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Giorgi Doborjginidze
Georgian Technical University, Tbilisi, Georgia

METHODS FOR SUPPLY CHAIN PERFORMANCE MEASUREMENT

The supply chain performance is one of the most important factors of company's competitiveness. As an efficient management tool, supply chain performance measurement enables companies to strategically manage and continuously control achieving objectives. In today's modern business world, it is hard to develop standardized criteria to measure performance of the supply chain processes, which enables companies to evaluate a quality of their processes and define target values for performance improvement. In this paper the methodology of Supply Chain Operations Reference Model (SCOR) has been discussed. The paper investigates SCOR framework and its effectiveness as a process measurement tool to improve supply chain efficiency. The study introduces the approach which has been used in the Georgian Supply Chain Industry Research and discusses the main results of the study.

Keywords: Performance Measurement, Supply Chain, Metrics, Supply Chain Operations Reference.

Background for research: Supply Chain Management (SCM) is an important business philosophy that has raised an interest among most active areas of research in the academic operations management community in order to support companies to improve supply chain performance and increase their competitiveness on global market.

Performance measurement is defined as the process of quantifying the efficiency and effectiveness of action. Effectiveness is the extent to which customer's requirements are met, while efficiency measures how economically a firm's resources are utilized to achieve a predetermined level of customer satisfaction. As an important management tool, performance measurement enables supply chain to strategically manage and continuously control achieving of objectives.

Various companies are approaching continuous improvement as an instrument to enhance their core competitiveness using SCM. Many companies couldn't utilize their potential 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. One of the main reasons of this failure is different approach for measurement technics and metrics. The performance measurements should be understandable by all participants in the supply chain and should offer minimum opportunity for manipulation.

Performance measurement tools and models should developed to achieve and measure organizational goals. Vast majority of companies realise the importance of financial and non-financial performance measures, however they have failed to represent them in a balanced framework. Kaplan and Norton have observed that companies and researchers have focused on financial performance measures or operational measures, which doesn't lead to metrics that can indicate whole organizational performance.

For a balanced approach it is important to take into consideration that the financial performance measurements are important for strategic decisions, while for supply chain operations like procurement, manufacturing and distribution, non-financial measurements should be used.

It is also important to define number of metrics to be used. Often companies cannot prioritize metrics and use a large number of performance measures. Therefore, the metrics which are used to measure performance should indicate organizational performance. To achieve an effective performance measurement and improvement of supply chain processes, the measurement goals should come up to organizational goals. The performance metrics should create balance between financial and non-financial measures that is related to decision making and control at strategic and operational levels.

Results: In cooperation with Georgian Logistics Association (GLA) and APICS Supply Chain Council the Department of Logistics at the Georgian Technical University has conducted the Supply Chain Industry Study to assess supply chain management practices and capabilities within and across Georgian industries. The study has been focused on supply chain practices and metrics used by global leading manufacturers and distributors, evaluating company maturity across three areas: supply chain management processes, organization, and metrics. Processes span the five Level 1 processes of the APICS Supply Chain Council Supply Chain Operations Reference (SCOR) model to enhance compatibility with international markets by introducing a globally accepted industry standard for supply chain operations: Plan, Source, Make, Deliver, and Return. The research provides quantifiable insight to enable informed decision-making at a corporate, industry, and national levels.

Provided research enabled each company participated in the study to receive an assessment of their operations as compared to their relative competitors. Industry scope for future surveys may change and adjust

according to market developments and trends. Provided benchmarking of performance metrics at local and international levels helped companies in their efforts to identify opportunities to reduce supply chain operational costs and increase service quality, gain insight into relative strengths and weaknesses compared to other companies in the same industry, and combat organizational complacency and the perception that current performance is acceptable. The benchmarking results for companies highlighted cost-saving opportunities in transportation, inventory, forecasting and planning cycles, order-to-cash, and plan-to-make operations. Provided research has catalyzed the Georgian supply chain sector to improve supply chain operations, and hence improve economic competitiveness for the country.

