COMPARING SUPPLY CHAIN PERFORMANCE METRICS WITH ORGANIZATIONAL EXCELLENCE PERFORMANCE METRICS

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ABSTRACT

AMR Research has published a list of the Top 25 Supply Chains for the past few years. These companies and the AMR criteria provide excellent examples for exploring supply chain performance metrics. The NIST publications on the Baldrige Award winners and more recent publications on the success of Six Sigma programs are benchmark examples for organizational excellence performance metrics. Performance metrics will be discussed from the perspective of both supply chain management and organizational excellence. A comparison will be made between metrics used in connection with the two different viewpoints.

INTRODUCTION

Supply Chain management (SCM) continues to be a topic of great interest to teachers, researchers and practitioners. The supply chain is vitally important to the majority of companies today and companies are constantly looking for ways to improve their supply chain performance. University curricula include Supply Chain courses in a variety of areas including engineering programs, business programs and technology programs. With this backdrop in mind, looking at companies that are very successful with their supply chain initiatives may hold many worthwhile lessons. AMR Research has assisted us in this endeavor by publishing the Top 25 Supply Chains. This list recognizes those companies that have achieved a high level of success in their supply chain performance. AMR also provides some fundamental performance metrics and descriptions of company performance along with the Top 25 list.

Organizational Excellence enjoys a similar level of interest for the same set of constituencies. There are numerous local, state, national and international awards and recognitions that use some form of "organizational excellence" as a criterion. There are also numerous examples in the literature where companies are acknowledged as being "best in class" or "best in the world." Companies recognized in this manner again provide us with a glimpse at the metrics that are important for those businesses operating with the "excellence" mindset.

Supply Chain Management

First we discuss the fundamentals of supply chain management. Many exchanges occur in the overall process of planning, sourcing, making and delivering products, services and information. As these exchanges occur and the material moves through a series of providers and ultimately reaches consumers, the efforts of several parties need to be aligned – this is referred to as the supply chain [14].

The following definition for "supply chain management" offers further clarification:

> "Supply chain management is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders" [9].

The important fact to take away from this description is the need to coordinate across the entire network of companies in the supply chain. Superior supply chain performance cannot be achieved without superior performance along each link of the supply chain.

Supply Chain Metrics

The Top 25 evaluation by AMR Research focuses very specifically on individual firm performance as they identify the best performing supply chains. While this approach is certainly counter to the definition of supply chain management, there is a strong argument that individual firm success very much depends on successful "integration of key business processes" and successful execution of those business processes with all of the key organizations in the supply chain. We also suggest that if the featured individual firm has outstanding performance then we would expect to find partner firms from that firm's supply network who enjoy similar success.

According to AMR: "The report identifies the top 25 manufacturers and retailers that exhibit superior supply chain capabilities and performance. Supply chain leaders are able to shape demand, instantly respond to market changes, and crush their competitors. According to AMR Research benchmarking data, leaders carry 15% less inventory, are 60% faster-to-market, and complete 17% more perfect orders. These advantages separate predators from prey." As performance metrics, less inventory reduces cost for the company and the latter two metrics allow the company to exceed customer expectations and attain excellent performance in customer satisfaction. These are also basic metrics that are readily adopted by many companies seeking to monitor supply chain performance in a different manner.

The criteria for selection to the Top 25 list are as follows: "The first component of the ranking is publicly available financial data and is weighted at 60% of the total score, with return on assets and inventory turns each accounting for 25%, and trailing 12 months growth accounting for 10%. The second component of the ranking is AMR Research's opinion, which is weighted at 40% of the total score. The opinion component is based on a structured voting methodology across AMR Research's team of analysts" [1]. The companies in the Top 25 for 2004 and 2005 are listed in Table 1.

