

Linking learning and effective process implementation to mass customization capability

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Abstract

This study investigates the role of learning and effective process implementation in the development of mass customization capability. Building upon the knowledge-based view of the firm, we argue that internal and external learning are two knowledge-generation routines that contribute to effective process implementation. Effective process implementation, in turn, is a knowledge-based manufacturing capability, which, as a function of internal and external learning, leads to mass customization capability. We employ structural equation modeling to empirically test the effects of learning on mass customization capability, mediated by effective process implementation, using survey data collected from 100 manufacturing plants in 3 industries and 6 countries. Our results provide empirical evidence supporting the proposed model of the effect of internal and external learning on mass customization capability, fully mediated by effective process implementation. This research is one of the first studies to integrate insights from the knowledge-based view of the firm and mass customization. It complements the OM view of mass customization, which to date has largely focused on the technical side, by demonstrating the role of managerial practices and learning in cultivating mass customization capability in a manufacturing environment.

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1. Introduction

As competitive pressures intensify and product life cycles shorten, mass customization (MC), as an emerging paradigm, is becoming increasingly important. Companies are searching for ways to develop MC capability to

meet specific customer needs in a cost-efficient way. A number of potential solutions to the development of MC capability, including changes in the product design and manufacturing process, have been proposed (Feitzinger and Lee, 1997; Tu et al., 2001). However, the existing literature offers little insight regarding the development or implementation of these solutions, which many companies have found difficult to apply. An increasing amount of anecdotal evidence indicates the urgent need to advance the existing literature by exploring the antecedents to MC capability. Toward this end, our study focuses on investigating how manufacturing plants develop resources and capabilities associated with the manufacturing process in pursuit of MC capability.

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From an operations management (OM) viewpoint, MC refers to the ability to quickly produce customized products in large volumes and with a cost, quality, and delivery comparable to that achieved by mass production (MacCarthy et al., 2003). Compared to mass producers, manufacturers that customize their products may face a more complex and dynamic production environment and often deal with changes in process technologies. In such an environment, simply installing new process technologies is not enough (Kakati, 2002). To realize the potential of these new processes and technologies, manufacturers must implement them appropriately. Earlier innovation studies indicate that effective process implementation is a critical operations capability, but one that is very difficult to develop (Jayanthi and Sinha, 1998). Knowledge creation and learning can influence a manufacturer's capacity to effectively implement new processes and technologies (Tu et al., 2006). In the MC context, Kotha (1995, 1996) uses the case of National Bicycle Industrial Company of Japan to illustrate the important role of knowledge and organizational learning in the building of MC capability. Similarly, Pine et al. (1993) argue that learning is a prerequisite for the development of MC capability. Other MC researchers also conclude that mass customization calls for a transformed company—a learning organization (Hirschhorn et al., 2001).

Building upon the existing literature, this study develops a conceptual framework that relates learning and effective process implementation to the development of MC capability. Our inquiry is guided by the knowledge-creating version of the knowledge-based view (KBV) of the firm (Spender, 1996; Nonaka, 1994). The KBV we draw upon considers knowledge as a strategically valuable resource and emphasizes the role of the firm in creating knowledge that eventually leads to superior performance. This knowledge creation-based KBV theory has become essential in a hypercompetitive environment where firms are expected to constantly innovate new products/processes and improve the efficiency and effectiveness of the existing ones (Nonaka, 2007). Since it focuses inside the firm to see how capabilities can be developed to improve performance through the creation of knowledge, KBV theory provides a useful theoretical lens enabling OM researchers to search for answers to their questions regarding the development of operations competence. Therefore, we apply arguments from the KBV to our investigation of pathways to the building of MC capability. Specifically, we propose that two knowledge-generating routines – internal learning and external learning – lead to effective

process implementation, which, in turn, improves a manufacturer's MC capability.

This study contributes to the MC literature in several unique ways. First, we integrate insights from the KBV and OM research to build a better understanding of how to develop MC capability. As a result, we complement the OM view of MC – which by and large focuses on the technical side of MC (Duray, 2006), including such issues as modularization and postponement – by demonstrating the role of soft managerial practices in cultivating MC capability in a manufacturing environment.

Second, we extend the existing MC literature by exploring the antecedents to process implementation suggested by practitioners and researchers, and systematically testing a path model using large-scale cross-sectional data. With a few exceptions, the existing MC literature is largely conceptual and case-based (Pine et al., 1993; Kotha, 1995; Feitzinger and Lee, 1997). Although these conceptual and case studies provide useful insights, the lack of large-scale empirical studies limits the generalizability of the ideas (Duray, 2006). To that end, our study utilizes empirical data collected from different industries and countries and finds empirical confirmation for the proposed KBV theory and associated hypotheses.

The remainder of the paper is organized as follows. In the next section, we review the relevant literature, introduce the constructs of interest, and present our research hypotheses. In Section 3, we describe the data used for the analysis and report psychometric properties of the research constructs. Section 4 presents the empirical results and discussion. Finally, in Section 5 we conclude with the contributions and limitations of this study and suggested directions for future research.

2. Literature review and research hypotheses

The term “mass customization” was first coined by Davis (1987) in his book *Future Perfect* and popularized by the seminal work of Pine (1993b). MC arises as the result of customers' increasingly unique needs and intensifying competition. The existing research views MC as a strategic choice and develops various conceptual frameworks to classify different mass customizer types. For instance, Lampel and Mintzberg (1995) define a continuum of five MC strategies based upon the chosen level of customization. Duray et al. (2000) contend that point of customer involvement and type of modularity are the varying features of MC, and they propose four types of mass customizers – fabricators, involvers, modularizers, and assemblers – accordingly. These early studies

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