

Adapting the Balanced Scorecard to Improve MRO Supplier Performance: A Case Study

Gregory Benson, Ed.D.
University of Nebraska Kearney

Abstract

The annual Maintenance, Repair, and Operating Supplies (MRO) expenditure in the United States is approaching \$400 billion annually (Foroughi, 2008). Despite the hundreds of billions of dollars spent on MRO goods, very little research can be found regarding effective MRO supplier performance measurement systems. If MRO suppliers are to be responsive to the expectations of their customers, it is essential that MRO supplier performance measurement systems; 1) effectively identify MRO supplier performance expectations essential to the customer, 2) translate selected performance expectations into quantifiable MRO supplier performance measurements, and 3) effectively communicate selected MRO supplier performance measurements in a manner that motivates MRO suppliers to meet and/or exceed expectations (Brewer and Speh, 2000; Doolen et al., 2006; Kaplan and Norton, 1996).

This case study demonstrates how a large Fortune 100 company's manufacturing plant adapted the balanced scorecard principles implemented at its facility for use to manage and improve the overall performance level of the plant's primary MRO suppliers. The study examines the overall performance level of plant's 23 primary MRO suppliers during the initial three year balanced scorecard implementation period, as well as the sustainability of the plant's MRO supplier performance results twelve years after the initial MRO supplier balance scorecard rollout.

This study provides a practical, data-based adaptation of Kaplan and Norton's (1996) seminal balanced scorecard research that allowed the manufacturing location to link its strategic procurement objectives in a manner that engaged and motivated its key MRO suppliers to perform at levels never before experienced at the facility. This adaptation of the balanced scorecard approach to MRO procurement fills an MRO supplier performance measurement research gap that exists in today's supply chain literature, thereby adding to supply chain performance measurement body of knowledge (Beamon, 1999; Brewer and Speh, 2000; Hald and Ellegaard, 2010; Kaplan and Norton, 1993; Neely et al., 1995, 2000).

Based on prior research related to balanced scorecards, the following propositions were created for this study.

1. Implementation of a balanced scorecard approach to track selected MRO suppliers' performance would provide significant MRO supplier non-financial performance improvement in areas considered essential to the future success of the Fortune 100 Company's manufacturing facility.
2. Implementation of a balance scorecard approach to measure MRO supplier performance would provide a significant reduction in costs associated with MRO goods purchased for use at the Fortune 100 Company's manufacturing facility.

Keywords: MRO; Supply Chain Management; Supplier Performance Measurement; Operational Strategy Development; Balance Scorecard

Introduction

It has been estimated that the annual spend by businesses in the United States for maintenance, repair, and operating supplies (MRO) was approaching \$400 billion (Foroughi, 2008). Despite the hundreds of billions of dollars spent on MRO products, very little research based literature can be found regarding the effective measurement of MRO supplier performance. If suppliers of MRO products are to be responsive to the expectations of their customers, it is essential that MRO supplier performance measurement systems; 1) effectively identify and select MRO supplier performance expectations that are essential to the success of the business customer, 2) translate selected performance expectations into quantifiable MRO supplier performance measurement measurements, and 3) effectively communicate selected MRO supplier performance measurement measurements in a manner that are understandable and will motivate MRO suppliers to meet and/or exceed their customers' MRO supplier performance expectations (Brewer and Speh, 2000; Doolen et al., 2006; Kaplan and Norton, 1996).

Purpose of Study

This case study of a Fortune 100 Company's capital-intensive manufacturing location (hereafter referred to as "TCB") located in the Midwest demonstrates how a large manufacturing plant was able to adapt the balanced scorecard approach implemented at its facility for use to manage and ultimately improve the overall performance of its MRO suppliers. The study examines the overall performance level of the plant's 23 primary MRO suppliers during the initial three year MRO supplier balanced scorecard implementation period, as well as the sustainability of the plant's MRO supplier performance results twelve years after the initial MRO supplier balance scorecard rollout.

This case study provides a practical, data-based adaptation of Kaplan and Norton's (1996) seminal balanced scorecard research that demonstrates how TCB linked its strategic procurement objectives in a manner that engaged and motivated its key MRO suppliers to perform at levels never before experienced at the plant. The study examines the TCM plant's MRO balanced scorecard adaptation and implementation process, and reports the accompanying performance results associated with the plant's MRO supplier balanced scorecard.

Based on prior research related to the use balanced scorecards, the following propositions (Baxter and Jack, 2008) were created for this study.

1. Implementation of a balanced scorecard approach to track selected MRO suppliers' performance would provide significant MRO supplier non-financial performance improvement in areas considered essential to the future success of the TCB manufacturing facility.
2. Implementation of a balance scorecard approach to measure MRO supplier performance would provide a significant reduction in costs associated with MRO goods purchased for use at the TCB manufacturing facility.

Literature Review

Kaplan and Norton (1992) introduced “the balanced scorecard” as a performance measurement approach where organizations identified a small number of essential measures that allowed managers to quickly (and simultaneously) view financial and operational business performance results from four critical perspectives - customer, internal processes, innovation and learning, and financial measures. It did this by having organizations choose measures that answered the following four questions:

- How do customers see us? (customer perspective)
- What must we excel at? (internal perspective)
- Can we continue to improve and create value? (innovation and learning perspective)
- How do we look to shareholders? (financial perspective) (Kaplan & Norton, 1992, p. 72).

