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Framework for Supply Chain Performance Evaluation - SCOR

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Abstract —

The process of choosing appropriate supply chain performance measures is difficult due to the complexity of these systems. The paper presents an overview and evaluation of the performance measures used in supply chain models and also presents a framework (SCOR) for the selection of performance measurement systems for manufacturing supply chains. Supply chain management (SCM) has been a major component of competitive strategy to enhance organizational productivity and profitability. The literature on SCM that deals with strategies and technologies for effectively managing a supply chain is quite vast. In recent years, organizational performance measurement and metrics have received much attention from researchers and practitioners. The role of these measures and metrics in the success of an organization cannot be overstated because they affect strategic, tactical and operational planning and control. Performance measurement and metrics have an important role to play in setting objectives, evaluating performance, and determining future courses of actions. The paper discusses an approach towards supply chain performance measurement.

Keywords — SCOR, Supply Chain, Performance & Evaluation.

I. INTRODUCTION

By the late 1980s, outsourcing in US industries contributed to nearly 60% of the total product cost, increasing to 90% by 2010. This implies significant visible impact of distribution, purchasing, and supply management on company assets. Managers in many industries, especially those in manufacturing, are trying to better manage supply chains. Important techniques/methodologies like just-in-time (JIT), total quality management, lean production, computer generated enterprise resource planning schedule (ERP) and Kaizen have been embraced. The concept of supply chain management (SCM) represents the most advanced state in the evolutionary development of purchasing, procurement and other supply chain activities. At the operational level, this brings together functions that are as old as commerce itself—seeking goods, buying them, storing them and distributing them. At the strategic level, SCM is a relatively new and rapidly expanding discipline that is transforming the way that manufacturing and non-manufacturing operations meet the needs of their customers. Development of cross-functional teams aligns organizations with process oriented structure, which is much needed to realize a smooth flow of resources in a supply chain. Such teams promote improved supply chain effectiveness. They minimize or eliminate functional and departmental boundaries and overcome the drawbacks of specialization, which can distribute the knowledge of all value adding activities such that no one, including upper level managers, has complete control over the process. Such teams helped in the formation of modern supply chains by promoting greater integration of organizations with their suppliers and customers. Supplier partnerships and strategic alliances refer to the co-operative and more exclusive relationships between organizations and their upstream suppliers and downstream customers.

The growth and development of SCM is not driven only by internal motives, but by a number of external factors such as increasing globalization, reduced barriers to international trade, improvements in information availability, and environmental concerns. Furthermore, computer generated production schedules, increasing importance of controlling inventory, government regulations and actions such as the creation of a single market have provided the stimulus for development of existing trends in SCM. Supply chain integration is needed to manage and control the flow in operating systems. Such flow control is associated with inventory control and activity system scheduling across the whole range of resource and time constraints. Supplementing this flow control, an operating system must try to meet the broad competitive and strategic objectives of quality, speed, dependability, flexibility and cost.

To meet objectives, the output of the processes enabled by the supply chain must be measured and compared with a set of standards. In order to be controlled, the process parameter values need to be kept within a set limit and remain relatively constant. This will allow comparison of planned and actual parameter values, and once done, the parameter values can be influenced through certain reactive measures in order to improve the performance or re-align the monitored value to the defined value.

II. IMPORTANCE – PERFORMANCE MEASUREMENT

The strategic, operational and tactical levels are the hierarchies in function, wherein policies and trade-offs can be distinguished and suitable control exerted. Such a hierarchy is based on the time horizon for activities and the pertinence of decisions to and influence of different levels of management. The strategic level measures influence the top level management decisions, very often reflecting investigation of broad based policies, corporate financial plans, competitiveness and level of adherence to organizational goals. The tactical level deals with resource allocation and

