Available online at www.sciencedirect.com
ScienceDirect
Computers in Industry 59 (2008) 351–363
COMPUTERS IN INDUSTRY
www.elsevier.com/locate/compind

Technologies in support of mass customization strategy: Exploring the linkages between e-commerce and knowledge management

Marilyn M. Helms [a,*], Mohammad Ahmadi [b,1], Wen Jang Kenny Jih [c,2], Lawrence P. Ettkin [b,3]

[a] Dalton State College, 213 N. College Drive, Dalton, GA 20730, United States
[b] University of Tennessee at Chattanooga, 615 McCallie Avenue, Chattanooga, TN 37403, United States
[c] Department of Computer Information Systems, Jennings A. Jones College of Business, Middle Tennessee State University, 1301 East Main Street, Murfreesboro, TN 37132-0001, United States

Received 27 November 2006; received in revised form 30 April 2007; accepted 13 September 2007
Available online 5 November 2007

Abstract

This paper explores two major interdisciplinary techniques facilitating mass customization strategies—e-commerce and knowledge management. The linkages between the two serve to validate the strategic shift toward mass customization. Internet-enabled e-commerce provides capabilities for firms to reach global buyers and suppliers and is increasingly recognized as a way to support the gathering of knowledge, specifically customer preferences. Knowledge management provides frameworks needed to manage intellectual capital as a valuable organizational resource for supporting customized preferences. Knowledge management makes mass customization a more viable strategy for manufacturers as they work to meet changing customer needs and desires. This article posits the linkage between e-commerce and knowledge management can support firms as they gather customer preferences and evaluate the data to advance mass customization. A profile for firms to assess their readiness for mass customization, specifically considering available knowledge management and e-commerce linkages, is provided along with areas for future research.
Published by Elsevier B.V.

Keywords: Knowledge management; Electronic commerce; Information technology; Mass customization

1. Introduction

Although the term ‘‘mass customization’’ was identified by Davis [1] in his book, *Future Perfect*, when he referred to the term as an oxymoron of mass production and customized goods [2], the concept emerged for the first time in the book *Future Shock* [3]. Later the term shifted toward a new business strategy and not just an evolution of mass production [4]. Mass customization relies on component standardization, modularization, or form postponement [5,6]. Other linking technologies like e-mail and the Internet allow firms to rapidly and more effectively communicate with consumers in a co-design process to learn exactly is wanted in services and product features.

Today’s customers are demanding quality, style, and uniqueness over homogeneous products. The purpose of this paper is to explore the information technology (IT) components to meet these unique and changing consumer desires to support a mass customization strategy. Specifically, two emerging and supporting technologies – e-commerce and knowledge management – are considered. The role of e-commerce is vital to capturing information resulting from customer feedback and electronic interactions. Knowledge management or on-going learning from customers and stakeholders is necessary to continually develop and refine product and service offerings for customization.

E-commerce provides the linkage to capture external information. Knowledge systems combine this information with internal organizational expertise transforming the information into knowledge to improve product options. The aim is to integrate these different but appropriate areas of information and communication technology as enabling tools to advance mass customization as a more viable organizational strategy. Based on a review of the current mass customization, e-commerce, and knowledge management literature, questions for top management to consider as they explore organizational

* Corresponding author. Tel.: +1 706 272 2600; fax: +1 706 272 4525.
E-mail addresses: mhelms@daltonstate.edu (M.M. Helms), ahmadi@utc.edu (M. Ahmadi), kjih@mtsu.edu (W.J.K. Jih), Lawrence-ettkin@utc.edu (L.P. Ettkin).
[1] Tel.: +1 423 425 4410; fax: +1 423 425 4158.
[2] Tel.: +1 615 898 5181; fax: +1 615 898 5187.
[3] Tel.: +1 423 425 4403; fax: +1 423 425 4158.

0166-3615/$ – see front matter. Published by Elsevier B.V.
doi:10.1016/j.compind.2007.09.003

readiness for mass customization are developed and are presented for discussion and strategic planning purposes.

2. Mass customization

While a company's marketing department may offer individualized or customized products, the offering typically means similar variations of the same mass produced items are available-like colors, features, materials or other options. If mass customization is the best way to delivery the desired uniqueness to customers, then customer involvement during the design process (including the utilization of web-based product development methodologies) provide the capability for this necessary involvement and serves to differentiate customization from mere product and service variety, defined as just additional, new offerings to the marketplace (see [7] for a discussion of the unique differences between variety and customization).

While a few products have been mass customized, many more products remain possibilities. A customized car might involve a paint option, a variety of wheels or tires, or seat styles. Computers too can be customized as various software and hardware can be easily added. Baseball gloves, for example, come in only standard sizes and it is often hard to find an exact fit. Though mass customization, a customer can select the correct length of fingers, correct pockets, correct wrist size, and even the glove color they desire.

While manufacturers struggled in the past to meet the wants and needs of their customers without sacrificing the efficiencies and profits gained through mass production, developments in information technology have increased the viability of a mass customization strategy. Most computer-aided-design (CAD) and computer assisted manufacturing (CAM) equipment used in apparel pattern making enable mass customization through the automatic alteration of patterns for individual body measurements. An essential key to the use of these enabling technologies is the ability of CAD systems to integrate measurement information and make changes to patterns, as necessary, without permanently changing the original garment pattern.

Interactive product websites too have advanced so customers can view the final prototype of their mass customized product on-line (i.e., running shoes at www.nike.com; teddy bears at www.vermonteddybear.com; custom chinos at www.landsend.-com; or custom shirts at www.customizedgirl.com). Services too offer mass customization (e.g., cafeteria human resources benefits, selected cable television or satellite ratio station packages) or around a standard product (e.g., in-home service policies, extended warranties).

3. Mass customization strategy

Researchers have examined important features and success factors of mass customization (see, for example [8–12]). Silveira et al. [13] and McCutcheon et al. [14] extended the concept of mass customization as a viable organizational strategy. Ahlstrom and Westbrook [8] agree most articles on mass customization are concerned with the strategic impact of the concept. Yet most of the articles with a strategic theme do not address specific implementation issues.

Several studies explored the fuzzy characteristics of customer needs elicitation and the difficulty of capturing the necessary information to aid customization. Blecker et al. [15] examine what they called ''recommender systems'' within e-commerce for the mass customized environment and focused their research on gathering the implicit characteristics of customers needs. E-commerce systems use these recommender systems to search for products or services corresponding to customer- specific preferences or requirements. Blecker et al. [16] agree an information system based on an electronic market is the suitable approach for steering mass customization. Chen et al. [17] recognized too the ''fuzzy'' aspects of customer language and developed a corresponding fuzzy-logic model for product customization. The authors agree with the increasing popularity of the Internet, it is possible for consumers to be involved in the design of products that reflect their personalities and the medium can be used to facilitate this consumer input in the product design phase.

4. Electronic commerce and mass customization

E-commerce uses computer networks and the Internet to buy and sell products, services and transmit information. Researchers have analyzed e-commerce business models from many perspectives and frameworks [18–20] and agree when used properly, the Internet can become the technological foundation of an innovative strategy.

E-commerce includes business-to-consumer (B-to-C), business-to-business (B-to-B), and internal business interactions via an Intranet [19–22]. Data exchange between manufacturers and their suppliers (B-to-B) can be handled efficiently and in a timely manner using e-commerce techniques but often must be paired with agent technology that allow the computerized data systems of all supply chain partners to accurately communication together to transmit timely data. Further study of agent-based coordinate by Sugumaran et al. [23] found systems collaboration and coordination among first. To interface the various participants working together, multi-agent systems are needed. Business to consumer (B-to-C) e-commerce supports mass customization by selling product and service options, on-line.

Business-to-business e-commerce interactions are handled by electronic data exchange which, through agent technologies, standardizes the information and orders between companies, permitting direct communication between numerous and varied business application systems. Customers need a way to describe exactly what they want to purchase and this task can be supported by interactive, integrated e-commerce configuration tools and systems (see [24,25]). If an order forces an engineering change, software for engineering data management allows quick design changes and can be integrated with systems responsible for production control and planning. The integration of suppliers as well as the coordination of cross-organizational production processes is critical success factors for mass customization (see [26]).

How the Internet is incorporated in the value-creating business strategy, rather than the mere presence on the Internet