What made the balanced scorecard different from other performance measurement approaches was its ability to incorporate into a single management report an organization's traditional financial measures (based on actions already taken by the organization) with central operational measures that were key to the organization's future success. Kaplan and Norton (1992) described the balance scorecard approach as follows:

The [balanced] scorecard puts strategy and vision, not control, at the center. It establishes goals but assumes that people will adopt whatever behaviors and take whatever actions are necessary to arrive at those goals. The measures are designed to pull people toward the overall vision (p. 79).

Since its introduction in 1992, the balanced scorecard has been used extensively by organizations to transform their strategic objectives into clear financial and non-financial performance measures; thereby providing organizations with a “management system that can motivate breakthrough improvements” by defining and communicating the organization's priorities to its managers, employees, and other crucial stakeholders (Kaplan & Norton, 1993). The application of the balanced scorecard has evolved from its original application at the

strategic planning level within organizations to now include strategic planning by functional business units (ie. accounting, production, supply chain management) within an organization.

An early study regarding the application of the balanced scorecard to supply chain management (SCM) was conducted by Brewer and Speh (2000) when they examined the use of the balanced scorecard approach to “provide data on whether the supply chain [was] performing up to expectations” (p. 75). In their study, Brewer and Speh (2000) considered supply chain activities to include anything associated with the transformation and movement of goods from a raw material to a finished good ready for sale to the retail consumer, which included activities such as procurement, production scheduling, inventory management, material handling, warehousing, transportation, and customer service. At the time of the study, the authors noted “there is little evidence that firms have incorporated the balanced scorecard approach into their SCM practices” (Brewer & Speh, 2000, p. 85).

In linking the balanced scorecard performance measures to supply chain management, Brewer and Speh (2000) explained that traditional SCM performance measures failed to 1) “adequately assess supply chain performance”, and 2) “motivate employees to behave with a supply chain orientation” (p. 84). As a result, the researchers provided sixteen examples, “a tiny fraction of the possible measures that [could] be developed” (p. 91), of SCM performance measures that could fit into the four perspectives associated with a balanced scorecard approach. Brewer and Speh (2000) noted that supply chain performance measurement association to an organization’s strategic objectives was essentially uncharted territory, and the “challenge for managers will be to craft...measurements that focus on key supply chain processes and interactions” (p. 91).

Doolen, Traxler, and McBride (2006) furthered the research regarding balanced scorecards in SCM with a study that built upon the principles associated with the four perspective approach to the balanced scorecard developed by Kaplan and Norton (1992), and the supplier performance measures research conducted by Lefkowith (2001) that underscored the need for performance measures to be objective, credible, and timely. The case study took place at a medium sized manufacturing plant, and involved the plant’s top 20 core direct material suppliers which accounted for 90% of their direct material expenditures. For their study, Doolen et al. (2006) created and implemented the following five step supplier scorecard development process that “incorporate[ed] both the scorecard design activities as well as activities related to scorecard implementation” (p. 27).

- Identify which strategic and operational objectives of the organization are related to supplier performance.
- Develop balanced and objective performance measures appropriate for suppliers.
- Engage suppliers to ensure that performance measures are credible and actionable.

- Establish a graphical design that provides a clear evaluation of supplier performance.
- Educate suppliers on performance measures and implications for differing performance levels (p. 27).

Shepard and Gunter (2006) published a SCM literature review paper that included 362 articles, published between 1990 and 2005, that were concerned with SCM measurement systems and measurements. Based on their review, Shepard et al. (2005) noted that only “42 journal articles and books were identified which were directly concerned with performance measurement systems and measurements for supply chains” (p. 246). The authors continued by stating that it was “widely acknowledged that there has been relatively little interest in developing measurement systems and measurements for evaluating supply chain” (p. 246). Shepard et al. (2005) suggested five areas for further SCM performance measurement systems research including “it is important to treat measurement systems as dynamic entities that must respond to environmental and strategic changes...further work is needed to investigate the factors influencing the evolution of performance measurement systems for supply chains...” (p. 253).

In a study that examined the use of the balanced scorecard on supply chain integration within service businesses, Chang et al. (2013) added the following to the discussion of using a balanced scorecard (BSC) approach to measure SCM performance:

- The BSC model integrates different perspectives on company operations and accommodates the relationship of an organization with its external trading environment.
- The application of the BSC performance evaluation method requires that monitoring methods of all organizational partners are consistent.
- The objectives and measures for different supply chains could be designed separately based on different localized demands.
- The BSC method helps insure that staffs remain aware of the operational objectives of performance measurements, which should neither be an end to themselves, nor tools for rewards and punishments (pp. 544-545).

“[E]nhancement of supplier performance on an ongoing basis has become a paramount objective for manufacturing firms because this enables them to gain and maintain competitive advantage ...” (Joshi, 2009, p. 133). While much can be found in SCM literature about the development, application, and performance results associated with the use of supplier scorecards for measuring the performance of direct material suppliers used by manufacturing, virtually no research-based SCM literature is available regarding the adaptation, incorporation, and recording of results associated with the use of the balanced scorecard approach to measure MRO supplier performance. This case study examined the adaptation of the balanced scorecard approach to MRO procurement, thereby filling the MRO supplier performance measurement gap that exists

in today's SCM performance measurement research (Beamon, 1999; Brewer and Speh, 2000; Hald and Ellegaard, 2010; Kaplan and Norton, 1993; Neely et al., 1995, 2000).