measuring performance against targets to be met in order to achieve results specified at the strategic level. Measurement of performance at this level provides valuable feedback on mid-level management decisions. Operational level measurements and metrics require accurate data and assess the results of decisions of low level managers. Supervisors and workers are to set operational objectives that, if met, will lead to the achievement of tactical objectives. Many firms look to continuous improvement as a tool to enhance their core competitiveness using SCM. Many companies have not succeeded in maximizing their supply chain's potential because they have often failed to develop the performance measures and metrics needed to fully integrate their supply chain to maximize effectiveness and efficiency. The discrete sites in a supply chain do not maximize efficiency if each element in the chain pursues goals independently. Measurements should be understandable by all supply chain members and should offer minimum opportunity for manipulation. Performance studies and models should be created so that organizational goals and achievement of those goals can be measured, thus allowing the effectiveness of the strategy or techniques employed to be accessed. Most companies realize the importance of financial and non-financial performance measures; however they have failed to represent them in a balanced framework. While some companies and researchers have concentrated on financial performance measures, others have concentrated on operational measures. Such an inequality does not lead to metrics that can present a clear picture of organizational performance. For a balanced approach, companies should understand that, while financial performance measurements are important for strategic decisions and external reporting, day to day control of manufacturing and distribution operations is often handled better with non-financial measures. Another area where inequality persists is deciding upon the number of metrics to be used. Quite often companies have a large number of performance measures to which they continue to add based on suggestions from employees and consultants. They fail to realize that performance assessment can be better addressed using a trivial few—they are not really trivial, but instead are those few areas most critical to success. The metrics that are used in performance measurement and improvement should be those that truly capture the essence of organizational performance. A measurement system should facilitate the assignment of metrics to where they would be most appropriate. For effective performance measurement and improvement, measurement goals must represent organizational goals and metrics selected should reflect a balance between financial and non-financial measures that can be related to strategic, tactical and operational levels of decision making and control.

III. KEY PERFORMANCE INDICATORS

It is crucial that the measurement of Supply Chain performance indicators are synchronized with the overall supply chain strategy. Often the measurement of performance indictors begins at a functional level and with the formation of supply chain these do not change much. **S**upply chain performance indicators are classified in two clearly defined but closely interrelated categories - functional indicators and end-to-end supply chain indicators. One measures the effectiveness of the function and second measures how well these functions are coordinated. While they are measured separately, they must not be considered in isolation. The choice of functional indicators depends upon industry vertical. Traditionally organizations measure functional indicators and hence have a good understanding of them. With the advent of supply chain and focus on overall coordination and effectiveness, some of the functional indicators come out to be conflicting and counter-productive. **T**he end-to-end measures are more generic in nature and can be classified in 3 sub-categories:

A. ASSETS RELATED

1) CASH TO CASH CYCLE TIME: Inventory days of Supply + Days of Sales outstanding - average payment period for materials (time it takes for a dollar to flow back into a company after it has been spent for raw materials)
2) INVENTORY DAYS OF SUPPLY: Total gross value of inventory at standard cost before reserves for excess and obsolescence divided by COGS and multiplied by 365 days
3) ASSET TURNS: Total Net product revenue divided by Total net assets

B. COSTS RELATED

1) COST OF GOODS SOLD: The cost related with buying raw materials and producing finished goods. This cost includes direct costs (labor, materials) and indirect costs (overhead)
2) SUPPLY CHAIN MANAGEMENT COST: The costs associated with the supply chain including execution, administration and planning
3) VALUE ADDED PRODUCTIVITY: Total product revenue less material purchases divided by total employment in full time equivalents
4) WARRANTY COST: Warranty costs include materials, labor and problem diagnosis for product defect

C. CUSTOMER SERVICE RELATED

1) FILL RATES: The percentage of ship from dock orders shipped within 24 hours of order receipt. For services, this metric is the proportion for services that are filled so that the service is completed within 24 hours
2) PERFECT ORDER FULFILLMENT: The percentage of orders that are delivered complete, on time, with complete documentation and in perfect condition
3) DELIVERY PERFORMANCE TO CUSTOMER COMMIT DATE: The percentage of orders that are fulfilled on or before the original scheduled or committed date

