

ABSTRACT

An Economic Analysis of Flexible Automation In Batch Manufacturing

With Emphasis on Fabrication (May 1987)

Joel W. Troxler, B.S., University of Wyoming;

M.S., Colorado State University

Chairman of Advisory Committee: Dr. Leland Blank

The implementation of programmable manufacturing automation in American industry has lagged the technological advances made in recent years. The absence of adequate economic analysis and justification methods is a fundamental problem in dealing with capital investment decisions of this scope and complexity. But even when the justification barrier is overcome, some problems remain, as evidenced by the failure of several installed flexible manufacturing systems to produce at the desired level of output.

The preponderance of evidence in the literature and case studies suggests that justifying and tracking flexible manufacturing automation is a complex task that requires consideration of many tangible and intangible decision factors. Previously developed methods usually focus on subsets of factors measured strictly in monetary based terms. A comprehensive analysis methodology that systematically identifies the relevant decision factors and incorporates them in a procedure to indicate the value of the system to the user is presented in this dissertation. Methods of decision science and engineering economy are utilized in the analysis process. Strategic, tactical, and operational decision factors are systematically identified, scaled, and aggregated into four measures of value to the user, namely suitability with respect to strategic planning, capability, performance, and economic productivity. Each attribute measure is defined by its determining factors and specific indicators. Features of the method include: the analysis of manufacturing systems from several vantage points which allows problem isolating comparisons to be made; adaptability to both justification planning studies and post implementation tracking analysis; implicit and explicit risk evaluation.

The system value method is illustrated with alternative comparisons from the metal fabrication sector. The quantification of decision factors and the description of economic conditions address system relationships that have been altered by computerization in fabrication industries.