Chapter I
Mass Customization with Configurable Products and Configurators: A Review of Benefits and Challenges

Mikko Heiskala
Helsinki University of Technology, Finland

Juha Tihonen
Helsinki University of Technology, Finland

Kaija-Stiina Paloheimo
Helsinki University of Technology, Finland

Timo Soininen
Helsinki University of Technology, Finland

ABSTRACT

Configurable products are an important way to achieve mass customization. A configurable product is designed once, and this design is used repetitively in the sales-delivery process to produce specifications of product individuals meeting customer requirements. Configurators are information systems that support the specification of product individuals and the creation and management of configuration knowledge, therefore being prime examples of information systems supporting mass customization. However, to the best of our knowledge, there is no systematic review of literature on how mass customization with configurable products and use of configurators affect companies. In this chapter, we provide such a review. We focus on benefits that can be gained and challenges which companies may face. A supplier can move to mass customization and configuration from mass production or from full customization; we keep the concerns separate. We also review benefits and challenges from the customer perspective. Finally, we identify future research directions and open challenges and problems.
INTRODUCTION

Today, customers are demanding products that will better meet their increasingly diverse needs. Mass customization (MC) has been proposed (Pine, 1993a) as a more cost-efficient solution to this challenge than full customization (FC), a term we use in this chapter for craft production of one-of-a-kind, bespoke products. MC is the ability to provide products tailored to individual customer needs on a large scale at, or close to, mass production (MP) efficiency, using flexible processes (Da Silveira, Borenstein, & Fogliatto, 2001; Hart, 1995; Pine, 1993a). One way to implement MC is through configurable products (CP). The design of a configurable product specifies a set of pre-designed elements and rules on how these can be combined into valid product individuals (Salvador & Forza, 2004; Tiihonen & Soininen, 1997). Such knowledge is called configuration knowledge. The design of a configurable product is used repetitively, in a routine manner without creative design, in the sales-delivery process to produce specifications of product individuals that meet the requirements of particular customers. Defining a valid, error-free (sales) specification of a customer-specific product individual can be difficult because the product elements often manifest complex interdependencies and incompatibilities. Some companies have addressed this difficulty by employing information systems called product configurators (or configurators, for short) as support in the task of defining a sales specification (Barker & O’Connor, 1990; Forza & Salvador, 2002a, 2002b). A configurator is an information system that supports the creation and management of configuration knowledge and the specification of product individuals (Sabin & Weigel, 1998; Tiihonen & Soininen, 1997).

However, to the best of our knowledge, there is no systematic review of literature on how configurators affect the operations and business of companies pursuing mass customization with configurable products. The majority of papers describe the introduction and use of a configurator in a single-case company. A significant set of papers describes issues of MC, CP, and configurators. This review aims to provide a summary.

The rest of this chapter is structured as follows. Next, the overall framework of the literature review is described. The following section then contemplates the benefits and challenges of MC and CP for the supplier and customer, first compared with MP and then compared with FC.

This section is followed by a discussion of configurator benefits, how they may overcome or alleviate the MC and CP challenges, and then moves on to configurator challenges. Also in this section, the supplier perspective is discussed before the customer perspective. Before suggestions for future research directions, discussion, and conclusions end this chapter, the rationale for a company to move to MC are briefly discussed.

LITERATURE REVIEW METHODS AND FRAMEWORK

For the literature review, we first identified the benefits and challenges attributed to MC, configurable products, and configurators. Second, we studied how configurators have been used to meet the challenges related to MC with configurable products. Third, we identified unmet challenges and remaining problems in configurator-supported MC and derived suggestions for future work. The framework for our literature review reflects this process and illustrates our viewpoints (see Figure 1). We classified benefits and challenges according to whom they concern (supplier or customer) and the direction of a move to MC. A supplier can move to MC (Duray, 2002; Lampel & Mintzberg, 1996; Svensson & Barfod, 2002) and CP (Tiihonen & Soininen, 1997) from either the direction of MP or FC. The latter classification is not visible in Figure 1.

We used electronic scientific databases with search terms such as mass customization, cus-