4) RESPONSIVENESS LEAD-TIME: The average elapsed time, including all delays, to receive a customer order and transform resources into goods and services, through to the point of customer receipt. (assuming zero inventories in the system)
5) PRODUCTION FLEXIBILITY: Number of days required to achieve an unplanned sustainable 20% increase in deliveries

IV. SUPPLY CHAIN PERFORMANCE MEASUREMENT: CURRENT STATE

For organizations to work closely with strategic component suppliers, contract manufacturers, logistics providers and distributors, their supply chains must be streamlined and technology-enabled. However, organizations that want to streamline their supply chains must first understand what is working well, what is not and where the opportunities for improvement are. These companies need to have a way to measure the performance of their supply chain on an ongoing basis. Traditional approaches of measuring supply chain performance -- scorecards, dashboards and reports showing supply chain metrics -- suffer from three shortcomings:

A. THEY ARE NOT LINKED TO STRATEGY

It can be difficult to see how a supply chain metric affects the firm's overall objectives. If the metric is trending in the wrong direction, which aspect of supply chain strategy will be affected? Without a framework that links each metric to a certain element of strategy, the context behind a metric can get lost. When such context is missing, it becomes a challenge for organizations (large OEM's in particular) to get everyone to see the common vision. Next-generation Supply Chain Performance Management (SCPM) systems will need to be able to show the link between any metric and the element of strategy it impacts.

B. THEY HAVE A SILO APPROACH

Current supply chain analytics solutions do a good job of showing the performance of metrics for individual departments, such as cost per unit manufactured or process yield information from contract manufacturer for the operations team, or percentage of on-time delivery against committed date or fill rate for the customer delivery organization. However, this type of a silo approach sacrifices the overall process and end goals in the interest of improving the performance of an individual department. As a result, functional silos are reinforced within the organization. The key is to measure the performance of overall business process in such a way that poor performance of a departmental metric could be overlooked in the interest of increasing the overall business process performance - for example trade-offs between manufactured cost and customer responsiveness metric to improve customer loyalty. To achieve this, next-generation Supply Chain Performance Management systems will need to do more than show departmental metrics - they need to have a process orientation.

C. THEY HAVE A FLAT HIERARCHY.

The metrics that help measure the overall performance of supply chain are not standalone -- they are related to each other, sometimes in a hierarchical fashion. Such relationships help drill down and better understand root cause more effectively. For example, if a hierarchical relationship were developed between % on-time delivery against committed date and those metrics that affect it, the system will tell that on-time delivery against committed date is trending down despite contract manufacturers on time shipment metrics holding, because demand forecast accuracy is down. However, most current supply chain analytics have no way to define such relationships.

V. HIERARCHY OF SUPPLY CHAIN METRICS

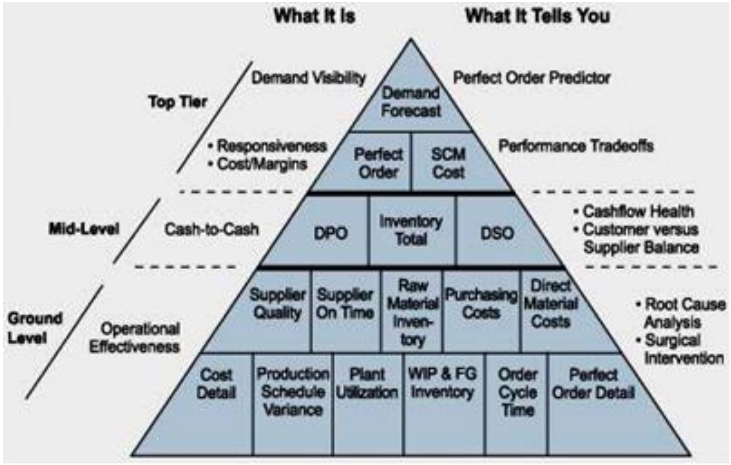

Figure 1: Hierarchy of Supply Chain Metrics

While demand forecast, costs, and order quality are clearly important indicators of overall performance, additional metrics are required to take effective action. However, simply indiscriminately adding metrics into the pot is not the answer. A multilevel approach that allows increasing granularity of focus is needed. The **Hierarchy of Supply**

Chain Metrics is defined as: A tiered system of metrics to improve supply chain effectiveness—the top tier assesses a company's supply chain health, while the two successive tiers diagnose the root cause of performance gaps and provide insight for corrective action.

