to the delivery of receipt at each of the customer's stock. | PMG | For stock items Order Receipt to Order Entry, Order Entry to Shipment, Shipment to Order Receipt, and overall Order Fulfillment Lead Time. | Not Hardwired Yet. These are departmental and/or diagnostic measures supporting lead time within the order fulfillment process. | Customer Delivered On Time and In Full (Total Number of Customer Orders), the PMG survey as a guide.

Supply Chain Responsiveness | The agility of a supply chain in responding to marketable changes in price or market conditions advantage. | | | | | |

Production Reliability | Reliability indicators: the number of days to achieve an unprofitable 25% decrease in demand without cost penalty. | PMG | Upside Production Reliability. | | | |

Cost of Goods | Cost of Goods measures the cost of direct material and labor to produce a product or service. | PMG | & www.marketguide.com | Material Cost, Direct Cost of Production, and Indirect Cost of Production. | Not Hardwired Yet. These are departmental and/or diagnostic measures supporting unit cost goals. | Cost Centers for Material - Cost Centers for Direct Manufacturing Labor - Cost Centers for Indirect Manufacturing Labor.

Total Supply Chain Management Cost | Total Supply Chain Management cost measures the direct and indirect costs to plan, source, and deliver products and services. | PMG | Operating Cost Management, Material Acquisition Cost, Material Handling Cost, Financial and Planning Related Costs, Mfg Cost, and Inventory Carrying Costs. | Customer Service Cost, Outbound Transportation Cost, V高潮Warehouse Cost, Purchasing Cost, Inbound Warehouse Cost, Deadline Planning, and Supply Planning. Transactional Productivity is an international level (average of division/total Material Acquisition Costs (production, hours) divided by Purchase Orders. | Map the cost centers that support supply chain activities rated at Level 3; then add them up, use the PMG survey as a guide.

Value Added Productivity | Value Added Productivity is calculated by subtracting direct material cost from the revenue and dividing the result by the number of employees. This is similar to take per employee. | | | | | |

Inventory/Returns Processing Cost | Warranty/Returns Processing Cost measures the direct and indirect costs associated with returns including defective, planned maintenance, and excess inventory. This is calculated in Warranty/Returns Processing Costs. | No Source identified. This metric is important but difficult to get good statistical benchmark comparisons. | Source Leadtime (Portfolio: Order Delivery Time in # of Order items. | Not Hardwired Yet. These are departmental and/or diagnostic measures supporting return cost goals. | Source Leadtime for Consistent item & Manufacturing Cost for Material & Order, Order for Equipment & Stock Items.

Cash-to-Cash Cycle Time | Cash-to-Cash Cycle Time measures the number of days that cash is tied up as inventory. | PMG | www.marketguide.com | Days Payable Outstanding, Days of Inventory, and Days Sales (Receivables: Outstanding). | Days Payable Outstanding, Days of Inventory, and Days Sales (Receivables: Outstanding). | Net Operating Income, Total Revenue.

Inventory Days of Sale | Inventory Days of Sale measures the number of days that a day is tied up as inventory. | PMG | & www.marketguide.com | Days Payable Outstanding, Days of Inventory, and Days Sales (Receivables: Outstanding). | Days Payable Outstanding, Days of Inventory, and Days Sales (Receivables: Outstanding). | Net Operating Income, Total Revenue.

Asset Turn | Asset Turn is calculated by dividing revenue by total assets including both working capital and fixed assets. | PMG | www.marketguide.com | Revenue, Total Net Assets, for marketing, calculating, median (middle), superior (average of top 20%), and advantage (mean of median and superior) based on the industry or other designated competitors. | | | |

Profitable Income after cost. | Gross Margin | Gross Margin is calculated by subtracting Cost of Goods from Revenue and is most often expressed as a percentage of the remaining dollars to sales. | PMG | & www.marketguide.com | Revenue, Cost of Goods, for marketing, calculating, median (middle), superior (average of top 20%), and advantage (mean of median and superior) based on the industry or other designated competitors. | | | 