Methodology

A single case study at a large manufacturing plant was selected for this study, because it allowed the researcher to develop “an in-depth inquiry into a specific and complex phenomenon (the ‘case’), set within its real-world context” (Yin, 2013, p. 321). The TCB manufacturing facility was chosen for this study, because of its significant annual expenditure (in excess of \$12 million annually) for MRO products, its procurement and operational leadership reputation within the corporation, and its accessibility for the researcher.

A semi-structured, face-to-face interview approach using an initial set of scripted, open-ended interview questions with follow-up probing questions used on an as-needed basis to clarify responses to the scripted questions was used for all interviews within this study. Interviews were conducted in 2013 by the researcher with a total of twelve TCB employees consisting of managers, supervisors, and other key informants, as well as five interviews with MRO supplier representatives who were involved in TCB’s initial MRO supplier scorecard adaptation and implementation process. The interviewee sample size for this case study was considered acceptable given the purpose of the research (Stuart et al. 2002; Voss et al., 2002).

It was essential that a validation process was in place that assessed the accuracy of the study’s findings. Creswell (2013) recommended that “qualitative researchers engage in at least two [validation strategies] in any given study” (p. 253). Data reliability for this study was accomplished through the triangulation of information provided by the TCB plant that was gained from the face-to-face interviews, annual MRO expenditure and production output reports, and MRO supplier scorecard implementation documentation and measurements results (Baxter and Jack, 2008; Voss et al., 2002; Yin, 2013).

Case Study Details

While the term “MRO” may be viewed differently by companies, in the case of the TCB plant the term MRO represented a full range of consumable, “non-direct material” products needed by employees and manufacturing equipment to support the plant’s production of finished goods. At the time the TCB plant implemented its initial MRO supplier balanced scorecard, all MRO products purchased for use at the facility were classified into one of the following 14 MRO product categories (annualized expenditure included).

| MRO Product Category | Annualized Expenditure (Rounded) |
|-------------------------------|-------------------------------------|
| • Abrasives | \$2.70M |
| • Machine Lubricants/Coolants | \$2.15M |
| • Make-To-Print Repair Parts | \$1.30M |
| • Electrical Parts | \$0.75M |
| • Tooling Steel | \$0.70M |

| | |
|---------------------------------|----------------|
| • Chemicals | \$0.65M |
| • Power Transmission Parts | \$0.65M |
| • Industrial Tools and Supplies | \$0.60M |
| • Material Handling Parts | \$0.50M |
| • Electronic Parts | \$0.40M |
| • Industrial Gases | \$0.25M |
| • Safety Products | \$0.25M |
| • Janitorial Products | \$0.20M |
| • Other, Miscellaneous | <u>\$1.00M</u> |
| • Annual MRO Spend Total | \$12.1M |

Nine of the plant's MRO product categories listed above had a single primary MRO supplier that provided at least 90% of the products (based on dollars spent) for the category. Listed below are the five MRO product categories that had two or more primary MRO suppliers (number of suppliers listed) and the minimum percentage of product (based on dollars spent) that the collective group of primary suppliers in the category sold to the TCB plant.

- Abrasives: 2 suppliers, 99%
- Machine Lubricants/Coolants: 2 suppliers, 99%
- Make-To-Print Parts: 3 suppliers, 75%
- Electrical: 2 suppliers: 95%
- Other, Miscellaneous: 5 suppliers, 70%

In response to a significant competitive threat in 1995, the TCB plant's strategic planning team identified and approved an aggressive, five-year plant-wide cost reduction goal. At the same meeting, the plant's Materials department (consisting of purchasing, production scheduling, inventory control, shipping and receiving functions) was assigned the strategic objective of developing a supply chain action plan that would reduce the total cost for all incoming goods and services (direct materials and MRO) to the TCB plant by 20% by 2001.

In response to this strategic objective, one of the cost reduction activities identified by the Materials team was to adapt the balanced scorecard approach (similar to the one previously implemented at the plant) to identify and measure key financial and non-financial performance measures for use with the plant's MRO suppliers. The Materials team thought the creation of an MRO supplier balanced scorecard would; 1) provide a formalized method to quantify and manage key MRO supplier performance measures, 2) provide an effective method for the purchasing team to communicate to the company's MRO suppliers the MRO performance measures that TCB considered most critical to the plant's long-term success, and 3) assist the plant in reaching its 20% total cost reduction initiative by 2001. Consideration by the Materials team of creating a balanced scorecard for measuring MRO supplier performance was consistent with the Kaplan and Norton's (1993) explanation that a balanced scorecard "is grounded in an organization's strategic objectives and competitive demands" (p. 134). Additionally, the Materials team thought the MRO balanced scorecard would be a means to compare the performance level of one MRO supplier to another, and to compare the year-over-year

performance results of the same supplier. The action that was being considered by the TCB team was consistent with the Brewer and Speh (2000) study reported four years later that concluded “[T]he balanced scorecard metric selection process can be adapted to a supply chain context, thereby motivating employees to truly manage with a supply chain mindset” (p. 76).

The initial MRO supplier balanced scorecard implemented by TCB was the result of a two-year development process. The first step of the process involved the formation of a team (called “MRO+”) tasked with the development of a process to adapt, identify, quantify, and select MRO supplier performance measures that were essential to the plant’s future success. The MRO+ team was a cross-functional team with representatives from purchasing, human relations, engineering, tooling, accounting, training, and the Materials Manager (team champion) for a total of seven members.