The hierarchy has three levels, each serving a different purpose and aimed at a different goal

A. TOP TIER: SUPPLY CHAIN HEALTH ASSESSMENT:

This is the 50,000-foot level, at which an executive can assess, with just three metrics, the overall health of the supply chain and the high-level tradeoffs a company might be making. At the highest level of the hierarchy are three key metrics: DFA, Perfect Order Fulfillment, and Supply Chain Management (SCM) total cost. The extent of a company's demand visibility can predict the responsiveness of its supply chain, as evidenced by its Perfect Order rating. It is essential to look at the balance between Perfect Order fulfillment and SCM cost. A tradeoff between two performance areas: customer responsiveness, as captured in their Perfect Order fulfillment rating, and costs is achieved.

B. MID-LEVEL: SUPPLY CHAIN DIAGNOSTIC:

The next level of detail is the 25,000-foot view. This level uses a composite cash flow metric to provide an initial diagnostic tool. It looks beyond overall customer responsiveness and cost to the cash-to-cash metric—how well is the company managing its cash flow? Are there immediate opportunities to take some cash off the table? The cash-to-cash metric is a composite that includes customer and supplier payment times and total inventories. It allows a company to see whether the time it takes to pay its suppliers and the time it takes a company's customers to pay are in balance. This metric determines whether the inventory metric, which can contribute to high cost and/or a low Perfect Order, deserves further analysis. High inventories might be a result of excess in any of the components of raw materials, work in process, or finished goods, and each is a symptom of a different underlying problem.

C. GROUND LEVEL: SUPPLY CHAIN EFFECTIVENESS:

The bottom level uses a variety of metrics that support effective root cause analysis and allow surgical, highly efficient corrective action. Analysis of the detailed metrics on the ground level of the hierarchy allows a company to identify and implement the specific interventions that address the root cause of issues identified at the first two levels with the most efficient and targeted use of resources. Metrics at the ground level include supplier effectiveness indicators such as the percentage of supplier receipts that passed quality and on-time standards and the raw material inventories, purchasing operating costs, and direct material costs that are often affected by and interact with supplier performance. Also included here are metrics that indicate a company's level of operational effectiveness, including further SCM cost details, production schedule variance, plant utilization, work in process and finished goods inventories, order cycle time, and details about the Perfect Order fulfillment total.

VI. SUPPLY-CHAIN OPERATIONS REFERENCE-MODEL (SCOR)

Supply-Chain Operations Reference-model (SCOR) is a process reference model developed by the management consulting firm PRTM and endorsed by the Supply-Chain Council (SCC) as the cross-industry de facto standard diagnostic tool for supply chain management. SCOR enables users to address, improve, and communicate supply chain management practices within and between all interested parties in the Extended Enterprise. SCOR is a management tool, spanning from the supplier's supplier to the customer's customer. The model has been developed by the members of the Council on a volunteer basis to describe the business activities associated with all phases of satisfying a customer's demand. With all reference models, there is a specific scope that the model addresses. SCOR is no different and the model focuses on the following:

1) All customer interactions, from order entry through paid invoice.
2) All product (physical material and service) transactions, from firm's supplier's supplier to firm's customer's customer, including equipment, supplies, spare parts, bulk product, software, etc.
3) All market interactions, from the understanding of aggregate demand to the fulfillment of each order.