Operating Income | Operating Income (or Margin) is calculated by subtracting Cost of Goods and Sales, General and Administrative (SG&A) from Revenue and is most often expressed as a percentage of the remaining dollars to sales. | PMG | & www.marketguide.com | Revenue, Cost of Goods, for marketing, calculating, median (middle), superior (average of top 20%), and advantage (mean of median and superior) based on the industry or other designated competitors. | | | 

Net Operating Income | Net Operating Income (or Margin) is calculated by subtracting Cost of Goods and Sales, General and Administrative (SG&A) and Taxes from Revenue and is most often expressed as a percentage of the remaining dollars to sales. | PMG | & www.marketguide.com | Revenue, Cost of Goods, SG&A, Taxes, and Corporate Taxes. | | | 

Economic Profit | Economic Profit (or Margin) is calculated by subtracting Cost of Goods, Sales, Direct Material Cost of Capital from Revenue and is most often expressed as a percentage of the remaining dollars to sales. | PMG | & www.marketguide.com | Revenue, Cost of Goods, SG&A, Taxes, and Corporate Income. | | | 


Return on Investment | Return on Investment (or Return) is calculated by dividing Net Operating Income by Total Invested Capital. | PMG | & www.marketguide.com | Revenue, Cost of Goods, Corporate Taxes, and Corporate Income. | | | 

Share | Earnings Per Share | Earnings Per Share is the adjusted income available to common stockholders divided by the diluted weighted average shares outstanding. | PMG | & www.marketguide.com | Adjusted Income, Diluted weighted average shares outstanding. | | | 

EPS Percent Change | EPS Percent Change is the percent change in the trailing twelve months (TTM) EPS as compared to the same TTM period one year ago. | PMG | & www.marketguide.com | | | | 

Stock Price Percent Change | Stock Price Percent Change is the percent change in the trailing twelve months (TTM) price (Book Price) as compared to the same TTM period one year ago. | PMG | www.marketguide.com | | | |
goals for improvement. **Order fulfillment lead time** decomposes to Level 2 by calculation. It calculates for each order, the number of days to deliver on time and complete. *Performance Measurement Group* (PMG) ([www.pmgbenchmarking.com](http://www.pmgbenchmarking.com)) breaks it into three basic process steps and by item type (e.g. stock versus to-order).

Another frequently used Level 2 decomposition is **back order duration**. A subset of all orders, it calculates the number of days it takes missed or partially delivered orders to deliver complete. Level 3 decomposition is varied by the department’s role in the order fulfillment process and the goals for improvement.

**Supply chain response time** decomposes to Level 2 by calculation. It calculates the number of days by adding plan (or re-plan) days to contracted source lead time, manufacturing cycle time and **order fulfillment lead time of stocked items**. Level 3 decomposition is varied by the department’s role in the managing lead time or cycle time processes and the goals for improvement.

**Production flexibility** decomposes to Level 2 by a mix of estimation and calculation. For material, labor and capacity, determine the number of days it would take to sustain unplanned requirements of plus/minus 20%. Estimate the principal constraint. No Level 3 metrics are identified.

**Internal-facing metrics**

Internal measures are more deliberate in the decomposition because as they involve **costs and inventory numbers**, they have to add up.

**Cost of goods sold** decomposes to material cost, direct cost of production, and indirect cost of production at Level 2. Level 3 is **Not Hardwired Yet** as these are departmental and/or diagnostic measures supporting unit cost goals.

**Supply chain management cost** decomposes to order management cost, material acquisition cost, finance and planning related, supply chain related management information system (MIS) cost, and **inventory carrying cost**. Level 2 metrics decompose to Level 3 measures for customer service cost, outbound transportation cost, finished goods (FG) warehouse cost, purchasing cost, inbound transportation cost, raw material (RM) warehouse cost, demand planning, and supply planning cost, MIS fixed assets, and MIS operational costs.

**Inventory carrying cost** is the only hitch. This is not a pure operational cost; it combines costs for taxes, insurance and write-offs for non-working inventory. It then borrows from other metrics like cost of capital for inventory and space costs from **order management**.