Once the organizational meetings had been completed, the MRO+ team scheduled a group meeting with all members of the TCB purchasing team followed by individual, face-to-face meetings with several of the plant’s supervisors and other key personnel from the production floor, as well as employees from the maintenance, operations, and accounting departments to identify their expectations of the plant’s MRO suppliers. The purpose of having these meetings was to gather information so the team could identify and quantify the plant’s critical MRO supplier performance measures.

The second step of the process involved the analysis of input gathered by the MRO+ team in Step 1, and the adaptation and development of an MRO supplier balanced scorecard that would be presented to the TCB strategic planning team (plant manager and his direct reports). After considerable discussion concerning the input gathered in Step 1, the MRO+ team agreed on a list of 17 MRO supplier performance measures the team thought would significantly improve the future operational and financial success of the plant. A draft of the MRO supplier balanced scorecard, consisting of the 17 measures, was presented to the TCB strategic planning team for consideration and approval. The strategic planning team approved the MRO supplier balanced scorecard approach, but the team did not consider the scorecard to be “balanced.”

The MRO+ team was instructed by the strategic planning team to reassess their recommendation, to reduce the number of items to be measured from the 17 that were presented to ten the MRO+ team thought were most critical to the plant’s success, and to make certain the MRO supplier scorecard measurements represented a balanced appraisal of MRO supplier performance. The action taken by TCB’s strategic management team was consistent with a key balanced scorecard principle – “The balanced scorecard forces managers to focus on the handful of measures that are most critical” (Kaplan & Norton, 1992, p. 73).

As part of the MRO supplier performance measurement evaluation and selection process, the MRO+ team adapted the four balanced scorecard perspectives in order to support the plant’s localized demands. The following explanation was provided on how the balanced scorecard perspectives were adapted by the TCB team.

- Customer – Customer concerns fall into the categories of time, quality, performance, and service (Kaplan & Norton, 1992). The team considered the TCB plant to be the “customer” to their MRO suppliers; therefore, they listed MRO supplier performance measures associated with time, quality, performance, and service into the “Customer” perspective of the MRO balanced scorecard.
- Internal Business Process – Internal business process measures relate to processes and competencies that an organization must excel at to ensure market leadership (Kaplan & Norton, 1992). The TCB location had a reputation of operational innovation and leadership within the corporation, therefore, MRO supplier measures associated with MRO supplier management tools developed at TCB that expanded their leadership role within the company were placed in this perspective.
- Learning and Growth – The learning and growth perspective is associated with an organization’s commitment to continuous improvement and ability to learn more effective ways of doing things. To be successful, an organization must be able to continuously improve its operating efficiencies (Kaplan & Norton, 1992). TCB’s measures associated with new electronic technologies or with technical and support inquiry responses were placed in this perspective.
- Financial – Financial measures should tell the managers within an organization if the company’s strategy, implementation, and execution are contributing to the bottom-line improvement (Kaplan & Norton, 1992). Any MRO supplier measurements associated with bottom-line MRO unit price improvement were placed under this perspective.

Three additional team meetings were held by the MRO+ team before they were able to agree upon the following ten most critical MRO supplier performance measures for the plant.

- Customer
 - On-time MRO product delivery
 - Inventory location of MRO products
 - Response time to TCB inquiries
- Internal Business Process
 - TCB certified MRO supplier
 - MRO supplier agreement with TCB
- Learning and Growth
 - Electronic Data Interchange (EDI) capability
 - Technical support
 - Bar coding capability for MRO goods shipped
- Financial
 - Invoice payment terms
 - Freight responsibility for goods shipped to TCB

Once the top ten MRO supplier performance measurements were agreed to by the MRO+ team, the revised MRO supplier balanced scorecard went back to the strategic planning team for review and approval. The strategic planning team approved of the revised MRO supplier balanced scorecard with one condition; the scorecard had to be beta tested with a small group of TCB's primary MRO suppliers before being rolled out to all primary MRO suppliers.

Step 3 of the process involved a six month MRO supplier scorecard beta test with three of TCB's primary MRO suppliers who had agreed to participate in the beta-testing process. During the testing period, the MRO+ team met on a monthly basis with the three participating MRO suppliers, as well as fifteen TCB department personnel whose area of responsibility was impacted by the performance level of the plant's primary MRO suppliers. The monthly meetings provided the MRO+ team with feedback related to the scorecard measurements.

Minor revisions were made to the MRO supplier scorecard measurements by the MRO+ team during the beta testing period. At the end of the six month beta-test, a summary of the MRO supplier performance results, and the monthly feedback collected from the beta test, were submitted to the TCB strategic planning team. Approval from the strategic planning team was given to fully implement the MRO supplier balanced scorecard with TCB's 23 primary MRO suppliers and the MRO+ team was dissolved. At the same time, the Materials manager was assigned responsibility to champion all future revisions to the MRO balanced scorecard (in consultation with the purchasing group) on an as needed basis.

MRO Supplier Performance Results

The ten MRO supplier performance measurements listed below (and assigned point values) made up the initial MRO supplier balanced scorecard that was rolled out to TCB's 23 primary MRO suppliers at its annual MRO Supplier Conference in January 1997.

