



NORTH-HOLLAND

Measuring Organizational Flexibility: An Exploration and General Model

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ABSTRACT

An organization is flexible if it is capable of multiple responses to its environment. Because changing over from one response to another involves "set-up costs," flexibility can be regarded as detrimental to efficiency. But in a time of globalization and rapid change in business, companies must attend to agile response (flexibility) as much as to efficiency. Efficiency can be measured by several techniques, including Data Envelopment Analysis (DEA). There is, however, no accepted, operational, and useful measure of organizational flexibility. This article characterizes the properties such a measure would have. Following some scene-setting discussion of the roles of efficiency and flexibility in theories of economics, evolution, and general systems, a general model of (relative) flexibility is proposed, building on Ashby's [1] definition of the variety that must be generated by a sustainable system. A special case of this model is applied to 10 years of financial data on 44 computer and computer-related companies. Results show that companies scoring high on a flexibility measure achieve more consistent efficiency over the time span studied. Discussion indicates how a flexibility model can complement DEA studies to round out the characterization of corporate performance. © 2000 Elsevier Science Inc.

Introduction

Flexibility means being capable of multiple responses to the firm's environment. There is a cost (in energy or money) in maintaining an inventory of responses, and changing over from one response to another involves set-up costs. A firm can achieve cost efficiencies by cutting back on its inventory of responses (and gambling that the discarded responses will not be needed), for instance by hiring less well-trained personnel. Thus, flexibility and efficiency can be regarded as antithetical or detrimental to one another.

But in a time of globalization and rapid change in business, companies must attend to agile response (flexibility) as much as to efficiency. "Agility is survival, being responsive to client requirements," says Al Walker, Executive VP of Standard Technologies,

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Technological Forecasting and Social Change 64, 23–38 (2000)
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655 Avenue of the Americas, New York, NY 10010

0040-1625/00/\$—see front matter
PII S0040-1625(99)00077-3

Inc. [2]. It also involves, he says, shortened response time and real-time assessment of the company's progress.

Efficiency can be measured by several techniques, including Data Envelopment Analysis (DEA). But there is no accepted, operational, and useful measure of organizational flexibility. This study characterizes the desirable properties of such a measure. Our focus is on overall corporate performance, and so we develop a measure that can either subsume the flexibility of the detailed functions (machine shop, foreign currency trading, etc.) of the organization, or, if data are available, model them directly.

Organization of This Article

Following a scene-setting discussion of the roles of efficiency and flexibility in theories of economics, evolution, and general systems, some theories applicable to organizational efficiency and flexibility are reviewed. These are Data Envelopment Analysis [3] and Ashby's Law of Requisite Variety, respectively. Following sections of the article list the desirable characteristics of the kind of flexibility measure we seek, and examine some candidate measures for conformance to the desired characteristics.

Next, building on Ashby's [1] definition of the variety that must be generated by a sustainable system, a general flexibility model is adduced. A special case of this model is applied to 10 years of financial data on 44 computer and computer-related companies. Results show that companies scoring high on a flexibility measure achieve more consistent DEA efficiency over the time span studied. This span encompasses the fast-changing information technology market of the 1980s.

Discussion indicates the research that is needed to make the flexibility model generally practical, and how such a flexibility model can complement DEA studies to round out the characterization of corporate performance.

A Context for Flexibility

Where does a discussion of a business firm's flexibility fit within systems theory, evolutionary theory, and economic theory?

FLEXIBILITY AND ECONOMICS

Notwithstanding some current (and a very few historical) mentions of the role of innovation in the economy, economic literature continues to emphasize efficiency and equilibrium. Microeconomics centers on the efficient production function, and on the efficient production frontier that is defined by the firms showing maximum efficiency at different scales of production. Companies can not gain from trading efficiency for flexibility. Not operating at the efficiency frontier is simple failure, and must result in the company disappearing from the marketplace.

There is much in the real behavior of firms that is not addressed by the powerful theories of microeconomics. For example, the "Stanford Visionary Companies" [4] constantly test new procedures and mechanisms, transcend tradeoffs (viz., the mathematical "catastrophe" that transforms a tradeoff between quality and productivity into a regime in which quality and productivity reinforce each other), attempt to align workers with consistent signals, try new things, and are never satisfied with "good enough." These companies demonstrate a commitment to flexibility and adaptation. In this article we acknowledge this reality while still presuming that the survival of the firm requires efficiency in the long run.

FLEXIBILITY AND EVOLUTION

Charles Darwin titled his book *The Origin of Species by Means of Natural Selection*, implying first that the species (as opposed to, say, the individual organism) was of interest for studying why different kinds of organisms inhabit an ecosystem now and

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