

# The Use of Performance Metrics as a Strategic Management Tool

\*Terry R. Collins, Ph.D., P.E.  
Assistant Professor  
Industrial Engineering Department  
University of Arkansas

Manuel D. Rossetti, Ph.D.  
Assistant Professor  
Industrial Engineering Department  
University of Arkansas

Julie A. Watson  
Research Associate  
Industrial Engineering Department  
University of Arkansas

## ABSTRACT

This paper was presented from research conducted at the University of Arkansas through the auspice of The Logistics Institute (TLI) and Department of Industrial Engineering. The research study was conducted for a governmental agency to develop a core set of meaningful, balanced and robust performance metrics to be used in the strategic management decision making process. The performance metrics collected from previous TLI research and a comprehensive literature review were been compiled and categorized into four primary dimensions of, cycle-time, quality, financial, and resource. This paper presents the research methodologies used to develop and verify the four categories of performance metrics.

**KEYWORDS:** Performance Measurement, Strategic Decision Making, Balanced Scorecard, Oregon Productivity Matrix

## INTRODUCTION

This paper presents the methodology of selecting and monitoring predetermined performance metrics for a governmental agency. All of the work completed on this project has been under the guidance of The Logistics Institute (TLI), and the United States Defense Logistics Agency (DLA). The DLA-Defense Distribution Center (DDC) is a branch of the Department of Defense. The DLA-DDC has distribution depots strategically positioned around the world. This project focused on the receiving and stowing of items into the 24 depots across the continental U.S. and issuing of materiel to military installations around the world. The DLA depots located in the continental U.S. store over 4 million items or National Stock Numbers (NSN's) with a value exceeding 8 billion dollars.

The Logistics Institute is an Industry/University Cooperative Research Center co-jointly administered by the University of Arkansas and Georgia Tech Industrial Engineering Departments. The program began in 1982 as the Material Handling Research Center (MHRC) at Georgia Tech. In 1991, The Logistics

Institute and the University of Arkansas joined the MHRC, and in 1994 the MHRC changed officially to The Logistic Institute partnering Georgia Tech and the University of Arkansas.

Since there are several interpretations for the term “performance measurement” it is appropriate to provide a clear definition used in the context of this study. Performance measurement consists of a set of analytical tools that take measurements, display recordable results, and the ability to initiate actions based on the measurement results [8]. Performance measurement is essentially comprised of several criteria consisting of: effectiveness, efficiency, quality, productivity, quality of work life, innovation, and profitability [2,9].

The remainder of this paper will discuss the objectives of the project, and the development, selection and testing of the methodology. The performance metric ballot and balloting process will also be presented. Additional information will be provided on how the various categories were defined and developed.

## **PROJECT GOALS AND OBJECTIVES**

There were several initiatives for this project regarding the development of performance metrics for use in the strategic decision making process for DLA. The first and foremost goal of the project was to develop a core set of appropriate, balanced, and robust performance metrics for the DLA depots. In close association to developing the set of performance metrics, a secondary goal was to identify the necessary information technology architecture/analysis tools that were available. This would enable DLA to categorize the most important performance metrics such that the complexity of monitoring and tracking the metrics would be manageable.

Once the goals of the project were identified, the next phase was to set clearly defined objectives to meet the expectations of the study. The project objectives are presented below:

1. analysis of the current DLA performance metrics with industry and the DLA mission to identify critical metrics relevant to the strategic decision making process,
2. accumulate and categorize a core set of critical performance metrics for DLA use,
3. identify and select the most appropriate methodology for integrating the performance measures for use in the strategic decision making process, and
4. analysis of current DLA information systems will be required to determine the level of data support for the proposed methodology.

## **LITERATURE REVIEW**

In order to satisfy the aforementioned objectives a thorough literature review was needed to identify the most appropriate method for collecting, categorizing, and presenting the results of the selected performance metrics. Choosing which metrics to monitor and track is typically the most arduous task when developing a performance measurement system. Fortunately, the drudgery of defining all of the potential performance metrics had already been done by Watson, Malstrom, and Landers in a previous TLI study for DLA [10]. The study generated a total of 247 performance measures that were considered metrics. This best practices logistics performance evaluation study reviewed earlier research work which provided insight on the methodologies used to administer a best practices studies [1,3,6,7]. Most of this

research had a logistics focus, however, all of the research applied to the general strategic decision making mission for the DLA.

Utilizing all 247-performance metrics would be well beyond the capabilities of any performance metric evaluation system. Therefore, the best practices study consolidated duplicate metrics and organized the metrics into four common categories. These categories were cycle time, quality, financial, and resource. Captured within each category was the matching performance metrics. In particular, the cycle time grouping of metrics focused on how responsive DLA was to meeting customer needs. The quality metrics specifically dealt with service quality. Monitoring both, short and long-term profitability was the purpose of the financial metrics. Finally, using resource metrics in the performance measurement system helped address the delicate issues of depot capacity and facility utilization.

Once the performance metrics were categorized, a methodology for collectively evaluating the metrics was needed. In review of the research literature there were two performance measurement evaluation models which provided the best fit with the objectives of the research study. These two models were the Balanced Scorecard developed by Kaplan and Norton [5], and the Oregon Productivity Matrix Model developed by the Oregon Productivity Center at Oregon State University [ 4 ].

The Balanced Scorecard provided the best fit with the ability to incorporate company missions and strategic management into a tool that monitored and tracked performance against set goals. The best and most distinguishing characteristic about the Balanced Scorecard model was it evaluated past performance as outcome measures and integrated these measures with long-range strategic management metrics which tend to drive future performance. Therefore, the Balanced Scorecard was said to be balanced in the sense that companies looked at the short and long term goals of the organization. Figure 1 illustrates how the Balanced Scorecard maps the strategic mission of the organization to the Balanced Scorecard categories.

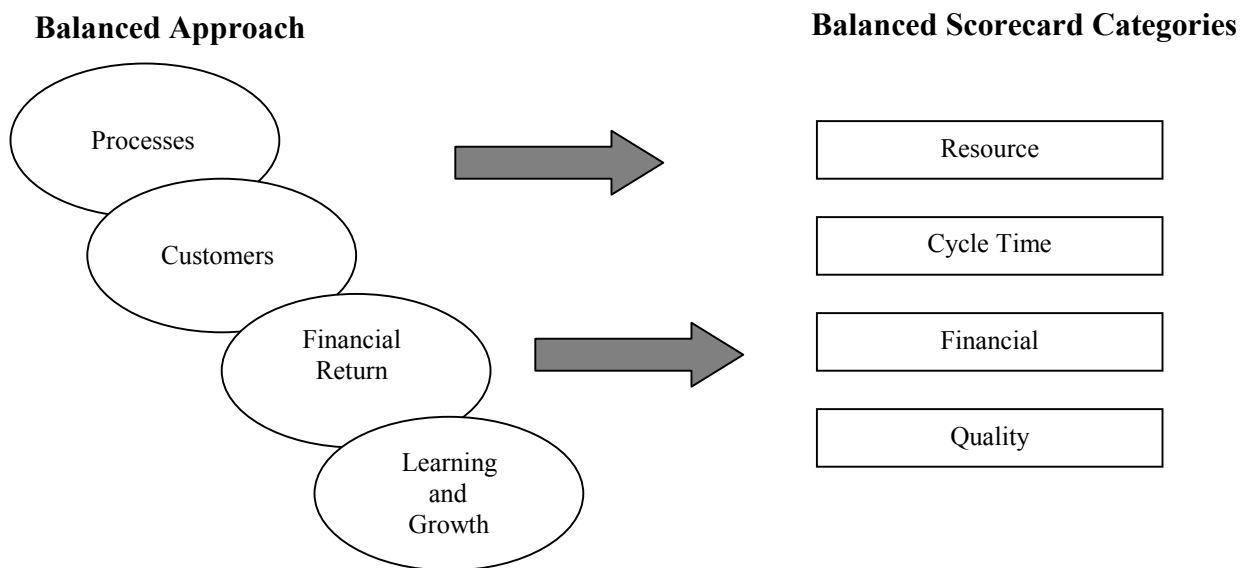


Figure 1. Using the Balanced Approach to determine the Balanced Scorecard Categories