1. On-time delivery performance (annualized average).

100% - 99.90% = 10

99.89% - 99.40% = 6

99.39% - 98.50% = 3

98.49% - 97.51% = 1

97.50% = 0

97.49% - 93.00% = -5

Less than 93.00% = -10

2. EDI capable

Yes = 10

No = 0

3. Location of supplier MRO inventory to TCB location (in miles).

Less than 10 = 10
10 – 50 = 5
50 – 200 = 2
More than 200 = 0

4. Invoice payment terms for goods purchased.

2/10, Net 30 or better = 5
1/10, Net 30 = 3
Net 30 = 0
Less than Net 30 = -5

5. Response to TCB inquiries within 24 hours of initial request.

Meets or exceeds expectations = 10
Does not meet expectations = -10

6. Bar coding capability for MRO goods shipped.

Yes = 5
No = 0

7. TCB certified MRO supplier.

Yes = 10
No = 0

8. Formal MRO supplier agreement with TCB.

Yes = 10
No = 0

9. Freight damage claim responsibility for goods shipped to TCB.

MRO Supplier = 10
TCB = 0

10. Technical support

Full-time supplier representative located at TCB = 5
24/7 emergency support service = 2
Traditional 8-5, 5 days/week support service = 0

At the initial 1997 MRO supplier balanced scorecard rollout meeting each supplier received: 1) MRO supplier balanced scorecard training, 2) their company's baseline (Year 0)

MRO supplier balanced scorecard performance results score (based in the previous year's performance results), and 3) the upcoming year's MRO supplier balanced scorecard performance results expectation, which was a full-year performance measurement score of at least 40 points. During the meeting, it was explained that the MRO supplier balanced scorecard measurements were not created to be stagnant; rather, it was expected that the MRO balanced scorecard measurements would evolve over time to reflect the changing MRO supplier performance expectations of the TCB plant. This explanation was consistent with the balanced scorecard principle,

The ...process measures on balanced scorecard identify the parameters that the company considers most important. But targets for success keep changing. Intense competition requires that companies make continual improvements to their...existing processes... (Kaplan & Norton, 1992, pp. 75-76).

The MRO suppliers attending the initial 1997 rollout meeting (Year 1) were informed that failing to meet the next year's (Year 2) MRO supplier balanced scorecard performance expectations could be a factor in TCB's future MRO supplier sourcing decisions. The Year 0 (baseline year) average performance results for TCB's 23 primary MRO suppliers (hereafter referred to as "Group") for each of the ten performance measurements were as follows:

1. On-Time Delivery:

- 16 MRO suppliers' shipments were below 93% on-time
- 7 MRO suppliers' shipments were 93.00% - 97.49% on-time
- The average on-time delivery percentage for the 23 MRO suppliers (as a group) was 90.24%.

2. Capable of receiving purchase orders via EDI (electronic data interchange)

- 9 received EDI transmission of purchase orders
- 14 had not agreed to EDI transmission of purchase orders

3. Location of MRO Supplier Inventory sold to TCB:

- 1 inventory location was less than 10 miles
- 1 inventory location was within 10 – 50 miles
- 4 inventory locations were within 50 - 200 miles

- 17 inventory locations were more than 200 miles
4. Invoice payment terms for goods purchased.
- 6 suppliers had agreed to 2/10, Net 30 terms
 - 17 suppliers had agreed to Net 30 terms
5. Response to TCB inquiries within 24 hours of initial request:
- 19 suppliers met TCB's MRO supplier responsiveness expectations
 - 4 suppliers did not meet TCB's MRO supplier responsiveness expectations
6. Bar coding capability for MRO goods shipped to TCB facility
- 3 suppliers had bar coding capability for outbound MRO shipments
 - 20 suppliers did not have bar coding capability for outbound MRO shipments
7. TCB certified MRO supplier.
- 2 suppliers were TCB certified suppliers
 - 21 were not TCB certified suppliers
8. Formal MRO supplier agreement with TCB:
- 8 suppliers had formal agreements with TCB
 - 15 suppliers did not have formal agreements with TCB.
9. Freight damage claim responsibility for goods shipped to TCB.
- 10 suppliers were responsible for handling freight claims for shipments to TCB
 - 13 suppliers were not responsible for handling freight claims for shipments to TCB
10. Technical support:
- 2 suppliers provided full-time supplier representative located at TCB

- 15 suppliers provided 24/7 emergency support service
- 6 suppliers provided 8-5, 5 days/week support service

The performance results above were translated into the following averaged Year 0 (baseline) Group calculation for each of the ten measurements.

| | |
|----------|----------|
| 1. -8.48 | 6. 0.65 |
| 2. 3.92 | 7. 0.87 |
| 3. 1.00 | 8. 3.48 |
| 4. 1.30 | 9. 4.35 |
| 5. 8.26 | 10. 1.74 |

At the end of Year 1, the averaged MRO supplier balanced scorecard performance results for the Group were:

| | |
|----------|----------|
| 1. -3.47 | 6. 0.87 |
| 2. 5.65 | 7. 1.74 |
| 3. 3.26 | 8. 4.35 |
| 4. 2.17 | 9. 5.65 |
| 5. 10.00 | 10. 2.17 |

The realized improvement percentage between the averaged Group Year 0 (baseline calculation) and the results after the first full year of implementation for each of the ten MRO supplier performance measurements were:

| | |
|-----------|-----------|
| 1. 144.3% | 6. 33.8% |
| 2. 44.1% | 7. 100.0% |
| 3. 226.0% | 8. 25.0% |
| 4. 66.9% | 9. 29.9% |
| 5. 21.1% | 10. 24.7% |

At the Year 2 MRO supplier conference, primary MRO suppliers were provided with TCB's revised MRO supplier balanced scorecard performance expectations for the upcoming year, which required each MRO supplier to reach a total of 50 points for the full year. At that time, the Materials manager explained that the performance expectations for scorecard measurements #1 and #5 had been revised to place greater emphasis on activities associated with on-time delivery reliability and the reduction of MRO supplier errors for goods sold to the plant.