From the AMR discussion we list the following metrics:

- Return on assets (ROA)
- Inventory turns
- Trailing 12 months growth in revenue
- Time-to-market
- Days of inventory
- Perfect orders [1]

An approach with similarities but with more extensive coverage is the SCORcard metrics as advocated by Bolstorff and Rosenbaum [4]. They are strong supporters of the SCOR model for supply chain management. Examples of the metrics used in the SCORcard are as follows:

- Delivery performance
- Line-item fill rate
- Perfect order fulfillment
- Order fulfillment lead time
- Supply chain response time
- Production flexibility
- Cost of goods
- Total supply chain cost
- Sales, general, and administrative cost (SGA)
- Warranty/returns processing costs
- Cash-to-cash cycle time
- Inventory days of supply

- Asset turns
- Gross margin
- Operating income
- Net income
- Return on assets [Source: 4]

Another perspective comes from Bowersox, Closs and Cooper [5]. They divide measurement into three categories: Operational Assessment, Financial Assessment and Social Issues in Logistics Performance Measurement. Supply Chain Comprehensive Metrics are another of their categories and includes:

- Cash-to-Cash Conversion
- Inventory Days of Supply
- Dwell Time
- On-Shelf In-Stock Percent
- Supply Chain Total Cost
- Supply Chain Response Time.

Table 1. Top 25 Supply Chains from AMR

Rank	2004 Companies	2005 Companies
1	Dell	Dell
2	Nokia	Procter & Gamble
3	Procter & Gamble	IBM
4	IBM	Nokia
5	Wal-Mart Stores	Toyota Motor
6	Toyota Motor	Johnson & Johnson
7	Johnson & Johnson	Samsung Electronics
8	Johnson Controls	Wal-Mart Stores
9	Tesco	Tesco
10	PepsiCo	Johnson Controls
11	Nissan Motor	Intel
12	Woolworths	Anheuser-Busch
13	Hewlett-Packard	Woolworths
14	3M	The Home Depot
15	GlaxoSmithKline	Motorola
16	POSCO	PepsiCo
17	Coca-Cola	Best Buy
18	Best Buy	Cisco Systems
19	Intel	Texas Instruments
20	Anheuser-Busch	Lowe's
21	The Home Depot	Nike
22	Lowe's	L'Oreal
23	L'Oreal	Publix Super Markets
24	Canon	Sysco
25	Marks & Spencer	Coca-Cola

Sources: [1] & [14]

SUPPLY CHAIN EXAMPLES

Proctor & Gamble (#2 on the Top 25): Proctor & Gamble is the country's leading manufacturer of household products. It has 35 manufacturing plants, 30,000 suppliers, and 5,000 retailers. Its supply chain continues to be one of the most complex and well-managed in the world. In the past, P&G used the traditional 'push' method where their products were produced and delivered in large quantities and at times that are determined by the company, and then they are shelved at retailers for immediate sale. This became a problem due to the fact that nearly 60% of P&G's products are sold by retailers under promotion (such as buy one, get one free) [12][13].

When stock outs occurred during promotions, P&G knew they had to change. They began bringing retailers and suppliers into the demand forecasting side of the business and switched to the demand driven 'pull' method of the supply chain. P&G has also put into effect an initiative the company calls "Efficient Consumer Response II." This will help them reduce cycle time to 65 days from the original 130 days seen in the 1980's. According to Steve David, Proctor and Gamble CIO, that "currently we have 4,000 internal websites, 25,000 organizational nodes, 70,000 materials, 200,000 products, 500,000 customers, and 1 million parts…..but we still need to clean up our act" [8].

SYSCO (#24): SYSCO is an acronym for Systems and Services Company. Their initial public offering was in 1970 where sales were $115 million. In the fiscal year of 2005, sales had grown to $30.3 billion. SYSCO assists foodservice operators in providing consumers with solutions for meals consumed away from home. Today, SYSCO has sales and service relationships with approximately 390,000 customers and operates from 170 locations throughout the US and portions of Alaska, Hawaii, and Canada.

Their supply chain has become so effective because they have become a leader in reducing paper based transactions and converting them to an electronic database, which helps monitor the ordering process more efficiently and effectively. SYSCO recently partnered with EFS Network to help with this venture. This venture has allowed SYSCO to dramatically enhance their partner relationships as well as business to business trading capabilities.

By increasing customer service, providing a question and answer forum on their website, as well as tracking abilities for consumer orders, SYSCO has reached the top 25 status of most effective supply chains [16].

