Introduction

SETTING THE CONTEXT FOR SERVICE CUSTOMIZATION

The developed nations have entered a post-industrial era, where wealth is created largely by services rather than manufacturing economies. Such servitization of the economy (Dimitrovska, 2006), with diminishing physical production, raises a number of challenges in trying to understand how services actually generate wealth. Why are, for example, consumers prepared to spend an increasingly larger share of their disposable income on services? What is the concrete value/benefit they derive from the consumption of such, essentially intangible, services, and how can it be measured?

Services, indeed, differ significantly from products, mainly because, unlike products, they are intangible. The experience of service consumption cannot get quantified as easily as that of tangible products. A physical product has a shape, color, texture and other properties that are observable, measurable/quantifiable and, more importantly, easily attributable to the properties of some material or technique used for manufacturing the product. This makes it possible for products to be designed and redesigned, improved, manufactured using different methods, and generally modified, to meet some expectations or requirements of the consumers. Services, on the other hand, lack any of these characteristics. Although the production of services, like that of products, require the use and manipulation of physical resources (most noticeably of human labor, but also of machinery and of other physical resources), unlike products, services lack physical parts and properties. Thus, the outcome of services must be defined indirectly, in terms of its effect on the recipient, the service consumer. Such effect is not always visible; as often it amounts to some subjective experience such as ‘enjoyment’, ‘satisfaction’ (or in their opposites). However, this effect is often hard to quantify, i.e. to pinpoint the extent a consumer was ‘satisfied’ with a service. The consumer’s service experience must also be measured at the right time, before it is diminished in the consumer’s memory; as such experience (unlike a product) does not stay indefinitely with the consumer. Nor the effect of the service on the consumer can be altered or controlled in advance, as a service happens as it is consumed: it does not exist before or afterwards. It is relatively easy, as said above, to map a consumer’s needs or expectation for a product to the product’s properties, and ultimately, to the resources or methods used for its production. If the consumer wants a green car, green paint will be used during its manufacturing. If the consumer wants a faster car, a more powerful engine will be designed, built and bolted onto the car. The same cannot be easily achieved for services. This makes the relation between service characteristic and its impact on consumer satisfaction not as obvious as for products. How can we modify, for example, a service to meet a consumer need, when it is not clear how resources and production methods affect service parameters, or how such parameters affect the consumer’s needs/expectations/requirements?
Mass customization and e-service customization, the subject matter of this book, require the ability to manipulate/adapt (electronic) services to meet the preferences, expectations and requirements of individual consumers- rather than of groups of consumers, segments or ‘markets’. This of course looks like a tall order, considering the above mentioned, substantial, differences between services and products. If product mass customization is still far from being a universal and efficient method in manufacturing (albeit with the notable exception of some industries), where does that leave service customization? The answer is that services present different customization challenges from products. In particular, e-services, involve electronic means such as the Internet for their delivery or consumption, and require mainly informational rather than tangible resources to produce or deliver, and, thus, present their own unique challenges: The problem is not how to organize finite (physical) resources and production methods for mass customization. Virtual resources are infinitely easier to manipulate than physical products, and service production methods, being information based, are inherently more flexible and adaptable than those of products. The challenge has to lie in deciding what needs to be customized, not how to do it. Thus, even more so with e-services than with products, the real effort required for customization involves understanding the, often elusive, consumers, their wants and needs, expectations, and desires from the customized service.

Before the advent of the electronic, web based marketing channels, engaging with the consumer was a far more difficult proposition, compared with nowadays, where an offered service can be a mouse click away on the consumer’s browser. On the same token, a competitor’s e-service is also a mouse click away from ours. Today, the battlefield for engaging with the consumers, captivating them with genuinely useful services, and making them come back to us over and over, is the Internet, and the weapons are the browsers and other online applications and tools that have spun around them.

The Internet and the Web gives the consumer almost unlimited choice in products. At the same time, it causes a globalization of consumer habits and tastes. One important question that arises is as follows: Does the Internet and the World Wide Web offer the same opportunities for unlimited choice of services as they do for products? Limitless e-service choice can become possible on the Web only through customization. Such customization on the Web, applied at a mass market level, in a cost efficient manner, will present an unprecedented opportunity for both the industries and the consumers. Indeed, we have only just started to experience the service customization era. Today, some industries such as online social networks, media and entertainment are pioneering service mass customization on the Web. As service customization accelerates through other types of industries and consumer markets, we will start to experience, in the near future, the benefits of service customization in many more areas of everyday life.

AIM OF THE BOOK

The book aims to be a knowledge resource for Web-related concepts, approaches and technologies revolving around the core theme of e-service customization and to propose a fuzzy logic based methodology for e-service customization. As it usually happens with new and less well established disciplines, the e-service customization area is an unstructured mesh of concepts, theories, methods and technologies with origins in such diverse disciplines as marketing, consumer behavior, (product) mass customization, Web services, Web 2.0 and Web 3.0, artificial intelligence, user interface personalization and several other areas. Effectively, this means that both researchers and practitioners, in this area, lack a systematic framework for organizing, comparing and evaluating the theories, practices and practical technologies
for the e-service customization. In turn, this hinders further research into service customization, as well as the fruitful exploitation of the research results by the industry.

Indeed, with this book we have aimed to systematize, clarify and organize the concepts of e-service customization and highlight areas worth further investigation. The book addresses aspects of service customization such as:

Cognitive Foundations of Customization: The benefits of e-service customization cannot often be understood without resorting to describing and analyzing the cognitive processes of the consumer. Thus, in this book we suggest methods to model the service consumers using cognitive/linguistic techniques and understand their interplay with service models.

The Mechanisms of Customization: Customizable e-services imply an underlying organizational capability that is delivered by business processes. The book proposes business process structures that are flexible and adaptive to meet the requirements of customization, as well as technologies to support them, such as process management systems.

The Business Imperative for E-service Customization: Organizations embark in e-service customization strategies because they hope that these will result in the achievement of goals such as increased sales, improved profit margins, larger market share and so on. In this book, we suggest strategies for e-service customization and how they can impact the aforementioned business goals.

WebTechnologies for E-service Customization: E-services are increasingly delivered and consumed over the Web rather than through alternative channels. Today, the Web is morphing from a network of sites presenting information, to a computing platform in its own right. The book puts emphasis on the potential of the Web and of technologies such as Web services to provide the platform for e-service customization, through adaptive Web sites, user managed mashups, or sophisticated service recommender systems.

Case Studies from Various Business Sectors: The term ‘service’ is very generic and encompasses many different types of services that differ significantly and qualitatively from each other. To present the above proposed models and theories in different contexts and to illustrate the potential of e-service customization, we use case studies from such diverse sectors as finance and health.

**WHAT ARE E-SERVICES**

The boom in electronic, Internet based, services affects the consumers’ everyday lives, but also the way companies are doing their electronic business. At the moment, e-services seem to be everywhere, from Internet portals to any device that is equipped with a microchip. Beside computers, e-services are now embedded in such mainstream devices such as cars, phones and fridges (Péraire & Coleman, 2000).

An e-service can be defined as a service offered to a consumer, over an electronic medium such as the Internet.

In a more technical way, an e-service can be defined as a software module that is accessible over a network (such as the Internet) and provides one or more services through some interface. From a technical perspective, e-services are therefore, delivered by software applications over networks, accessible via standardized protocols. In recent years, we witnessed a rapid growth in the number of electronic services. Such services, accessible via standardized protocols, reside on computer networks, and have functionality and purpose that can be repeatedly exposed and integrated in applications or composed to from other composite services (Hull et al., 2003).
E-services are delivered to consumers mainly over the Internet/Web, but also via other channels such as mobile devices and interactive TV. E-services range from traditional information and entertainment services to more sophisticated services such as financial, healthcare and government services. Other e-service examples include individually customized travel packages, business insurance policies, software-support agreements, training plans, legal contracts, financial investments plans or healthcare and health treatments (Kratochvil & Carson, 2005). Such sophisticated e-services require high level of customization in order to utilize their full benefits and enhance their usability.

E-services are not only purely IT, web or infrastructure services; the e-service business model comprises in addition the service product, service environment and service delivery (Rust & Kannan, 2002). The technology is, therefore, an enabler in e-service in order to meet the needs and wants of customers, and, thus, enable the growth of the market and revenue (Rust & Kannan, 2002). Kratochvil and Carson (2005) suggest that competition among companies lies in giving the customers exactly what they want, when they want it, but still profitably and at a price acceptable to the customers. This is where the flexibility of service customization comes to play.

The e-service phenomenon was originally investigated by researchers like Rust and Kannan (2002), Stafford (2003), De Graaf and Muurling (2003) and Turban et al. (2002), who addressed issues such as the importance of a customer-focused approach and the quality aspect in e-services. Indeed, through e-services, organizations endeavor to improve customer satisfaction and retention. However, as e-services differ from industry to industry, the concept of service quality must be understood in different contexts. Factors such as the accessibility of the service and the interaction between the customer and the service were suggested to be important elements by researchers such as Grönroos et al. (2000). Furthermore, additional aspects such as customer engagement in the service process, facilitating and supporting services, as well as interfaces to the service, play a decisive role in the definition of service quality. Parasuraman (2002), cited in Buckley 2003 and Santos (2003) identified similar criteria impacting on the service quality, while Rust and Kannan (2003) suggested that customization and personalization should be considered in the implementation of a customer-focused approach. It appears therefore, that factors such as e-service quality are relevant in an e-service customization context. These are further discussed below.

In services provided by humans, the responsibility for customization often lies with the company's employees, whose interpersonal behavior and service-offering adaptive behavior can improve the actual service offering to a customer (Gwinner et al., 2005). Also, human service providers can adjust to the needs of the customers (Rust & Chung, 2006). However, the new e-services require less human participation, and pose different requirements for adaptability.

**Elements of e-Service**

E-Services can be described in terms of the following parameters

- Inputs, Outputs,
- Functionality,
- Data/Content,
- Quality of Service,
- Execution/Behavior.

The above perspectives allow a better understanding of the issues involved in e-service customization.
E-Service Inputs and Outputs

Inputs and outputs of an e-service are defined as the e-service’s interface with its environment. This is similar to the concept of a Web Service Definition Language (WSDL) interface document in Web services (W3C, 2001). However, the inputs and outputs of e-services are far more complex than the simple programming data types (e.g. integer or real numbers, strings and so on), used in Web services. Thus, to fully define what an e-service does, might require a higher order description than a programming specification.

E-Service Functionality

From a mathematical point, it should be possible to describe e-service functionality as a function that transforms its inputs to outputs. However, two services can have identical inputs and outputs, but be totally different from each other. Thus, additional models must be employed to describe the e-service functionality. Chapter 3 discusses further technologies that enhance e-service functionality.

E-Service Data/Content

The e-service data and content refer to the concepts and elements, such as an order number, a product price, etc that are necessary for the implementation of the service functionality. Ontologies can provide the means for representing and populating the concepts and their values (Fensel & Bussler, 2002).

Quality of Service

Quality of Service (QoS) properties refer to an e-service’s reliability, availability, performance or any other measurement that might indicate the service’s potential in performing its functions in the most efficient, reliable and dependable manner (Papazoglou & Georgakopoulos 2003). QoS properties provide a way for the service consumer to express the desired metrics during the selection stage in order to locate the most suitable service. QoS can be an important customization parameter. QoS criteria for service customization are discussed in Chapter 1 of this book.

E-Service Execution/Behavior

A behavior of an e-service is described by a set of states (e.g. invoked, initialized, running, completed) that an e-service can be in and the set of operations that change the state of an e-service during run time (Hamadi & Benatallah, 2003). Several models have been proposed and used for representing the behavior of e-services such as Petri-Nets, workflow models, etc. Depending on the inputs and the goals of an e-service, its behavior may change, by triggering different execution paths of the service or by invoking other e-services thus developing a composite service. Current Web service technologies such as SOAP, UDDI, WSDL operate at a syntactic level, thus requiring human intervention in locating, invoking and combining the appropriate web services. A human is needed to understand what information is required to execute a service and to interpret the resulting information. For the automation of web service discovery, composition and execution semantic description of web services is required (Davies et al., 2006).
Product Mass Customization

Mass production was one of the greatest inventions of the 20th century (Piller et al., 2004). Thanks to mass production, products became affordable, of better quality, and reached the mainstream masses of consumers. Today, this business model is becoming however, less important, because customers want choice and individuality. Mass production, therefore, has given way to customer centric mass customization. The concept of mass customization is introduced in this section because it is underpinning research in e-service customization.

During the nineteenth century, with the advent of the industrial revolution, mass production became the dominant manufacturing approach, where products were produced in large quantities at low and affordable prices, thus achieving economies of scale. The success of mass production was undeniable as products were manufactured on massive levels, in an efficient way, in direct response to consumer demands. In the late twentieth century however, we started to witness dramatic changes to consumers’ tastes and habits. Consumers became more sophisticated, more demanding, with a preference towards exclusivity and, most importantly, a new awareness of quality and functionality. Customers now demand durable and reliable products, corresponding exactly to their specific needs. Market segments have been redefined. Sheth and Sisodia (1999) argue that the customer profile is characterized by higher levels of diversity by income, age, ethnicity, and lifestyle. Customers are becoming more willing to spend more on customized products and services. In particular, consumers with their increased purchasing power, seek to express their identity by means of individualistic product choices. For example, BMW’s “individual program” emphasizes the fulfillment of individual fittings and equipment in its cars. In turn, many suppliers try to comply with customer requirements by developing product and service families with an increasing number of variations. Thus, many companies have to process, understand and satisfy their customers’ requirements individually to benefit from higher profit margins. However, the current competitive situation exerts pressure on many industries, thus, preventing companies from implementing strategies based on product and service differentiation regardless of the cost. The cost and benefits, through premium pricing, have changed, because consumers are now demanding relatively high standards of quality, service and variety but with competitive sales prices. Suppliers also have to comply with these new requirements. It is here that the objective of mass customization becomes valid and its aim looks appealing. The aim is to produce goods and services for a relatively large market that exactly meets the needs of every individual customer with regards to certain characteristics, at costs roughly corresponding to those of standard mass-produced goods.

Mass customization (MC) implies the development and distribution of products and services that are customized to specific customer needs and are made available at acceptable cost levels (Piller, 2003; Fulkerson, 1997). Mass customization of markets means that organizations can reach the same large number of customers as in the mass markets, but that additionally they possess the ability to address their customer’s needs individually as in the customized markets (Parker, 1995). The idea is to have the best of both mass production and customization. Mass Production, therefore, combined with customization results in low costs which in turn combined with individualization leads to mass customization and possibly to competitive advantage. According to Pine (1993a) MC’s target is to provide its customers (businesses or consumers), its products with an altered and inexpensive way by using information from the customers and with the help of manufacturing technology.

Although the term of “mass customization” was coined by Davis in 1987, some companies in Japan were already practicing mass customization as early as the 1960s. Also in the 1950s, some companies,
again in Japan, invented strategies that were flexible to changes according to competition. In 1993, Pine formally defined mass customization, however, its meaning still varies widely. For example, according to Hart (1995), mass customization is best described under two different definitions:

1. The visionary definition: “The ability to provide customers with anything they want profitably, any time they want it, anywhere they want it, any way they want it”. However this is not usually achieved.

The second definition is more pragmatic:

2. The pragmatic definition: “The use of flexible processes and organizational structures to produce varied and often individually customized products and services at the low cost of a standardized, mass production system”.

Mass Customization Strategies

As argued above, mass production is now an outdated business model. Companies have started to change their strategy from “standardized products, homogeneous markets, and long product life and development cycles” to “variety, customization and customer choice”. One product is not enough anymore. Today, the companies need to produce multiple product lines which meet the multiple needs of multiple customers. The same principles should also drive service mass customization. Four distinct strategies for mass customization are listed below. These strategies reflect the fact that services are often offered as a package with, or as an add-on, to products:

1. Customize services around standardized products and services.
2. Create customizable products and services.
3. Provide point of service delivery customization.
4. Customize the supply chain that delivers the product/service.

Types of Mass Customization

Lampel and Mintzberg (1996) and Gilmore and Pine II (1997), proposed an agenda for MC. MC can arise in different areas in the value chain, varying from “fitting” of products to the customers to total customization of the sales of a product (design, manufacturing, delivery and assembling). Gilmore and Pine (1997) define four levels of customization. These levels are based on observations of real practices:

- **collaborative** (the designers discuss with the customers),
- **adaptive** (some products are standard but can be adapted to customers’ choices during use),
- **cosmetic** (some products are standard but are packaged accordingly for each customer),
- **transparent** (products that are just made especially for each customer’s needs).

Lampel and Mintzberg (1996) define five levels of MC. This definition involves different process, product and customer aspects. A study by Amaro et al. (1999), confirms these levels.

Pine (1993b) also defines five stages of modular production:
• *Customized services* (standard products are manufactured before they come in touch with the customers),
• *Embedded customization* (standard products that can be diversified by customers during use),
• *Point-of-delivery customization* (after sale some additional work can be done),
• *Providing quick response* (short time for the delivery of the products), and
• *Modular production* (standard parts can be made in a large variety of products and services).

Spira (1996) defines a similar frame with four forms of mass customization:

• *customized packaging*,
• *customized services*,
• *additional custom work*, and
• *modular assembly*.

Da Silveira et al. (2001), suggest that the associations between the above definitions lead to eight general levels of mass customization.

The top level, level 8, is *design*. It refers to collaborative work. The manufacture and the delivery of the product are done according to the customer’s needs and preferences e.g. residential architecture (Lampel & Mintzberg, 1996).

The next level, level 7, is the *fabrication*. This refers to products made according to the customer’s needs but follows a basic and default design, e.g. Motorola’s Bandit pager (Eastwood, 1996).

Level 6 is *assembly*. It has to do with the arrangement of the modular components into different modulation according to customer, e.g. Hewlett-Packard products (Feitzinger & Lee, 1997).

Levels 5 and 4 are additional *custom* work and additional services. Davis (1989) believed that this is accomplished by adjusting ready products to the customers needs (e.g. what IKEA, the furniture store does) or services needs usually at the place of delivery (e.g. similar to what the fast food chain Burger King does).

In level 3, there is the *package* and *distribution*. This means that the packaging of same products can be modified according to specific market sections. Sometimes different box sizes are used for the same products (e.g. as with retailer’s Wal-Mart’s packaging of peanuts).

In level 2, there is *usage*. This occurs only after delivery. Some products can be adapted to different functions and use according to the situation e.g. Lutron’s lighting systems (Gilmore & Pine, 1997).

Finally, level 1, *standardization*, which according to Lampel and Mintzberg’s (1996) is the level of *pure standardization*. This is a strategy that can be helpful in many industrial sections.

**Manufacturing Methods and Techniques for MC**

Da Silveira et al. (2001) argue that some internal and external factors can influence the success of the mass customization systems. These factors are the reason why the MC is used as a competitive strategy and facilitates the evolvement of the MC systems. There are six factors that influence the MC the most. These factors are represented below. Factors 1 and 2 are mostly related to the market. Factors 3 and 6 are mostly based on organization.

1. Customer demand for variety and customization must exist.

Pine (1993a), Lau (1995) and Kotha (1996) suggest the need to work with the increasing number of customers and their demand for innovative and customized products. Kotha (1996)
and Hart (1995) believe that in order for MC to succeed, there must be a balance between the time period that the customers must wait until the product is manufactured as well as the money they have to give and the company’s potentiality to prepare the products on time and on a low budget.

2. Market conditions must be appropriate.

According to Kotha (1995), the timing of a company’s ability to transform MC potential into actual competitive advantage is really crucial. If, for example, a company can form an MC system before its competitors, it can obtain a great advantage and privilege over them. Customers will consider this company as innovative and it will have a long-term relationship with its customers before its competitors develop a respective system.

3. Value chain should be ready.

Kotha (1996), Haglind and Helander (1998), and Magretta (1998) maintain that MC should be based on a value chain concept. There are a lot of participants that need to collaborate in order for a product to be manufactured. Suppliers and distributors play a major part because they are value chain entities and they must be efficient in order, for the chain, to work properly.

4. Technology must be available.

Pine and Pietrocin (1993), Lau (1995), Kotha (1996), Hirsch et al. (1998) and Kanchanasevee et al. (1997) argue that MC systems need advanced manufacturing technologies (AMTs). In order for the company to communicate with the other value-chain entities and to manufacture quicker and more efficiently its products, it is fundamental for it to have technology that enables these kinds of tasks.

5. Products should be customizable.

Feitzinger and Lee (1997) suggest that in order for an MC product to be successful it needs to be able to be modularized, and renewed. This makes products simpler and at lower cost. Moreover, Pine and Pietrocin (1993) and Lau (1995) suggest that MC processes need quick product development due to short life cycles presented by MC products.

6. Knowledge must be shared.

MC strategy depends on the flexibility and the ability of the company to interpret the customer’s demands for new products and services. This is achieved with the help of knowledge. The knowledge that is created should be distributed to all parts across this chain. According to Pine and Pietrocin (1993) this demands the development of dynamic network systems as well as manufacturing expertise. According to Kotha, (1996), internal development and process technologies are also required. These important factors show that MC is not the best strategy for every company. First, the market and the customers must be analyzed. Value-chain plays an important role as well as technology and the development structure that is based on knowledge.
Facilitators of MC Implementation

According to Da Silveira et al. (2001), MC facilitators are the methodologies and technologies that support the development of the factors that are based on organization (e.g. value-chain, technology, customizable product knowledge). In order for an MC to be successful, technologies of manufacturing play an important role due to the fact that they help flexibility and productivity. MC enters the consumer field steadily and new information technologies are seen as its main facilitator. The facilitators are:

- Processes and methodologies that facilitate MC,
- Technologies that facilitate MC and
- Facilitating MC with Information Transfer, i.e. how technologies support the transfer of information that is, perhaps, the major implementation problem with MC.