SCOR is a process reference model designed for effective communication among supply chain partners. As an industry standard it also facilitates inter and intra supply chain collaboration, horizontal process integration, by explaining the relationships between processes (i.e., Plan-Source, Plan-Make, etc.). It also can be used as a data input to completing an analysis of configuration alternatives (e.g., Level 2) such as: Make-to-Stock or Make-To-Order. SCOR is used to describe, measure, and evaluate supply chains in support of strategic planning and continuous improvement. The model is based on 3 major "pillars":

A. THE PROCESS MODELING PILLAR

By describing supply chains using process modeling 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 virtually any supply chain.

SCOR is based on five distinct management processes: Plan, Source, Make, Deliver, and Return.

1) Plan - Processes that balance aggregate demand and supply to develop a course of action which best meets sourcing, production, and delivery requirements.
2) Source - Processes that procure goods and services to meet planned or actual demand.

3) Make - Processes that transform product to a finished state to meet planned or actual demand.
4) Deliver - Processes that provide finished goods and services to meet planned or actual demand, typically including order management, transportation management, and distribution management.
5) Return - Processes associated with returning or receiving returned products for any reason. These processes extend into post-delivery customer support.

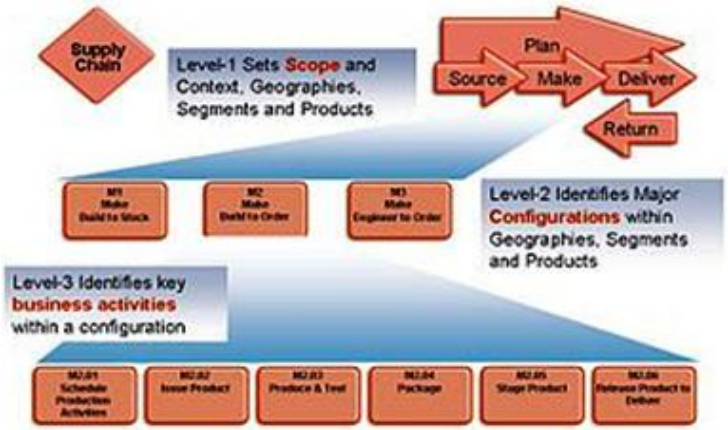

Figure 2: SCOR Process Framework

The Level 1 relates to the Make process. This means that the focus of the analysis will be concentrated on those processes that relate to the added-value activities that the model categorizes as Make processes. Level 2 includes 3 sub-processes that are "children" of the Make "parent". These children have a special tag - a letter (M) and a number (1, 2, or 3). This is the syntax of the SCOR model. The letter represents the initial of the process. The numbers identify the "scenario", or "configuration". M1 equals a "Make build to stock" scenario. Products or services are produced against a forecast. M2 equals a "Make build to order" configuration. Products or services are produced against a real customer order in a just-in-time fashion. M3 stands for "Make engineer to order" configuration. In this case a blueprint of the final product is needed before any make activity can be performed. Level 3 processes, also referred to as the business activities within a configuration; represent the best practice detailed processes that belong to each of the Level 2 "parents". The Level 2 process, "Make build to order", is broken into its Level 3 components identified from M2.01 to M2. Once again this is the SCOR syntax: letter-number-dot-serial number. The model suggests that to perform a "Make build to order" process, there are 6 more detailed tasks that are usually performed. The Level 3 processes reach a level of detail that cannot exceed the boundaries determined by the industry- agnostic and industry-standard nature of the SCOR model. Therefore all the set of activities and processes that build - for instance - the M2.03 "Produce & test" process will be company-specific, and therefore fall outside the model's scope.

