

Performance Measurement System Management Using a Neighborhood Rough Set Methodology

Chunguang Bai

School of Management, Dalian University of Technology,
Dalian, 116024, P.R.China, E-mail: chunguang.bai@gmail.com

Joseph Sarkis

Graduate School of Management, Clark University
Worcester, MA 01610-1477, E-mail: jsarkis@clarku.edu

Abstract

Over the past three decades, a culmination of industrial forces and transformations has caused performance measurement to become important for organizational competitiveness. These forces and transformations include the changing nature of work; increasing competition; improvement and learning initiatives; pervasive national and international quality efforts; evolving organizational roles; increasingly complex external demands; and the power of information technology. Each of these characteristics have caused organizations and researchers to develop and investigate various performance measurement systems (PMS) to help manage their operations and extending these practices beyond their organizational boundaries to their supply chain.

The importance of performance measurement also crosses disciplinary boundaries and includes engineering, marketing, finance, operations, accounting, information technology and human resource functions. This pervasive interest makes the use and application of PMS and performance measurement a strategically and operationally vital activity within organizations. Given this importance the efficient and effective implementation of these systems and their supporting performance measurement is critical to organizations.

It has been well established that an important practice related to the design and management of PMS is the careful selection and management of performance measures and metrics. The lack of formal tools and approaches to help evaluate the relationships between the performance measures and the desired competitive outcomes is surprising given the strategic or operational importance of PMS.

To help address this gap in the literature we introduce a novel application of neighborhood rough set theory to the identification and selection of performance measures for an organization. We focus on supply chain process performance measurement in this paper, but the technique can be applied to other performance measurement environments. The rough set approach utilizes aspects of information entropy (or content) in performance measures to help reduce the set of performance measures to those that directly influence external performance outcomes, specifically process customer satisfaction. The results of an illustrative example will be a final set of performance measures that can inform management about the expected external outcome (customer satisfaction) and various performance measures to the outcomes. We provide an analysis of the results with practical insights from the rules and measures. That is, how the results may be used by decision makers will be detailed. The concluding section will summarize the paper, but also point to limitations of the technique and possible methodological and application extensions to the methodology.