The Oregon Productivity Matrix did not significantly differ from the Balanced Scorecard with one exception. The Oregon Productivity Matrix took multiple metrics and used a seven step process and subjective weighting system to rank/prioritize the metrics. The metrics were then added up to give a cumulative composite score. This single index was the indicator of how well the company was doing against the performance metrics. Figure 2 shows the seven-step process for the Oregon Productivity Matrix.

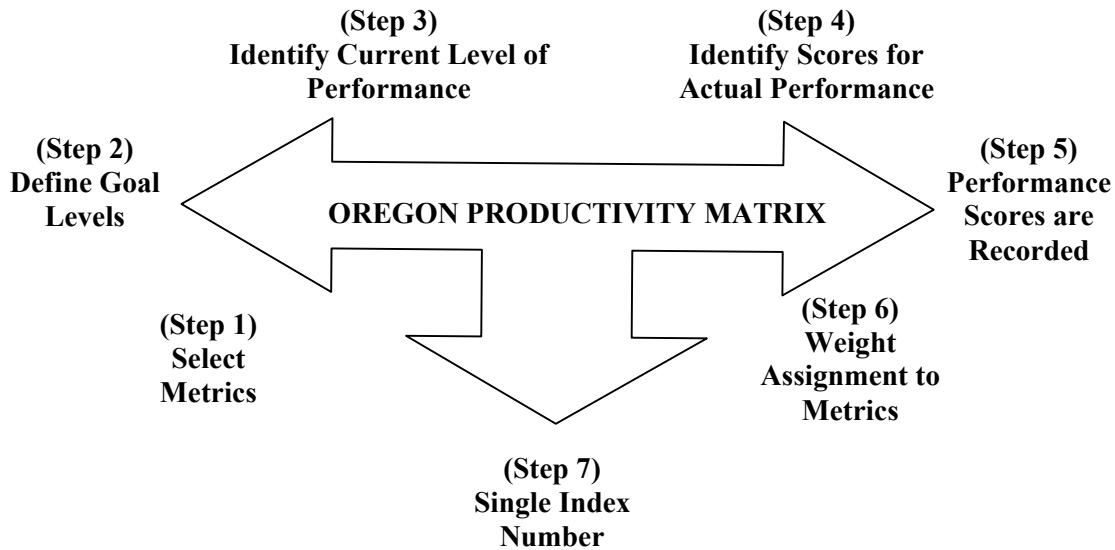


Figure 2. Seven Step Process for Oregon Productivity Matrix

### PERFORMANCE METRICS BALLOT

The initial components of the ballot were developed in an earlier TLI study with DLA-DDC [10]. TLI researchers gathered preliminary information on performance metrics through direct contact with DLA personnel and a TLI sponsored workshop with industry leaders. Figures 3, 4, and 5 show some of the information collected and used to develop specific metrics.

<b>Issuances (on-base and off-base)</b>	<b>% of TOTAL</b>	<b>Receipts</b>	<b>% of TOTAL</b>
Disposals Routine High priority		Station returns New procurements	

Figure 3. Percent Activity for Issues and Receipts

The selection of the Balanced Scorecard methodology as the performance measurement system was very appropriate as it systematically organized the performance metrics into groupings by category. Once the four categories were identified it was necessary to construct a survey instrument that would dramatically narrow down the list of metrics. The 97 performance metrics needed to be reduced to approximately 4 to 5 in each of the four Balanced Scorecard categories.