B. THE PERFORMANCE MEASUREMENTS PILLAR

As with the process modeling system, SCOR metrics are organized in a hierarchical structure. Level 1 metrics are at the most aggregated level, and are typically used by top decision makers to measure the performance of the company's overall supply chain. Level 1 Metrics are primary, high level measures that may cross multiple SCOR processes. Level 1 Metrics do not necessarily relate to a SCOR Level 1 process (PLAN, SOURCE, MAKE, DELIVER, and RETURN). The metrics are used in conjunction with performance attributes. The Performance Attributes are characteristics of the supply chain that permit it to be analyzed and evaluated against other supply chains with competing strategies. Just as a physical object like a piece of lumber would be described using standard characteristics (e.g., height, width, depth), a supply chain requires standard characteristics to be described. Without these characteristics it is extremely difficult to compare an organization that chooses to be the low-cost provider against an organization that chooses to compete on reliability and performance. Associated with the Performance Attributes are the Level 1 Metrics. These Level 1 Metrics are the calculations by which an implementing organization can measure how successful they are in achieving their desired positioning within the competitive market space. The metrics in the Model are hierarchical, just as the process elements are hierarchical. Level 1 Metrics are created from lower level calculations. (Level 1 Metrics are primary, high level measures that may cross multiple SCOR processes. Level 1 Metrics do not necessarily relate to a SCOR Level 1 process (PLAN, SOURCE, MAKE, DELIVER, RETURN). Lower level calculations (Level 2 metrics) are generally associated with a narrower subset of processes. For example, Delivery Performance is calculated as the total number of products delivered on time and in full based on a commit date.

C. THE BEST PRACTICES PILLAR

Once the performance of the supply chain operations has been measured and performance gaps identified, it becomes important to identify what activities should be performed to close those gaps. The SCOR model defines a best practice as a current, structured, proven and repeatable method for making a positive impact on desired operational results.

1) Current - Must not be emerging (bleeding edge) and must not be antiquated
2) Structured - Has clearly stated Goal, Scope, Process, and Procedure

3) Proven - Success has been demonstrated in a working environment.
4) Repeatable - The practice has been proven in multiple environments.
5) Method- Used in a very broad sense to indicate: business process, practice, organizational strategy, enabling technology, business relationship, business model, as well as information or knowledge management.

The practice shows operational improvement related to the stated goal and could be linked to Key Metric(s). The impact should show either as gain (increase in speed, revenues, quality) or reduction (resource utilizations, costs, loss, returns, etc.). SCOR improves on this by offering a "standard" solution. The first step is to recover the Level 1 and Level 2 process descriptions. It focuses only on the central processes: Source, Make, and Deliver. This reflects the general practice of members who focus first of all on these three process scopes. Only in a second step do they apply Plan and Return to map all their supply chain processes.

VII. THE SCOR METRICS

SCOR uses five performance measures categories or "SCOR Performance Attributes." The Performance Attributes are characteristics of the supply chain that permit it to be analyzed and evaluated against other supply chains with competing strategies. Just as to describe a physical object like a piece of lumber using standard characteristics (e.g., height, width, depth), a supply chain requires standard characteristics to be described. Without these characteristics it is extremely difficult to compare an organization that chooses to be the low-cost provider against an organization that chooses to compete on reliability and performance. Performance Attributes include:

A. SUPPLY CHAIN RELIABILITY

It is the performance of the supply chain in delivering the correct product, to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation, to the correct customer.

B. SUPPLY CHAIN FLEXIBILITY

It is the agility of a supply chain in responding to marketplace changes to gain or maintain competitive advantage.

C. SUPPLY CHAIN RESPONSIVENESS

It is the velocity at which a supply chain provides products to the customer.

D. SUPPLY CHAIN COSTS

The costs associated with operating the supply chain.

E. SUPPLY CHAIN ASSET MANAGEMENT

It is the effectiveness of an organization in managing assets to support demand satisfaction. This includes the management of all assets: fixed and working capital. Related to these attributes is a set of Level 1 metrics for which SCOR provides the algorithms to calculate the numerical results as well as the impact these metrics will have on the company's balance sheet and income statement. Level 1 Metrics are primary, high level measures that may cross multiple SCOR processes.

Table 1: SCOR Performance Attributes and Level 1 Metrics

Performance Attribute	**Definition**	**Level-1 Strategic Metric**
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.	• Perfect order fulfillment (RL 1.1)
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.	• Order fulfillment cycle time (RS 1.1)
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 Flexibility and Adaptability.	• Upside supply chain flexibility (AG 1.1) • Upside supply chain adaptability (AG 1.2) • Downside supply chain adaptability (AG 1.3) • Overall value at risk (AG 1.4)
Costs	The cost of operating the supply chain processes. This includes labour costs, material costs and transportation costs. A typical	• Total cost to serve (CO 1.001)

	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.	• Cash-to-Cash cycle time (AM 1.1) • Return on supply chain fixed assets (AM 1.2) • Return on working capital (AM 1.3)

Metrics in the Model are hierarchical – just as the Process Elements themselves. Level 1 Metrics are created from lower level calculations. (Level 1 Metrics are primary, high level measures that may cross multiple SCOR processes. Level 1 Metrics do not – however – necessarily relate to a specific SCOR Level 1 process (PLAN, SOURCE, MAKE, DELIVER, and RETURN). Lower level calculations (Level 2 metrics) are generally associated with a narrower subset of processes. For example, Delivery Performance is calculated as the total number of products delivered on time and in full based on a commit date. Additionally, even lower level metrics (diagnostics) are used to diagnose variations in performance against plan. For example, an organization may wish to examine the correlation between the request date and commit date.

VIII. POTENTIAL IMPLEMENTATION PROBLEMS

While the main advantages of the proposed changes are clear, certain general problems exist, apart from the possible technological problems:

1) Loss of control: An organization does retain some control as its employee has to formally approve the order – this would not be necessary from a process viewpoint, but remains in the model in order to slightly reduce the loss of control by the organization. Although certain aspects can be legally arranged, a high level of trust between companies is a prerequisite for making the supply chain specific investments.
2) The sharing of information can namely be a problematic issue as the companies in the supply chain may not be prepared to share their production data, lead times, especially when these companies are independent of each other. Indeed, the lack of trust between business partners is one of the main hindrances to collaboration in the supply chain context.
3) Asymmetric distribution of costs and benefits occurs since substantial investments are needed from both sides, but the transporter realizes fewer benefits, while taking on new responsibilities, risks and a more strategic role in the process. Therefore, the financial compensation plan for its services also has to be changed from the previous system that was based on the number and punctuality of deliveries to a system based on the quality of services for the final customer and average inventory costs for the petrol company.
4) Different organizational cultures and leadership styles: These will have to be aligned in to suit the supply chain. Importance of changes in organizational culture has to be emphasized.
5) A new way of thinking: Since employees will have to seek solutions on the supply chain levels – global instead of local optima and learn to cooperate closer with its supplier/buyer. Changes in human behavior are usually the hardest to achieve.

IX. CONCLUSION

This paper gives a brief outline of the SCOR model and the organizational benefits which can accrue by focusing on this model. It also highlights tangible benefits of organization's supply chain in terms of the SCOR defined performance attributes. Organizations are now increasingly focusing on SCOR cards which give a holistic picture of the entire supply chain performance. Also, from my literature review, I can observe the possibility of SCOR model adaptation to different environment and context even far from SCOR model scope area. Organizations have a better alternative for their organization of local environment and operating condition than investing limited and scarce resources in efforts, which do not amount to much more than 'reinventing the wheel'. The SCOR model has emerged as a quasi-standard business reference model across a range of industries. Global manufacturing and distribution activities have demanded more integration of the supply chain in the recent years, including developing countries.

X. FUTURE SCOPE OF RESEARCH

This paper serves as a starting point towards delineating the benefits of implementation of the SCOR framework. Further research must be undertaken later to study the detailed impact of SCOR framework on level two and further levels of SCOR performance metrics. In-depth industry specific process mapping and defining industry specific operational metrics must be taken up in detail. The current analysis of strategic higher level metrics must be further extended to drill into lower level tactical and operational metrics.

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