Approach: The Georgian Supply Chain Industry Study has been conducted based on SCOR performance measurement metrics. First version of the SCOR model was created in 1996 by the APICS Supply Chain Council (Former Supply Chain Council). The SCOR model is organized around the six primary management processes of Plan, Source, Make, Deliver, Return and Enable (shown in Figure 1). It is the only integrated cross functional framework that links performance measures, best practices and software requirements to a detailed business process model.
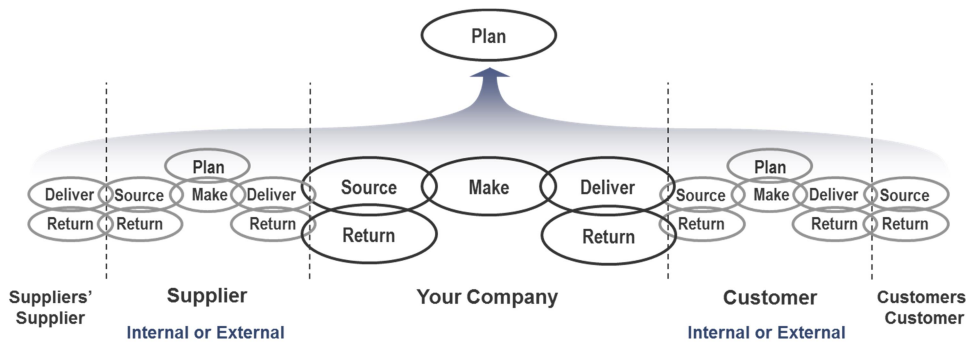

Figure 1: SCOR Reference Model *Source: SCOR 11.0*

Supply chain performance is measured from 5 perspectives: Reliability, Responsiveness, Flexibility, Cost and Asset Management. The model spans the chain from supplier's supplier to customer's customer aligned with operational strategy, material, work and information flows. SCOR is considered as an comprehensive system that requires a well-defined infrastructure, sufficient managerial resources and continuous business process re-engineering to align the business with best practices.

The following key objectives have been identified for Georgian Supply Chain Industry Study:
- Determine baseline performance for supply chain processes, skills and performance metrics;
- Establish a repeatable survey process that can be administered on an annual basis;
- Target industries that significantly contribute to economic growth;
- Develop apples-to-apples comparisons across all supply chain process areas;
- Provide relevant industry-specific peer comparisons;
- Introduce leading practices and standards employed by U.S. and EU markets to enhance the competitiveness of Georgian companies.

The study included two stages which have been focused on the analysis of the processes and skills and supply chain performance of survived companies. The following figure illustrates the approach, main objectives, completed tasks and results of the study phases.
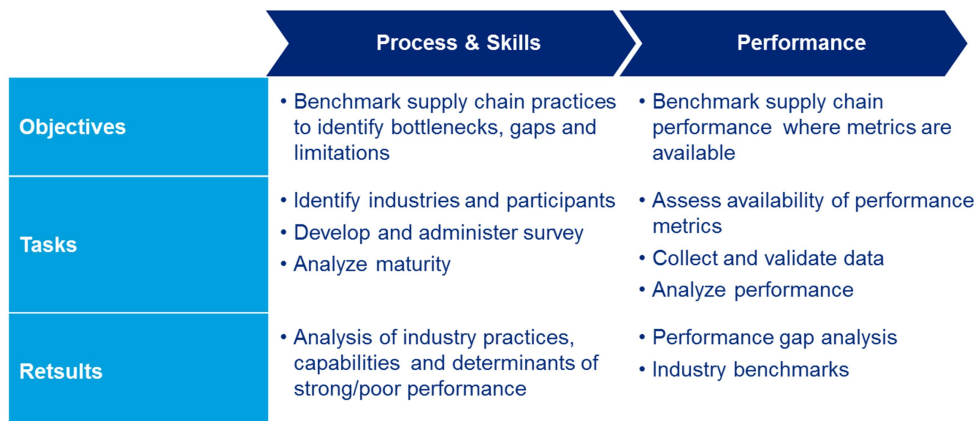

Figure 2: The stages in the Study Approach

One of the important tasks to conduct the study was to select and align the right performance metrics to SCOR processes to establish industry baselines. In total, 35 SCOR metrics have been identified as a measurement tool for supply chain performance in Georgian companies.

To enable industry-specific peer comparisons, it was important to target the industries that significantly contributes to economic growth based on gross domestic product (GDP), relevance of supply chain operations, and competitive market size. Participants included those in the food and beverage, life sciences (pharmaceutical), high technology (electronics), consumer products, and retail industries. This approach enabled each participant company to receive an assessment of their operations as compared to their relative competitors. Industry scope for future surveys may change and adjust according to market developments and trends.

Table 1 shows the main metrics that has been selected by each from five supply chain processes.

