Mass customization: A method for market segmentation and choice menu design

Flávio S. Fogliatto[a],[*], Giovani J.C. da Silveira[b]

[a]*Department of Industrial and Transportation Engineering, Federal University of Rio Grande do Sul, Av. Osvaldo Aranha, 99/5o, Andar 90040-020, Porto Alegre, Brazil*
[b]*Haskayne School of Business, University of Calgary, 2500 University Drive NW, Calgary, Alberta, Canada T2N 1N4*

Abstract

This paper proposes a method for designing choice menus for mass customization (MC). The method is based on the analysis of stated preferences (SP) on product or service attributes obtained through panel studies. The method is first presented, and then illustrated with a real world case application in a natural gas (NG) distribution company. The case application indicated the method was able to elicit stated preferences on a broad range of attributes enabling the design of choice menus of different sizes and content for alternative customer segments, thus balancing the trade-off between flexibility and complexity that is at the core of choice menu design.
© 2007 Elsevier B.V. All rights reserved.

1. Introduction

Mass customization (MC) has been defined as the ability to produce personally designed products and services at near mass production cost (Davis, 1987; Boynton et al., 1993). It is enabled by a series of advanced technologies including flexible manufacturing systems (FMS), computer aided design (CAD), and information networks (Boynton et al., 1993; Kotha, 1996; Lau, 1996). Over the last decade, MC has evolved from being the visionary idea coined by Davis (1987) to become an increasingly widespread model for manufacturing and service businesses. Research on MC has also progressed from an initial focus on the manufacturing capabilities to produce variety at low cost to a broader emphasis on supply chain coordination and customer involvement in the process of designing, producing, and delivering MC products and services (e.g. Wind and Rangaswamy, 2001; Addis and Holbrook, 2001; Kopczak and Johnson, 2003).

In this expanded view of MC, facilitating customer involvement in specifying or designing a personalized product has become one of major determinants of a successful customization strategy (Duray and Milligan, 1999; Wind and Rangaswamy, 2001; Ogawa and Piller, 2006). The use of "choiceboards" (Slywotzky, 2000) or "choice menus" (Liechty et al., 2001) emerged as a successful approach to efficiently enable customers to select

*Corresponding author. Tel.: +55 51 33164005; fax: +55 51 33164007.

E-mail address: ffogliatto@producao.ufrgs.br (F.S. Fogliatto).

product and service attributes in that context (Oliva, 2002).

Despite the increasing presence of choice menus in business and consumer industries ranging from apparel to telecommunications and financial services (Bharati and Chaudhury, 2004), few studies appear to have focused on problems associated to their design and configuration. Sonsino and Mandelbaum (2001) indicated that a well-designed choice menu should balance the trade-off between flexibility and simplicity in user choice. Despite the documented cases of companies that have been challenged by this particular trade-off (Wind and Rangaswamy, 2001), there has been limited research on methods to specify the number and types of options to incorporate in a choice menu.

This paper proposes a method for choice menu design in a MC context. The method, based on the analysis of customers' stated preferences about service or product attributes, has some important features. First, it is based on the use of traditional market research techniques, such as focus groups, quantitative research through questionnaires, and stated preferences (SP) modeling. Second, it uses cluster analysis and experimental design techniques to guide data collection from customers, leading to databases that are both cost-efficient and representative. Third, it proposes the use of SP modeling using logistic regression, which is both easy to interpret and available from common statistical packages and spreadsheet programs.

This paper is structured as follows. Section 2 presents the research background on customer involvement in MC, choice menus, and the stated preference method. Section 3 describes the method for choice menu design. Section 4 presents a real case of the method application in the NG industry. Section 5 discusses the study implications and conclusions.

2. Research background

2.1. Customer involvement in MC

In the context of customized production, customer involvement has been defined as user's direct participation in the design of a personalized product or service (Sioukas, 1995). Authors such as Duray (2002) and Ogawa and Piller (2006) suggested that customer involvement in design is a major determinant of the degree of personalization that can be offered by MC systems. Long-established MC case examples such as Ross Controls, Ritz-Carlton, Levi Strauss, Dell Computers, Custom Foot, and NBIC seem to have all integrated mechanisms to incorporate customer preferences into customized products or services (Pine et al., 1995; Duray and Milligan, 1999; Byrd, 2001; Wind and Rangaswamy, 2001).

From a producer's perspective, fostering user involvement in the design of MC products and services may lead to benefits including market learning, customer satisfaction, and improved performance. Obtaining and accumulating data about customer preferences improves learning about market trends, consumer preferences, and the trade-offs made in choosing products, which in turn helps to retain the customer base (Pine et al., 1995; Wind and Rangaswamy, 2001). Customer satisfaction increases as the final product or service incorporates his or her own specifications (Sioukas, 1995). Finally, productivity increases as customers carry out some of the tasks previously performed by the organization (Lovelock and Young, 1979).

Having recognized the benefits of user involvement, mass customizers now face the challenge of developing mechanisms to enable customers to communicate their individual preferences. Traditional techniques such as surveys and interviews have only limited ability to support individual customer choice (Duray and Milligan, 1999). For example, Wind and Rangaswamy (2001) compared the case of Dell that delivered 25000 assembly variations in 1999 with that of a company that offered 20 million options of a car but got orders mainly for the 20 models that were in show at dealers. Turning customers into effective co-designers requires the development of design interfaces providing individuals with ready access to standard components to be combined in a way that matches their needs (von Hippel, 1998). Such customer–supplier interfaces have been increasingly provided in the form of choice menus.

2.2. Choice menus

As discussed earlier, providing customers the ability to co-design products or services based on their own preferences has been considered one of the most distinctive features of MC (Duray, 2002; Ogawa and Piller, 2006). Over recent years, firms have increasingly offered menus (often over Internet-based interfaces) to allow customers to design