<b>Handling Characteristics</b>	<b>% of TOTAL</b>
Binable	
Medium bulk	
Heavy bulk	
Hazardous	

Figure 4. Volumetric Characteristics of the Items

The survey instrument selected for the study was a ballot-style questionnaire. The intent of the ballot was to have Depot Commanders check in each category the performance metrics that were most critical to the mission of the DLA Depot. Particular attention was given to the performance measurement issues of customer satisfaction, service, responsiveness, type of customer (civilian/military), and the characteristics of the items shipped.

<b>S E G M E N T</b>					
<b>TYPE</b>	<b>% of TOTAL</b>	<b>RETAIL</b>	<b>% of TOTAL</b>	<b>WHOLESALE</b>	<b>% of TOTAL</b>
<b>CIVILIAN</b>					
<b>MILITARY</b>					

Figure 5. Type of Customer and the proportion of retail and wholesale activity

## **BALLOTING PROCESS**

Currently, the study is in the process of completing the ballot questionnaire with each Depot Commander. The results of the ballots will be formalized into the Balanced Scorecard for the DLA-DDC. Once the balloting portion of the study is complete the fourth objective of the study will be addressed. DLA information systems will be evaluated to determine whether the selected performance metrics can be provided for analysis using the Balanced Scorecard method. The final results of the study will be presented in a future research paper.

## CONCLUSIONS

This paper presents the current findings of a research study being conducted for the DLA-DDC. The results presented in this paper have identified the best performance measurement system to be used at the DLA Depots. Using the Balanced Scorecard method, the DLA-DDC will be able to track strategic performance metrics and make decisions that reflect the mission of the Depot.

A ballot-type questionnaire has been developed to determine the most important performance metrics for the Depots. The selected metrics from each category will be used in the Balanced Scorecard. One unique feature on the Balanced Scorecard performance measurement system is that current metrics can be easily replaced with new metrics as the mission of DLA changes in time. This enables the system to be flexible and attentive to the time-based strategic management objectives of the DLA-DDC.

Thus far, this study has been very successful in developing a performance measurement system for the DLA-DDC. The four objectives mentioned in the introduction section of this paper are in the process of being satisfied. The first three objectives are near completion, and the fourth objective will be met once the performance metrics for the Balanced Scorecard have been identified.

## REFERENCES

1. A.T. Kearney, Inc. (1990) "Improving Quality and Productivity in the Logistics Process-Achieving Customer Satisfaction Breakthroughs, Oak Brook:CLM
2. Brinkerhoff, R. and D. Dressler, (1990) "Productivity Measurement: A guide for Managers and Evaluators." Sage Publications: Newbury Park
3. Cohen, M., Y. Zheng, and V. Agrawal, (1997) "Service Parts Logistics: A Benchmark Analysis." IIE Transactions, N29, 627-39.
4. Felix, G., and J. Riggs, (Autumn,1983) "Productivity Measurement by Objectives." National Productivity Review, 386-93.
5. Kaplan, R. and D. Norton, (1995) "Translating Strategy into Action: The Balanced Scorecard, Boston, MA, Harvard Business School Press.
6. Michigan State University (1989) "Leading Edge Logistics Competitive Positioning for the 1990s." Oak Brook: CLM.
7. Michigan State University (1997) "World Class Logistics: The Challenge of Managing Continuous Change." Oak Brook: CLM.
8. Rose, K. (1995) "A Performance Measurement Model." Quality Progress, V28, N2, 63-6.
9. Sink, S., T. Tuttle, and S. DeVries, (Summer,1984) "Productivity Measurement and Evaluation: What is Available?" National Productivity Review, 265-87.
10. Watson, J., E. Malstrom, T. Landers, S. Dhodpaka, V. Smith, and R. Harris, (1999) "Best Practices: Logistics Performance Evaluation." The Logistics Institute Final Report, TLI-MHRC-98-01