

## Generic manufacturing strategies: an empirical test of two configurational typologies

Sarv Devaraj<sup>a,\*</sup>, David G. Hollingworth<sup>b,1</sup>, Roger G. Schroeder<sup>c,2</sup>

<sup>a</sup> Management Department, Mendoza College of Business, University of Notre Dame, Notre Dame, IN 46556, USA

<sup>b</sup> Lally School of Management and Technology, Rensselaer Polytechnic Institute, Troy, NY 12180-3590, USA

<sup>c</sup> Operations and Management Science Department, Carlson School of Management, University of Minnesota, Minneapolis, MN 55455, USA

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### Abstract

The need to empirically test and validate typologies and frameworks that are derived deductively has been echoed repeatedly in the operations management literature. This paper reports on an empirical comparison of two configuration-based typologies: the Product–process matrix and the more recent generic manufacturing strategies model. Since there is substantial conceptual overlap between these models, a simultaneous examination provides insights about both models, and in particular, about the value-added of the generic manufacturing strategies model.

We examine hypotheses derived from these typologies using data from manufacturing plants in the United States, Italy, United Kingdom, Japan, and Germany; and from the automotive, machinery, and electronics industries. The data were analyzed using multiple analysis of variance (MANOVA) and hierarchical regression techniques. Our results indicate support for the Product–process matrix — lending further strength to a growing base of empirical research on this model. Our findings also provide support for the generic manufacturing strategies model with respect to various measures of cost, cycle time/inventory, quality, and innovation performance. Furthermore, our findings suggest that the generic manufacturing strategies model is a useful augmentation to the Product–process matrix. These findings suggest that the generic manufacturing strategy model has merit but deserves further empirical and theoretical attention. © 2001 Elsevier Science B.V. All rights reserved.

*Keywords:* Operation strategy; Process design

### 1. Introduction

A growing number of scholars are recognizing the need for empirical validation of operations management theories and propositions that are derived deductively (Adam and Swamidass, 1989; Amoako-Gyampah and Meredith, 1989; Flynn et al.,

1990; Swamidass, 1991). Bozarth and McDermott (1998) take the position that “a typology is not fully developed until it has been empirically validated”.

In this study, we compare and contrast two of these typologies: one that has been partially validated empirically — Hayes and Wheelwright (1979a,b, 1984) Product–process matrix, and another, which has not received empirical scrutiny — Kotha and Orne (1989) proposed generic manufacturing strategy framework. Frequently, theoretical frameworks are validated individually. However, substantial conceptual overlap exists between these two theories. Therefore, it is both interesting and useful to

\* Corresponding author. Tel.: +1-219-631-5074.

E-mail addresses: sdevaraj@nd.edu (S. Devaraj), hollid@rpi.edu (D.G. Hollingworth), rschroeder@csom.umn.edu (R.G. Schroeder).

<sup>1</sup> Tel.: +1-518-276-6445.

<sup>2</sup> Tel.: +1-612-624-9544.

simultaneously examine the similarities and differences between these two theories. Where the two theories overlap, similar predictions should emerge from both of them. Competing or differing hypotheses should also result from the differences between these two theories. These similarities and differences can be evaluated empirically, thus, providing both a test of the predictive capability of each theory as well as a test of the differences between them.

The value of this approach is two-fold. First, it provides additional empirical validation of the Product–process matrix while providing an initial empirical validation of Kotha and Orne (1989) generic manufacturing strategies framework. The second potential benefit is derived from the simultaneous examination of the two related theories. This approach can provide useful insights about the value added of one theory over and above the other. In a statistical sense, it is analogous to the partial *F*-test for a new set of variables (suggested by the generic manufacturing strategies framework) in a baseline model (that represents the Product–process matrix).

The rest of the paper is organized as follows. We review the relevant literature in Section 2. In Section 3, we develop the hypotheses that will be empirically tested. The research design and description of the variables is presented in Section 4. The estimation procedures are discussed in Section 5. Finally, in Section 6, we present results, discussions, limitations, and future directions of research.

## 2. Literature

Until recently, the Product–process matrix, proposed by Hayes and Wheelwright (1979a,b, 1984) has been widely accepted without empirical validation. It has been reproduced in numerous production and operations management texts and taught widely in business and engineering management schools. Only recently, have studies examined its empirical validity. Three studies reported in the literature have examined the Product–process matrix from differing perspectives, with different objectives, and have come to somewhat different conclusions. These studies are compared and contrasted in Table 1.

DeMeyer and Vereecke (1996) and Safizadeh et al. (1996) both conclude that while the manufacturing environment has changed significantly since the Product–process matrix was proposed, it appears to still have substantial predictive and descriptive ability across a broad range of industries, in multiple countries, in different and diverse markets, and across a broad range of products. In stark contrast, McDermott et al. (1997), using an arguably more precise method of “triangulated” data collection, in a more specific setting, found exactly the opposite result. They observed that the Product–process matrix initially succeeded, but eventually failed to adequately describe firms’ strategic actions over a 30-year time period.

Each of these three studies exhibit strengths and weaknesses, and it would be presumptuous to declare the Product–process matrix fully validated based upon DeMeyer and Vereecke (1996) and Safizadeh

Table 1  
Empirical studies of the Product–process matrix

	DeMeyer and Vereecke, 1996	Safizadeh et al., 1996	McDermott et al., 1997
Unit of analysis	“Companies”	“Plants”	“Firms”
Empirical methodology	Survey	Survey	Three methods: survey, interview, site visit
Sample size	1700	144	Nine companies, multiple USA plants
Geographic location	French manufacturers	USA manufacturers	USA, Asia, and European owned
Industry diversity	Very broad	Somewhat broad	Narrow — 1 industry
Customer market	French and international	USA primarily	USA — a few large customers dominate
Products	A broad range	A moderate range	A commodity-like product
Findings relative to Product–process matrix	Describes industry groups well, describes companies moderately well	Describes plants very well, especially when considering flexible technology and parts commonality used to obtain customization	Product–process matrix succeeds, then fails as a means of explaining the “strategy” of the firms.

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