The ten performance measurements listed below (with assigned points) made up the Year 2 MRO supplier balanced scorecard.

1. On-time delivery performance (annualized average).

100% - 99.90% = 10
99.89% - 99.50% = 6
99.49% - 98.75% = 3
98.74% - 97.76% = 1
97.75% = 0
97.74% - 93.50% = -5
Less than 93.50% = -10

2. EDI capable

Yes = 10
No = 0

3. Location of supplier MRO inventory to TCB location (in miles).

Less than 10 = 10
10 – 50 = 5
50 – 200 = 2
More than 200 = 0

4. Invoice payment terms for goods purchased.

2/10, Net 30 or better = 5
1/10, Net 30 = 3
Net 30 = 0
Less than Net 30 = -5

5. Implementation of a supplier error reduction program (approved by TCB) for goods shipped to TCB.

Meets or exceeds expectations = 10
Does not meet expectations = -10

6. Bar coding capability for MRO goods shipped.

Yes = 5
No = 0

7. TCB certified MRO supplier.

Yes = 10
No = 0

8. Formal supplier agreement with TCB.

Yes = 10
No = 0

9. Freight damage claim responsibility for goods shipped to TCB.

MRO Supplier = 10

TCB = 0

10. Technical support

Full-time supplier representative located at TCB = 5

24/7 emergency support service = 2

Traditional 8-5, 5 days/week support service = 0

At the end of Year 2, the averaged full-year performance results for each of the ten measurements were calculated for the Group using the revised MRO performance expectations for measurements #1 and #5. The following were the Group's performance average for each of the ten MRO measurements.

- | | |
|----------|----------|
| 1. -1.04 | 6. 2.83 |
| 2. 9.56 | 7. 2.61 |
| 3. 3.48 | 8. 4.78 |
| 4. 2.30 | 9. 6.95 |
| 5. -1.30 | 10. 2.17 |

The realized improvement percentage between the Group's averaged Year 1 results and the averaged Year 2 results for each of the ten performance measurements were:

- | | |
|-----------|-----------|
| 1. 241.7% | 6. 212.6% |
| 2. 69.2% | 7. 50.0% |
| 3. 6.7% | 8. 9.9% |
| 4. 6.0% | 9. 23.0% |
| 5. N/A | 10. 0.0% |

Although the Year 2 performance expectation for measurement #1 (On-Time Delivery) had been increased, the averaged Group performance result for "on-time delivery" improved significantly compared to the Year 1 result for this measurement.

At the third annual MRO supplier conference, TCB once again revised MRO supplier performance expectations for the upcoming year and raised the MRO supplier scorecard full-year total point expectation to 55 points. Consistent with the previous year, the Materials manager explained the reasoning for revising performance expectations for measurements #1 and #2,

which was to place emphasis on 1) improved on-time delivery reliability of suppliers, and 2) reducing the overall cost of administrative expenses associated with MRO goods sold to TCB.

The ten measurements listed below (and associated point values) made up the revised MRO supplier balanced scorecard for Year 3.

1. On-time delivery performance (annualized average).

100% - 99.90% = 10

99.89% - 99.50% = 6

99.49% - 98.75% = 3

98.74% - 98.01% = 1

98.00% = 0

97.99% - 94.50% = -10

Less than 94.50% = -20

2. Agree to EFT invoice payment

Yes = 10

No = 0

3. Location of supplier MRO inventory to TCB location (in miles).

Less than 10 = 10

10 – 50 = 5

50 – 200 = 2

More than 200 = 0

4. Invoice payment terms for goods purchased.

2/10, Net 30 or better = 5

1/10, Net 30 = 3

Net 30 = 0

Less than Net 30 = -5

5. Implementation of a supplier error reduction program (approved by TCB) for goods shipped to TCB.

Meets or exceeds expectations = 10

Does not meet expectations = -10

6. Bar coding capability for MRO goods shipped.

Yes = 10

No = 0

7. TCB certified MRO supplier.

Yes = 10

No = 0

8. Formalized supplier agreement with TCB.

Yes = 10

No = 0

9. Freight damage claim responsibility for goods shipped to TCB.

MRO Supplier = 10

TCB = 0

10. Technical support

Full-time supplier representative located at TCB = 5

24/7 emergency support service = 2

Traditional 8-5, 5 days/week support service = 0

At the end of Year 3, the Group's averaged full-year performance results for each of the ten measurements were calculated using the revised MRO supplier performance expectations for measurements #1 and #2. The following were the Group's performance average for each of Year 3 ten MRO supplier performance measurements.

- | | |
|---------|----------|
| 1. 1.52 | 6. 4.13 |
| 2. 1.73 | 7. 5.65 |
| 3. 6.78 | 8. 6.52 |
| 4. 4.39 | 9. 8.70 |
| 5. 2.17 | 10. 2.39 |

The realized improvement percentage between the Group's averaged Year 2 performance results and the averaged Year 3 performance results were:

- | | |
|------------|-----------|
| 1. 247.6 % | 6. 45.9% |
| 2. N/A | 7. 116.5% |
| 3. 93.7% | 8. 36.4% |
| 4. 90.95% | 9. 25.2% |
| 5. 266.9% | 10. 10.1% |

Despite the fact that the performance expectation for measurement #1 (On-Time Delivery) was increased for Year 3 compared to Year 2, the overall averaged Group result improved significantly when compared to the Year 2 result for this measurement.