ORGANIZATIONAL EXCELLENCE

There are several philosophies that share "organizational excellence" as a fundamental premise. Total Quality Management (TQM), the Baldrige Award and most recently Six Sigma initiatives are the main examples of philosophies and programs that are intended to drive the company to a high level of excellent performance.

The "Hendricks and Singhal" study provides evidence that companies who receive quality awards realize a 38% to 46% higher long term stock performance when compared to a control group of companies who did not receive a quality award [6] [7]. An earlier study showed that quality award recipients outperformed the non-winning counterparts in a control group in operating income and revenue over a ten-year period [6]. NIST research has shown similar results for Baldrige Award winners when compared to the benchmark stock market standards such as the S&P 500 Index.

Outstanding stock performance lags behind the improvement that accompanies TQM initiatives with the greatest stock performance success occurring in the fifth year after TQM implementation.

One of the main claims of Six Sigma is that it improves either the top line (i.e. revenue) or the bottom line (i.e. profit). This claim certainly begs the question to explore performance metrics and performance outcomes in more detail.

ORGANIZATIONAL EXCELLENCE EXAMPLES

Toyota is recognized for achieving organizational excellence in many aspects of their operations. The Toyota Production System has been well documented by Womack, Jones and Roos [17] as well as Ohno [11]. In his recent book "The Toyota Way," Liker [10] offers more explicit evidence in the first chapter entitled "The Toyota Way: Using Operational Excellence as a Strategic Weapon." Among the list of accolades listed there for Toyota include the following:

- In March, 2003, the close of Toyota's fiscal year, company profit was $8.13 billion which was more than the combined earnings for the Big 3 U.S. automakers (GM, Chrysler and Ford).
- For the first time in 2003, Toyota surpassed one of the Big 3 U.S. companies when it outsold Chrysler in August of that year (and surpassed Ford and GM in subsequent years).
- In a span of only ten years, the Lexus luxury segment has grown to the point where Lexus outsold BMW, Cadillac and Mercedes-Benz in the U.S. for the third consecutive year in 2002.
- The "Toyota Production System" has driven major changes in manufacturing and supply chain management in industries around the world. "Toyota employees are sought out by companies in almost every industry throughout the world for their expertise."
- Product development at Toyota takes one year or less for new product design while other automakers take two to three years for their new product development.
- Toyota serves as a benchmark as being best in the world (or best in class) in a variety of areas including: quality, productivity, manufacturing speed and flexibility. [Source: 10, p. 5)

From the Toyota example we can take the following metrics:

- Profit
- Market share
- Development speed
- Quality
- Productivity
- Cycle time
- Manufacturing flexibility

In their discussion of Logistics measurement systems Bowersox, Closs and Cooper offer "a framework that considers both operational excellence and asset utilization in logistical performance. On the operational excellence dimension, key metrics focus on improved accommodation of customers through increased customer success and on lowest total cost of service" [5, p. 388]. From this addition we take the two additional metrics of:

- Customer success
- Lowest total cost of service

From Six Sigma we can add the excellence metrics of Sigma Level with Six Sigma being the desired level of excellence (only 3.4 defects per million opportunities). Defects per million opportunities (DPMO) is another metric that can be utilized as another way to state the quality level. Defects per unit (DPU) will be an appropriate metric in some industries. And Rolled Throughput Yield (RTY) is another important metric which looks at the quality level being passed from one step of a process to the subsequent steps in

that process. From these comments one should gather that these metrics are very closely focused on the process.

- Sigma Level
- DPMO
- DPU
- RTY

From the Baldrige Award criteria we could add an extremely long list of metrics but we will limit it to just a few.

- Customer satisfaction/loyalty resulting from strategic action
- Employee satisfaction/motivation resulting from strategic action
- Success versus competitors
- Percent acceptance of process responsibilities by process responsible areas [2].

