

The impact of time-based manufacturing practices on mass customization and value to customer

Qiang Tu^a, Mark A. Vonderembse^{b,*}, T.S. Ragu-Nathan^b

^a College of Business, Rochester Institute of Technology, Rochester, NY 14623, USA

^b College of Business Administration, The University of Toledo, Toledo, OH 43606, USA

Abstract

Mass customization capabilities enable firms to design, produce, and deliver a high volume of differentiated products that meet specific customer needs in a timely manner and at close to mass-production prices. A critical part of mass customization is simultaneously achieving customer responsiveness, cost efficiency, and high volume production in the manufacturing system. This research describes mass customization and provides a framework to understand the relationships among time-based manufacturing practices, mass customization, and value to the customer. It involves the development of an instrument to measure mass customization. Data were collected from 303 manufacturing firms of various size, location, and industry to develop the instrument and test the relationships in the framework. The primary research method was structural equation modeling using LISREL. The study indicates that firms with high levels of time-based manufacturing practices have high levels of mass customization and value to the customer. Also, firms with high levels of mass customization have high levels of value to customer. © 2001 Elsevier Science B.V. All rights reserved.

Keywords: Mass customization; Time-based manufacturing; Value to customers; Structural equation modeling

1. Introduction

Skinner (1985) stated that US manufacturers have a serious management problem. A problem caused by an obsolete mind-set rooted in an industrial paradigm that has become dysfunctional for firms operating in a globally competitive, rapidly changing environment. This industrial mind-set treats the factory as a productivity machine that emphasizes maximum efficiency and stability by buffering the technical core from external changes, including customer requests for specific product features and performance (Tompson, 1967). During this era, management sought to

maximize profit by reducing cost through process mechanization and high-volume, mass production. As firms move from an industrial environment that focuses on internal efficiency to a post-industrial environment that emphasizes customer value, how can they simultaneously achieve the volume and cost efficiency of mass producers and the customization capabilities of job shops?

Shifting from an industrial to a post-industrial paradigm requires fundamental changes in management thinking as well as manufacturing systems design. Skinner (1985), Porter (1996), Hayes and Pisano (1996), Huber (1984), and Doll and Vonderembse (1991) suggested that the post-industrial era is characterized by growing global competition, changing customer requirements, increasing market diversity, and advancing manufacturing and information technology. Champlin and Olson (1994) described three

* Corresponding author. Tel.: +1-419-530-4319;

fax: +1-419-530-8497.

E-mail address: mark.vonderembse@utoledo.edu

(M.A. Vonderembse).

revolutionary changes for post-industrial manufacturing, i.e. global competition, technology advancement, and new managerial practices. Hayes and Pisano (1994) suggested that fragmented markets and fierce global competition demand greater manufacturing flexibility.

At the heart of these changes are increasingly individualized customer requirements (Porter, 1996). Bowen et al. (1989) proposed incorporating a customer service orientation into the manufacturing context. This concept of customer-driven manufacturing is gaining increasing popularity worldwide (Murakoshi, 1994). Global competition further stimulates this change and forces manufacturers to keep costs low while providing customized products and services (Parker, 1996; Anderson and Pine, 1997).

Manufacturing firms are searching for ways to attain “mass customization” (Pine, 1993), which is the ability to quickly design, produce, and deliver products that meet specific customer needs at close to mass-production prices. The foundation of mass customization is the ability to achieve customer responsiveness, cost efficiency, and high-volume production, simultaneously. Time-based manufacturing practices which include shop floor employee involvement in problem solving, reengineering setups, cellular manufacturing, preventive maintenance, quality improvement efforts, dependable suppliers, and pull production facilitates mass customization. They enable firms to slash time from operations and allow them to quickly change over between products. These practices should help firms to quickly and cheaply manufacture a variety of products that meet specific customer needs (Koufteros et al., 1998).

Some research studies examine the phenomenon of mass customization, but most studies are anecdotal in nature (Pine et al., 1993; Kotha, 1995). For example, Kotha (1995, 1996) conducted in-depth case studies of the National Bicycle Industrial Company of Japan, which designed, built, and delivered bicycles to precisely fit each customer’s physical dimensions. The case studies demonstrate the practical value and feasibility of mass customization. The current literature tends to describe the market implications of mass customization, but fails to provide operational measures (Duray, 1997). Empirical studies that investigate the

relationships between time-based manufacturing practices and mass customization are not available and represent an important missing link in manufacturing research.

This research defines mass customization and develops a valid and reliable instrument to measure it. Valid and reliable measures of time-based manufacturing practices (Koufteros et al., 1998) and customer value (Tracey, 1996) are provided by existing instruments. The study proposes a model for investigating the relationships among time-based manufacturing practices, mass customization, and the organization’s ability to create customer value. Theory development is essential for building a conceptual knowledge base and specifying hypothesized relationships among key variables (Hair et al., 1995). These hypothesized relationships are examined using structural equation modeling.

2. Theoretical framework

Customers are seeking products that meet specific applications (Peppers and Rogers, 1997). Mass customization, which is intended to produce customized products at mass scale without sacrificing efficiency, may become the basis of the next “industrial revolution” (Lau, 1995). Fig. 1 suggests that mass customization (MC) capabilities are affected by the firm’s ability to implement time-based manufacturing practices (TBMP). These practices eliminate waste, cut throughput time, and enhance flexibility (Blackburn, 1991; Koufteros et al., 1998; Monden, 1983). They help to create a manufacturing system that is responsive to customer requirements. MC has a direct impact on value to customer (VC). Empirical evidence suggests that customized products offer greater value than standardized products (Duray, 1997; Kotha, 1995). TBMP also has a direct impact on a firm’s VC. Customers value the impact of TBMP, such as high system reliability and productivity, even when the need for customization is low.

In the following sections, MC is defined so valid and reliable measures can be developed. TBMP and VC are described in order to facilitate theory development. The theories that relate TBMP, MC, and VC are discussed, and hypotheses are developed.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات