
Editorial

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1 Introduction

In today's dynamic changing economy, the ability to manage the value chain from the customers' point of view, not from the perspective of the provider, determines the competitiveness of many companies. The idea of a customer-centric enterprise is to focus all company operations on serving customers and delivering unique value by considering customers as individuals (Tseng and Piller, 2003). Contrary to other forms of customer orientation, this value is created as a result of a collaboration or co-creation process between the company and its customers. Customers are becoming more and more empowered and are using this power to 'vote' with their payment individually, not as a group or a block. They make their own judgement based on the value assessed from their own perspectives at the moment of transaction. However, the wide spectrum of personal value along with the diversity of personal preferences poses a major challenge for managers who are dedicated to serve. Thus, companies should neither just operate their businesses as usual by considering customers as a group nor by trying to serve the so-called 'average customers'. Even worse, companies can be misguided by setting up the whole operations for the convenience of provisioning without putting the customers at the centre.

The advent of computing and communication technology enables pervasive connectivity and direct interaction possibilities among individual customers and between customers and suppliers. This connectivity offers an enormous amount of additional flexibility. Beyond 'listening into the customer domain' (Dahan and Hauser, 2002) to address specific needs better and in a shorter response time, manufacturers are enabled to connect the capabilities of different suppliers to give customers the best economical value. Looking at customers as individuals and proactively developing products to cater these products at prices customers are willing to pay and the schedules that customers are willing to wait are by no means a straightforward task. Particularly in today's highly competitive business environment, activities to serve customers have to be performed efficiently and effectively. Mass customisation and personalisation have emerged as the leading idea in the last decade to reach exactly this objective.

Although the importance and difficulties of building a customer-centric enterprise have been well recognised, building up the body of knowledge is just as difficult. Above all, the scope of these monumental changes certainly requires concerted efforts among multiple disciplines. Equally, the landscapes of these issues are rapidly changing not only because of the rapid advancements in technology, methodologies and practices, but also because of the fast accumulation of learning and knowledge generation on this very subject – mass customisation and personalisation. The objective of this special issue is to contribute to this task of knowledge accumulation.

2 Idea and development of customer-centric enterprises

In the following sections, we want to explore further the idea of the customer-centric enterprise as a reaction to the developments stated earlier. We will provide a brief overview of the development of customer orientation and customer centricity in the management and manufacturing literature. It is important to note that the following concepts are presented in chronological order of their appearance. This order does not imply that all value creation processes at one time follow the most recent pattern. No

perspective has been or is, at one time, the only appropriate approach. It is the context of the task to determine the orientation most suitable for a given context.

Before mass production was brought about by the industrial revolution, products were customised with *craftsmanship*. Craftsmanship often presented products of high quality that were only available to selected groups of individuals (with appropriate purchasing power). Every customer was a segment of one, and 'marketing' was individualised and personal, but performed implicitly and considered as part of the interaction process. The advent of *mass production* standardised the products and operations to leverage economy of scales and division of labour. This standardisation reduced the cost of production drastically. As a consequence, a mass population could now afford goods and services that were only available to selected groups. A new generation of mass consumers was created to enjoy the products that were designed to meet the demands of a segment of population large enough to justify the fixed cost of production including set-up cost and capital outlays. The 'mass consumption society' (Sheth *et al.*, 2000,p.55) transformed into a sellers-market. This transformation led firms to adopt organisational forms centred on products. Groups of related products were seen during this period as the primary basis for structuring the organisation (Homburg *et al.*, 2000; Sloan, 1963).

The resulting increases in product variety and competition at the end of the 1950s led firms to start paying more attention to markets rather than to products. *Market orientation* as an organisational pattern of firms came up, following Drucker's (1954) argument that creating a satisfied customer is the only valid definition of a business purpose. Market orientation places as its first objective uncovering and satisfying customer needs at a profit. The market-orientated perspective was popularised by Kotler (1991 [1967]) and was soon widely adopted. Market orientation implies to see the total market not as a homogeneous mass market but to segment it into market segments of consumers. *Segmentation* started with the notion of socio-demographic division with variables such as age, sex and income. This kind of division resulted in a limited number of focused product variants (Smith, 1956). Later, segmentation became more refined. More subtly defined niches based on lifestyles and previous buying behaviour resulted in an increasing number of product variants to care for individual, specific needs. Market segmentation demands information on consumers' needs (Narver and Slater, 1990). Today's instruments of market research were created as tools to satisfy exactly this set of demands. They do so by applying better understanding with the information about customers.

With a continuous refinement of segmentation, market segmentation was replaced by the notion of *customer orientation*. Its principal features are the following:

- a set of beliefs that puts the customer's interest first
- the ability of the organisation to generate, disseminate and use superior information about customers and competitors
- the coordinated application of interfunctional resources to the creation of superior customer value (we refer the reader to Day (1994), for a review of the literature).

The strong emphasis on providing 'customer value' in *all* functions of the organisation can be especially regarded as the differentiation of customer orientation to the previous stage of market orientation. The customer came closer into the focus of the firm. During this time, the notion of the marketing function as the central entity to deal with and think about a firm's customers developed. *Relationship management* reinforced this

perspective. It 'emphasises understanding and satisfying the needs, wants and resources of *individual* consumers and customers rather than those of mass markets and mass segments' (Sheth *et al.*, 2000). Instead of segments of customers, individual customers were seen as the target of the marketing mix. This resulted in the term 'one-to-one marketing' (McKenna, 1991; Peppers and Rogers, 1993). The members of one market segment are no longer regarded as being heterogeneous in relation to their profit contribution for the firm. Each customer is assessed individually. Based on an individual output-to-input ratio of the marketing function for individual customers ('share of wallet'), customers are either addressed by a standardised offering or, if it pays off, by a customised offering (Day, 1996; Parasuraman and Grewal, 2000). As a result, product-based strategies are being replaced with a competitive strategy approach based on long-term *customer equity* growth of the firm.

The *customer-centric enterprise* combines the organisation perspective of customer orientation with the individual perspective of relationship management. It also extends the responsibility of dealing with the customer from the marketing function to the entire organisation. Customer centricity means that the organisation, as a whole, is committed to meet the needs of all relevant customers. At the strategic level, this definition translates to the orientation and mindset of a firm to share interdependencies and values with customers over the long term. At the tactical level, companies have to align their processes with the customers' convenience, instead of having to focus on the convenience of operations. Of course, sufficient infrastructural systems and mechanism have to be implemented to reach this state. These changes include a customer-centric *organisational structure*. Traditionally, separated functions like sales, marketing (communications) and customer service become integrated into one customer-centred activity (Sheth *et al.*, 2000). Further, customer centricity is turning the marketing perspective from the demand side to the *supply side*. Marketing management has traditionally been viewed as demand management. The focus has been on the product or the market, and marketing had to stabilise demand for an offering through promotional activities such as incentives or pricing policies. The customer-centric enterprise is turning its focus on the individual customer as the starting point for all activities. Instead of creating and stabilising demand (*i.e.*, trying to influence people in terms of what to buy, when to buy and how much to buy), firms should try to adjust their capabilities. These capabilities should include product designs, production processes and supply chains to respond to customer demand.

To this end, there is a significant change that departs from traditional operation management. Historically, demand and supply is balanced on well-defined product at the level of Store Keeping Units (SKU). Given the diversity of customers' needs and the variety of customers' demands, a more comprehensive way of looking at products is needed to manage the complexity between customers' needs and providers' capability. Product Family Architecture (PFA), with robust attributes to cover a wide spectrum of potential needs as suggested by Tseng and Jiao (1996), is an example of development toward this direction. Along this line, Piller (2005) further proposes *co-creation* between the company and the customer. Customers get an increasing role in the fulfilment process. Customers interact with the firm in various aspects of the design, manufacturing, distribution and usage of the product or service. This notion goes beyond the previous discussion of customer orientation. It also goes beyond many relationship management understandings which often focus only on the value of each individual customer for the firm.

3 Mass customisation: an operational strategy to enable customer-centric enterprises

Mass customisation can be regarded as the operational strategy to enable customer-centric enterprises. In this context, companies are organised to build up their capability to offer economic value by providing products and services that best serve customers. Instead of balancing demand and supply at the level of finished products, mass customisation synchronises a company's capabilities with customer's needs through innovative approaches. One of the major characteristics of mass customisation is its joint focus on customer centricity and efficiency. All operations are performed within a fixed solution space. This is characterised by stable but still flexible and responsive processes. As a result, mass customisation performs its activities with mass production efficiency – at a cost level corresponding to that of a mass production operation. Customer centricity through mass customisation is reached by its customer co-design process of products and services which meet the needs of each individual customer with regard to certain product features. (Note that mass customisation does not demand lot sizes of one. Customer products can be produced in larger quantities for an individual customer or subsystems that will meet the needs of groups of customers.) *Customer co-design* means that customers are integrated into value creation by defining, configuring, matching or modifying an individual solution. Customisation demands that the recipients of the customised goods transfer their needs and desires into a concrete product specification. Co-design activities are performed in an act of company-to-customer interaction and cooperation (Franke and Piller, 2003, 2004; Franke and Schreier, 2002; Khalid and Helander, 2003; Reichwald *et al.*, 2004; Tseng *et al.*, 2003; von Hippel, 1998).

In the literature on innovation management, an active role of customers in the development process has been studied in the last few decades. In this domain, the term co-design or design by customers denotes a product development approach where customers are actively involved and take part in the design of their own product (Kaulio, 1998; Piller, 2005; Tseng *et al.*, 2003). Research has shown that many commercially important products or processes are initially thought of as innovative users rather than of manufactures. Especially when markets are fast paced or turbulent, 'lead users' face specific needs, which are ahead of the general market participants. Cooperating with them has been described as an important source of innovation for firms (von Hippel, 2005). One particular idea in this context is the use of the so-called 'toolkits' for user innovation and co-design to accelerate user contributions to innovation (Franke and Piller, 2003; von Hippel, 2001). This interpretation corresponds closely to the co-design concept in mass customisation (Piller *et al.*, 2004).

In 1991, Udvardia and Kumar (1991) envisioned that customers and manufacturers will become 'co-constructors' (*i.e.*, co-designers) of products intended for each customer's individual use. In their view, co-construction would arise only when customers had a nebulous sense of what they wanted. Without the customers' deep involvement, the manufacturer would be unable to adequately fill each individualised product demand. Computer technology, particularly the capacity to simulate potential product designs before a purchase, would enable the collaborative effort (Ulrich *et al.*, 2003). This understanding represents one of the four forms of mass customisation as identified by Gilmore and Pine (1997) – collaborative customisation. In this strategy,

the manufacturer and customer work together to identify and satisfy the customer's needs through a system that allowed easy articulation of exact wants. Anderson-Connell *et al.* (2002) use the term 'co-design' to describe a collaborative relationship between consumers and manufacturers wherein, through a process of interaction between a design manager and a consumer, a product is designed according to consumer specification and based on the existing manufacturing components. Co-design differentiates mass customisation from other strategies like agile manufacturing or postponement strategies in the distribution chain. Customer co-design in a mass customisation context establishes an interaction between the manufacturer and customer which also offers possibilities for building up a lasting relationship. Once the customer has successfully purchased an individual item, the knowledge acquired by the manufacturer represents a considerable barrier against switching suppliers. The possibility of reorders becomes higher (Pine *et al.*, 1995).

4 Overview about this issue

In 1993, when we started this field of research, our graduate students complained about having few reference articles, only a few of these articles focused on mass customisation at that time. Today, we can identify more than 2500 published papers on mass customisation and personalisation, and their number grows rapidly. To overcome the scope and speed issues of knowledge explosion in this area, a bi-annual World Congress on Mass Customization (MCPC) has been organised since 2001. Among the more than 250 authors who presented their work at the MCPC 2003 conference (held at the Technische Universität München, Munich, Germany, see Piller *et al.*, 2003), we invited a number of authors to submit a chapter for this special issue (based on their representativeness of particular issues in the subject). The selection is based on papers and presentation at the 2003 MCPC conference and further contributions of the authors in the field of customer-centric enterprises.

The first four papers deal with the genus of mass customisation, the co-design process between each individual customer and the manufacturer in order to specify a custom product. Guilabert and Donthu discuss the development of a scale to measure customer customisation sensitivity to evaluate whether customers are really interested in mass customisation. It seems obvious that, if consumers are not interested in customisation, there is no need to pursue customisation strategies. Consumers may be more or less inclined toward different types of mass customised products and services. Therefore, it is critical to know how important customisation is for consumers. The paper presents an approach on how companies can evaluate the likelihood of customers to evaluate a mass customisation offering. Given that a mass customisation offering appears appealing for a customer, Kurniawan *et al.* evaluate, in the next paper, how the co-design process is perceived from the customers' perspective. The paper reports the results of an experimental investigation of differences between product configuration and product selection in terms of consumers' decision quality. The results show that configuration offers not only greater satisfaction with the resulting products (as compared with standard products) but also increases the satisfaction with the shopping process.

The following paper provides an in-depth look on the information systems enabling the configuration or co-design process. The special topic of Stegmann *et al.* is how customers can be supported by such a system during the product design task. While

configuration systems enable customers to virtually assemble a product and find a fitting specification, customers must also learn how to deal with the complexity of the product model and with the configurator tool itself. Their paper introduces different approaches to overcome the problems of complexity and uncertainty associated with this customer tool interaction. The implications of mass customisation on business information systems, however, go beyond the implementation of configuration systems, as Dietrich *et al.* discuss in their paper. They analyse the impact of mass customisation on future business information systems, focusing on globally distributed value chains. Using a case study from the footwear industry, the authors develop an innovative multiagent approach, which refers to using information represented with explicit machine-understandable semantics for coordinating and negotiating mass customisation activities throughout the supply web.

The next contribution, co-authored by Jiao *et al.*, proposes an approach of process platform planning to support variety synchronisation from design to production. This is a basic principle of mass customisation which aims to reduce the internal variety of product architecture and to create a stable solution space and stable processes, allowing for 'mass production efficiency' as a main characteristic of mass customisation. The authors show how a process platform is conducive to the synchronisation of product and process variety. Duray supplements these insights about process planning for mass customisation with her paper on the relation between the company's capability of flexibility and quality and the financial performance. Her study tests, within a sample of 126 mass customising companies, the tactical requirements of a mass customisation strategy and finds that teamwork and worker flexibility lead to increased financial performance for mass customisers. The paper by Blecker *et al.* provides another contribution in regard to defining the processes of a mass customisation system. Their analysis of flexibility capabilities of a mass customiser presents a number of key metrics to measure variety and complexity in operations and manufacturing-related tasks. The result is an elaborated system to detect the levers that should be considered to keep variety-induced complexity under control.

Moving from process to product structures, Lindemann and Maurer discuss the early evaluation of product properties for individualised products. They present a methodology for testing and evaluating product spectra and individual products regarding lead time optimisation. Recently, a number of design techniques have been developed to improve the design of custom-made products. The paper by Allen *et al.* strives to combine these techniques systematically based on the formulation of the design of customisable products as a problem of optimal access in a geometric space. Their method is illustrated with the design of a line of custom-made hand exercisers.

The remaining papers of this issue deal with special issues of mass customisation. Ruohonen *et al.* present empirical insight generated from 40 case companies in Finnish metal and electronics industries. Their results reveal four different clusters of mass customisation strategies. These clusters can be also interpreted as knowledge-based business strategies, reinforcing the central role of knowledge management as a success factor of mass customisation. The development of rapid prototyping technologies into rapid manufacturing systems could become a main enabler for the efficient production of custom goods, as Tuck and Richard discuss in their paper. Their paper focuses on the effects regarding the logistics and supply chain infrastructure with the advent of rapid manufacturing. Qiao *et al.* discuss the manufacturing system planning for mass

customisation using a simulation model of the component assembly line of Boeing aircrafts. Their focus is on the evaluation of information integration to derive a data-driven reconfigurable mass customisation modelling methodology. The final paper, contributed by Warschat *et al.* provides an integrated perspective of the mass customisation value chain. Based on the processes for marketing, sales, design, production and distribution, a case study from the footwear industry illustrates the demands of system and data integration along this process chain. The authors present an IT architecture to support an extended enterprise offering mass customised products.

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