The overall Group performance results for each of the MRO scorecard measurements during the initial three year implementation period improved significantly. As impressive as the results were over that three year period; the researcher was interested in the sustainability of MRO supplier performance results over an extended period of time. As a result, the researcher examined the MRO supplier performance measurement results of the Group after the twelfth year of the MRO supplier balanced scorecard implementation. The twelfth year (2008) was selected, because it was the last year that the TCB facility had local control of their MRO supplier selection and performance measurement. Beginning in 2009, the corporation centralized the procurement of MRO products, and related measurement activities, to its corporate headquarters.

Listed below were the 2008 MRO supplier performance measures (and associated point values) used by TCB during Year 12 of the MRO supplier balance scorecard.

1. On-time delivery performance (annualized average).

100% - 99.90% = 10

99.89% - 99.50% = 6

99.49% - 98.75% = 3

98.74% - 98.51% = 1

98.50% = 0

98.49% - 95.50% = -10

Less than 95.50% = -20

2. Agree to EFT invoice payment

Yes = 10

No = 0

3. Location of supplier MRO inventory to TCB location (in miles).

Less than 10 = 10

10 – 50 = 5

50 – 100 = 2

Greater than 100 = 0

4. Invoice payment terms for goods purchased.

| | |
|------------------------|------|
| 2/10, Net 45 or better | = 5 |
| 1/10, Net 45 | = 3 |
| Net 45 | = 0 |
| Less than Net 45 | = -5 |

5. Implementation of a supplier error reduction program (approved by TCB) for goods shipped to TCB.
Meets or exceeds expectations = 10
Does not meet expectations = -10
6. 5% annual cost savings guarantee to TCB.
Yes = 10
No = 0
7. ISO 9000 certified (or equivalent) MRO supplier.
Yes = 10
No = 0
8. Formalized supplier agreement with TCB.
Yes = 10
No = 0
9. Implementation of Vendor Managed Inventory program at TCB facility.
Yes = 10
No = 0
10. Technical support
Full-time supplier representative located at TCB = 5
24/7 emergency support service = 2
Traditional 8-5, 5 days/week support service = 0

The following were the Group's scorecard performance averages for each of the measurements. The number of primary MRO suppliers for the TCB plant had been reduced between Year 4 and Year 12 from 23 to 16.

- | | |
|---------|----------|
| 1. 1.38 | 6. 6.88 |
| 2. 8.75 | 7. 10.00 |
| 3. 5.63 | 8. 8.13 |
| 4. 4.38 | 9. 5.63 |
| 5. 6.25 | 10. 2.75 |

The year prior to implementation of TCB's MRO supplier balanced scorecard (Year 0), the full-year manufacturing output for the TCB plant was nearly 90 million units, and the average MRO expense for each finished unit produced was \$0.142 (baseline MRO expense). At the end of the initial three year period following the MRO supplier balanced scorecard implementation, the full-year average MRO expense for each finished unit produced at the TCB facility had been reduced by 23% to \$0.109/unit produced.

Using the baseline MRO expense of \$0.142/unit produced, twelve years (Year 12) after TCB's implementation of its MRO supplier balanced scorecard the full-year MRO expense for each unit produced was reduced by 41.6% to \$0.083/unit produced. During the same period of time, the Producer Price Index for finished goods increased by 28.8% from the December 1997 level of 131.1 points to the December 2008 level of 168.8 (Bureau of Labor Statistics, 2014). The TCB full-year finished goods output for Year 12 was just over 148 million units and the MRO expenditure for that year was \$12.28 million.

Subtracting the Year 0 manufactured finished goods output from the Year 12 manufactured finished goods output at TCB, the difference was an increase of approximately 58 million units in annual output while the MRO expenditure change during the same time period was an increase of \$0.28 million. Using the Year 0 baseline MRO expense of \$0.142/unit produced and multiplying the 148 million units produced in Year 12, the annual MRO expenditure for Year 12 comes out to approximately \$21 million. The difference between the actual \$12.28 million MRO expenditure for Year 12 and the Year 0 baseline MRO calculation of \$21 million represents an annual MRO cost reduction of approximately \$8.75 million. Multiplying the projected \$21 million Year 12 MRO figure by the 28.8% PPI inflation rate that took place during the same twelve year period and subtracting that figure from the actual \$12.28 million Year 12 MRO expenditure, one could argue that the annual MRO cost reduction of \$8.75 million in Year 12 would have actually been closer to a \$14.77 million MRO expenditure reduction when compared to Year 0.

Discussion

The MRO supplier balance scorecard performance results experienced during the first year of the implementation at the TCB plant through Year 12 were consistent with the Kaplan and Norton (1992) explanation,

It [balanced scorecard] establishes goals and assumes that people will adopt whatever behaviors and take whatever actions are necessary to arrive at those goals. The measures are designed to pull people toward the overall vision (p. 79).

Prior to TCB's implementation of a balanced scorecard approach in 1997, there was no formal process in place that allowed the TCB plant to purposefully identify and communicate critical MRO performance expectations to its primary MRO suppliers. The MRO related performance results for the year prior to the MRO balanced scorecard implementation (Year 0) were:

- MRO cost/part = \$0.142
- Average primary MRO supplier on-time delivery = 90.24%
- Over half of the primary MRO suppliers did not use the electronic technology that TCB requested
- Emergency freight costs to the TCB plant of over \$100,000 for the year
- Cost savings ideas submitted by the primary MRO suppliers amounted to less than 2% of the TCB's annual MRO purchases

In response to a competitive threat in 1995, the TCB plant initiated a strategic objective that led to the adaptation of the balanced scorecard for MRO supplier performance measurement. The MRO supplier balanced scorecard effectively linked the plant's SCM strategic total cost reduction objective to MRO supplier performance by identifying the TCB plant's ten most critical MRO related performance measures and developing a balanced scorecard that quantified and assessed the performance level of the plant's primary MRO suppliers to those ten critical measures. Once developed, the TCB plant effectively communicated the importance of the ten critical performance expectations to its group of 23 primary MRO suppliers, as evidenced by sustained improvement in financial and non-financial MRO supplier performance results over a twelve-year period.

Bottom-line, the plant's MRO supplier balanced scorecard was able to focus the attention of all involved parties to factors beyond the unit price of MRO goods purchased. Over the twelve year period included in this study, the number of MRO product categories at the TCB plant remained the same as they were during the initial MRO supplier balanced scorecard rollout, but the number of primary MRO suppliers to the TCB facility was reduced from 23 to 16. In addition, several of the performance expectation measurements included on the MRO supplier balanced scorecard were revised or changed from the initial 1997 MRO supplier balanced scorecard rollout. In spite of these changes, the principles associated with TCB's original purpose of implementing their MRO supplier balanced scorecard remained intact.

- Measure only the top 10 MRO supplier measurements considered critical to the operational and financial success of the facility.
- Make certain the measurements represented a balanced perspective of overall MRO supplier performance.
- Make certain the MRO supplier performance measurements were easy to understand.
- Focus on the continuous performance improvement of TCB's primary MRO suppliers.

- Promote a culture of effective two-way communication and constructive MRO supplier/TCB buyer relationships.

The improved MRO supplier performance results experienced by TCB following the adaptation and implementation of the MRO supplier balanced scorecard were consistent with the Doolen, Traxler, and McBride (2006) study regarding supplier scorecard design and implementation. Doolen et al. noted, “The focus of the supplier scorecard is to improve supplier performance and ultimately improve the bottom-line performance of the customer organization” (p. 27). Interestingly, the process followed by the TCB team during 1995 - 1997 in the adaptation development and rollout of the MRO supplier balanced scorecard was consistent with the five steps recommended by Doolen et al. (2006) ten years later.

- Step 1: The customer organization must identify key performance measures for the suppliers as they relate to the strategic and operational objectives of the customer organization.
- Step 2: Balanced and objective measures for a variety of suppliers must be selected. The set of balanced measures should be few in number and must focus on real, value-added results.
- Step 3: It is critical to engage the supplier in the process of developing and implementing the supplier scorecard. It is important to request feedback from suppliers for effective implementation.
- Step 4: Establish a scorecard design that clearly presents the measures and provides suppliers with a clear and understandable evaluation of their performance.
- Step 5: Suppliers must be provided with training to understand the performance evaluation criteria and implications for unacceptable and unacceptable performance.

Although little attention in SCM research literature has been focused on the MRO supplier performance measurement should not be interpreted that opportunities do not exist within an organization to work with and improve the operational and financial performance of the organization with regard to MRO supply management. The adaptation and implementation of an MRO supplier balanced scorecard by SCM teams within most organizations may be an untapped opportunity for continuous improvement, as was the case at the TCB plant.

A key contributing factor to the success of adapting and implementing the MRO supplier balanced scorecard at TCB was the inclusion of employees from other departments within the company during the identification and selection of the initial ten critical MRO supplier performance measurements, and the willingness of MRO suppliers to be involved in the measurement development process during the scorecard beta-testing period. The upfront time that was spent gathering input from a wide range of stakeholders resulted in an MRO supplier balanced scorecard that was well vetted before its implementation.

Conclusion

It is essential that a balanced scorecard approach is treated as a dynamic process that is reflective and responsive to the changing performance expectations of an organization's MRO suppliers. While much has been written in SCM literature about the need for supplier performance improvement, virtually all of the literature has been focused on direct material suppliers to a company, or a company's position within the overall supply chain process. As noted at the beginning of this article, by one estimate the annual purchase of MRO products was at nearly \$400 million; yet little, if any, research has been published that speaks specifically to how MRO supplier performance might be measured, or what types of measurements are relevant to MRO supplier management, or why companies should even care about their MRO purchases.

Additional study is needed in different business sectors, with larger population samples, to explore how other organizations are dealing with their MRO supplier performance. Are there other companies that have adapted the balanced scorecard model so they can measure and manage the performance results of their MRO suppliers, or have companies developed more effective and efficient methods of measuring and improving MRO supplier performance? The results reported from this case study were those of a manufacturing location with a reasonably large annual MRO expenditure. There is a need to explore if similar results would be realized from manufacturing locations with a small to medium sized MRO expenditure. Finally, this was a qualitative case study. It may be useful to conduct a quantitative study to confirm the results gathered from this study and to examine integration issues more closely as they relate to adapting the balanced scorecard model to managing and measuring MRO supplier performance.

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