**Transactional productivity** is an alternative Level 3 way to measure some aspects of supply chain cost. **Purchase order productivity** divides material acquisition cost (or people hours) by the number of **purchase orders**; **sales order productivity** divides order management cost (people hours) by the number of **sales orders**. Work orders, return authorizations and planning events are other transactions that can be calculated in a similar manner.

**Value-added productivity** decomposes at Level 2 to revenue, direct material cost, number of employees in full-time equivalent (FTE) jobs. Level 3 is **Not Hardwired Yet**.
Yet; many design teams use the calculations for Level 2 metrics as the source for Level 3 components.

Warranty/returns processing cost decomposes to returns warehouse cost, returns authorization processing cost, returns maintenance cost, returns transportation cost (inbound from customer, intercompany, and outbound to supplier). Level 3 is Not Hardwired Yet.

Cash-to-cash decomposes to Level 2 components of days payables outstanding, days of inventory and days sales (receivables) outstanding. Level 3 elements include the data elements of $ payables, cost of materials, accounts receivables, $ receivables, revenue, and accounts receivables terms. Inventory days of supply decomposes to Level 2 metrics of days RM inventory, days of work-in-process (WIP) inventory, and days of FG inventory. Level 3 inventory classifications differ by organization but often are based on volume and/or turns; classification language often is noted by A items, B items, C items and D items as well as non-working inventory.

Asset turns decomposes to Level 2 elements of revenue, working capital and fixed assets. The Level 3 components for working capital follow the same decomposition path as cash-to-cash.

Shareholder-facing metrics

Gross margin decomposes to Level 2 components of revenue and cost of goods. Use cost of goods as the source for Level 3 components.

Operating income or margin decomposes to revenue, cost of goods, sales, general & administrative (SG&A) expense. Use cost of goods and SG&A expense categories as metrics for Level 3 components.

Net operating income or margin decomposes to revenue, cost of goods, SG&A and corporate taxes. Use cost of goods, SG&A and corporate tax rate expense categories as a metrics for Level 3 components.

Economic profit decomposes to revenue, cost of goods, SG&A, corporate taxes and interest expense. In addition to the expense categories in net operating income, Level 3 decomposition also includes interest expense calculated, in part, by cost of money and working capital.

Return on assets decomposes to net operating income and total net assets; in some cases companies prefer to use operating income instead. Level 3 decomposition is based on the net operating income and total net assets decompositions discussed previously.

Return on sales decomposes to revenue and net operating income. Level 3 decomposition is based on the net operating income decompositions discussed previously.

Return on investment decomposes to net operating income and total invested capital. Level 3 decomposition is based on the net operating income decompositions discussed previously. Share data is calculated and defined at Level 1; there has been no need to decompose any further in a SCOR project.

How many SCORcards?

A critical task of the business is to determine how many SCORcards need to be assembled. Ideally, there is a SCORcard for each supply chain identified in the project scope and an enterprise consolidated SCORcard (see “Scale the Heights” in the Dec. 2001 SCTN for supply chain definition techniques).

The level of difficulty of completing this task is mostly dependent on accounting practices for the internal-facing and shareholder-facing metrics. The most complicated case occurs in companies that define supply chains by customer channel yet consolidate financial reporting by product group or location.

In this case, the design team might decide to combine onto one SCORcard the customer-facing data for each supply chain and with the consolidated internal-facing and shareholder-facing data; it is wise to match the costs with the revenue and inventory. Almost always, companies change their reporting capability to be able to SCORcard each supply chain independently.

This template is not perfect. It is not intended to become a standard; rather, it is intended to share lessons learned since it has been used.

The more user discussions we initiate on the trials and tribulations of using the SCOR metrics, the closer we will get to establishing standard ways of measuring performance. In addition, the more benchmark sources we can establish at Level 1 and Level 2, the more effectively we can compare and contrast companies and industries.

By the way, the design team mentioned earlier completed its gap analysis on time and on budget. It provided the basic framework for supply chain key performance indicators (KPIs) and cascading organizational performance goals.