Table 1: Selected Supply Chain Performance Metrics

	Plan	Source	Make	Deliver	Return
Metrics	• Forecast accuracy as a percent of units • Active SKU count (nearest hundred) • Percent of revenue from Make to Stock products	• Sourcing Cycle Time • Contract Cycle Time • PO Cycle Time • Percentage of direct material spend with domestic suppliers • Percentage of direct material spend that is under contract • Supplier on-time direct material • Percentage of acceptable products received from suppliers • Percentage of spend allocated to top 20% of vendors	• Manufacturing capacity utilization percentage • Schedule adherence • Defects per unit	• Receive, Configure, Enter and Validate an Order Cycle Time • Pick to Ship Cycle Time • Ship Cycle Time • Percentage of transportation outsourced • Transportation cost as a percentage of revenue • Fleet Utilization • Order fill rate • Percentage of Orders Delivered in Full • Delivery Performance to Commit Date • Documentation Accuracy • Perfect Condition	• Customer returned product as a percentage of total revenue • Returns Cycle Time

The supply chain process and skills analysis as well as competition analysis of the metrics have shown the following results:

• Low level of process automation in supply chain and logistics which results in errors and inefficiency of processes.

• No consistent application of enterprise forecasting practices, which will support the companies to improve Order Fill Rate in line with international benchmarks (next figure shows that the lowest level of Fill Rate[1] in retail and distribution is 65%, while international standards are 97%-99%).

• Low level of inventory management which results in high warehousing and inventory costs and decreases cash-on-hand for investment in growth. In the local companies inventory in days amounts in average 60 days in some cases 120 days (see Figure 3, Inventory Days of Supply).

• Relatively high primary and secondary transportation costs caused by a lack of consolidation and break-bulk operations and low level of truck fleet utilization. According to the study average outbound transportation cost in the companies amount to 7-12% from the total revenue. While international standards of outbound transportation costs is from 3 to 5% as a percentage of total operating revenue.

• Only a few companies (mostly global players operating in Georgia) are able to track holistic performance metrics (KPI). There is a limited use of standardized supply chain processes undermines the consistent application of leading practices across the organizations.

The following figure illustrates the benchmark analysis of key performance metrics of surveyed companies.

[1] Fill rate is a percentage of customer or consumption orders satisfied from stock at hand. It is a measure of an inventory's ability to meet demand.

Figure 3: Benchmark of Key Performance Metrics

Conclusion: This study shows that the supply chain performance measurement is gaining importance and scope. Both academics and practitioners have been looking solutions increasingly to design and implement performance measurement systems for supply chains to manage continuous changes in their structures, nature and requirements. To improve performance of the supply chain and optimize the cost performance measurement benchmarks, improvement studies have to be done. All supply chain participants should be involved and committed to common goals, such as customer satisfaction throughout the supply chain and enhanced competitiveness. The companies should develop their performance measurement and improvement programs, which will help them to improve cross functional and intra-organizational process planning and control and more complete supply chain integration.

This paper explains methodology of one of the most successful performance measurement tool-SCOR. Finally, it explains the approach of the Georgian Supply Chain Industry Study and introduces the main results of the study.

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Гиорги Доборйгинидзе. **Методы оценки эффективности системы поставок.**

Работа системы поставок - один из наиболее важных факторов конкурентоспособности компании. Как эффективный инструмент управления, оценка эффективности системы поставок позволяет компаниям стратегически управлять и непрерывно контролировать цели достижения. В сегодняшнем современном деловом мире трудно развивать стандартизированные критерии, чтобы определить уровень процессов системы поставок, который позволяет компаниям оценить качество своих процессов и определить целевые значения для повышения производительности. В этой работе была обсуждена методология Операционной Эталонной модели Системы поставок (SCOR). Работа исследует структуру SCOR и ее эффективность как инструмент оценки процесса, чтобы повысить эффективность системы поставок. В исследовании принят подход, который использовался в грузинском промышленном исследовании системы поставок и обсуждаются основные результаты исследования.

Ключевые слова: исполнительное измерение, система поставок, метрики, операционная ссылка системы поставок.

AUTHOR:

Giorgi DOBORJGINIDZE, PhD in Engineering, Professor, Head of Department of Logistics, Georgian Technical University, e-mail: g.doborjginidze@gtu.ge

АВТОР:

Гиорги ДОБОРЙГИНИДЗЕ, доктор философии, профессор, заведующий кафедры логистики, Грузинский технический университет, e-mail: g.doborjginidze@gtu.ge