In Table 2, the complete list of metrics discussed in this paper are listed in summary fashion:

Table 2. Comparison of Metrics

SC Metrics	OE Metrics
• Return on assets (ROA) • Inventory turns • Trailing 12 months growth in revenue • Time-to-market • Days of inventory • Perfect orders • Delivery performance • Line-item fill rate • Perfect order fulfillment • Order fulfillment lead time • Supply chain response time • Production flexibility • Cost of goods • Total supply chain cost • Sales, general, and administrative cost (SGA) • Warranty/returns processing costs • Cash-to-cash cycle time • Inventory days of supply • Asset turns • Gross margin • Operating income • Net income • Return on assets • Cash-to-Cash Conversion • Inventory Days of Supply • Dwell Time • On-Shelf In-Stock Percent • Supply Chain Response Time.	• Profit • Market share • Development speed • Quality • Productivity • Cycle time • Manufacturing flexibility • Customer success • Lowest total cost of service • Sigma Level • DPMO • DPU • RTY • Customer satisfaction/loyalty resulting from strategic action • Employee satisfaction/motivation resulting from strategic action • Success versus competitors • Percent acceptance of process responsibilities by process responsible areas

CONCLUSION

Supply chain management and Organizational Excellence have been significant initiatives over the past twenty years. This paper is intended to provide a better understanding of performance metrics associated with these initiatives. We have discussed the Top 25 Supply Chains and supply chain metrics. We have also discussed Organizational Excellence and metrics associated with that viewpoint.

Organizations exist to serve customers and supply chains are designed to deliver to customers so we would think that the metrics would be quite similar. While there are a few shared metrics there tends to some divergence in the metrics that are most important from each perspective.

The similarities tend to be in the areas where time or speed are important metrics whether it's new product development or cycle time. The differences in metrics tend to result from SCM's focus on material flow and the much broader metrics of OE which cover the spectrum of business processes.

This has been a preliminary and exploratory research attempt to look at metrics from these two different perspectives. Further research is planned and we feel there is an opportunity to further explore and compare companies that focus on Supply Chain versus companies that focus on Organizational Excellence.

REFERENCES

[1] AMR Research. Online (2006): http://www.amrresearch.com/Content/View.asp?pmillid=18895&nid=2558&rid=1104301503.

[2] Baldrige Business Performance Metrics, www.Baldrige21.com

[3] Beer, Michael, Why total quality management programs do not persist: The role of management quality and implications for leading a TQM transformation. *Decision Sciences*, 34: 4: 623-642, 2003.

[4] Bolstorff, Peter and Robert Rosenbaum *Supply Chain Excellence*. New York: AMACOM, 2003.

[5] Bowersox, Donald J., Daniel J. Closs, and M. Bixby Cooper. *Supply Chain Logistics Management, 2nd edition*. New York: McGraw-Hill Irwin, 2007.

[6] Hendricks, K.B. and Singhal, V.R. Does implementing an effective TQM program actually improve operating performance? Empirical evidence from firms that have won quality awards. *Management Science*, 43: 9: 1258-1274, 1997.

[7] Hendricks, K.B. and Singhal, V.R. Firm characteristics, total quality management, and financial performance. *Journal of Operations Management*, 238: 1-17, 2000.

[8] InfoWorld online. Proctor and Gamble reworks its supply chain. March 13, 2001. http://www.infoworld.com/articles/hn/xml/01/03/13/010313hnpng.html.

[9] Lambert, Douglas M., Martha C. Cooper, and Janus D. Pugh, Supply Chain Management: Implementation Issues and Research Opportunities. *The International Journal of Logistics Management*, 9:2, p. 1, 1998.

[10] Liker, Jeffrey K. *The Toyota Way,* McGraw-Hill: New York, 2004.

[11] Ohno, Taiichi., *The Toyota Production System: Beyond Large Scale Production.* Portland, OR: Productivity Press, 1988.

[12] Procter & Gamble. Online: http://www.pandg.com/investors/sectionmain.jhtml. 2006.

[13] "Procter & Gamble: Delivering Goods." Baseline; July 2004.

[14] Purchasing Magazine online, Supply Chain's Top 25, January 13, 2005. http://www.purchasing.com/article/CA497322.html

[15] Stock, James R. and Lambert, Douglas M. *Strategic Logistics Management*, Fourth Edition, McGraw-Hill/Irwin: New York, 2001.

[16]"The SYSCO Story." Online: http://www.sysco.com/aboutus/aboutus_story.html. 2006.

[17] Womack, James P., Daniel T. Jones, and Daniel Roos. *The Machine that Changed the World: The Story of Lean Production*. New York: HarperPerennial, 1991.