Processes and Methodologies that Facilitate MC

Processes and methodologies refer to the implementation of an MC system. They have to do with the most important elements of a strategy so that they will support the development of a successful MC. MC processes and methodologies are classified as:

- Agile manufacturing (Adamides, 1996; Owen & Kruse, 1997),
- Management of supply chain (Eastwood, 1996; Gooley, 1998),
- Customer-driven design and manufacturing (Davis, 1989; Kotha, 1995; Spira, 1996) and
- Lean manufacturing (Womack et al., 1990; Womack & Jones, 1996).

**Agile manufacturing**: This means the ability of a company of being prosperous and flexible and be able to survive into a competitive environment by continually changing markets according to the customers’ demands of products. Instead of waiting for the market to change they make first the change and they adapt to a new environment which looks more prosperous. Gutman and Graves (1995) suggested that a flexible manufacturer waits for the change to happen while an agile manufacturer has a proactive behavior. The main agile manufacturing strategic dimensions are (Owen & Kruse, 1997):

- value-based strategies that enrich customers, focusing on delivering value,
- cooperating to enhance competitiveness,
- organizing to master change and uncertainty,
- leveraging the impact of people and information.

These lead to the idea of internal and external agility according to Owen and Kruse (1997).

**Internal agility**: According to Jagdev and Browne (1998), this is the ability to respond straightforwardly to consumer demands for new products and services. Its production systems must be easy to be reprogrammed, so that it will operate economically. In order for agility to be successful, a true learning organization is essential, according to Owen and Kruse (1997).

**External agility**: Is related to the concept of virtual business according to Gutman et al. (1995), Song and Nagi (1997). Various individual companies constitute a virtual business. All these are linked and collaborate with each other and target high-quality and customized products, as Powell and Gal-
legos (1998) suggested. The characteristics of the virtual organizations are the following according to Song and Nagi (1997):

- product orientation,
- team-collaboration style,
- short-term relationships between individuals,
- speed,
- flexibility.

Turowski’s (1999) proposes that this model is supported by the existence of information technologies and telecommunication systems.

**Management of supply chain:** Boynton et al. (1993) define this as the regulation of the knowledge and the enhancing of activities into the value chain so that it will have an advantage in relation to its competitors. One of the major elements for success to MC systems is the adequate management and cooperation of the value-chain (Eastwood, 1996; Feitzinger & Lee, 1997; Lau, 1995; Kotha, 1995; Moad, 1995). Effective management of supply chains require:

- development of an interconnected information network involving a selected group of trained suppliers,
- successful balance of low stocks with high delivery service,
- design of innovative products with active collaboration of suppliers and
- cost-elective delivery of the right product to the right customer at the right timing.

**Customer-driven design and manufacturing:** This is in the core of MC systems. Jagdev and Browne (1998) consider this business practice as “to actively consider the market trends in general and individual customer requirements in particular during the design, manufacturing and delivery of the products”. Wortmann (1992) call this “One-of-a-Kind Production” (OKP). Its objectives are:

- providing conditions for the customer to initiate the design process of a product, and
- building an infrastructure to develop new products driven by the market

**Lean manufacturing:** Storch and Lim (1999) define this as a productive way to implement customer’s wants while at the same time maintaining competitive advantage. The MC production manages four elements of lean production:

- product development,
- the chain of supply,
- shop floor management and
- after-sales services (Warnecke & Hueser, 1995).

For the implementation of an MC production system, the following are important:

- define value based on the customer,
- concentrate on activities that create value and to eliminate all wastes, in all production steps and,
reorganize the value-creating activities into efficient processes, without interruptions and incorporating production variant at high levels.

A study about mass customization that took place in the UK, showed that 21% of the companies that used this concept increased their market share, 24% decreased the time of response to customers orders, 14% increased their profitability and 5% lowered their manufacturing costs. On the other hand, other companies experienced many difficulties such as inflexible factories, customization expenses, inflexible information systems, management changes, difficulties understanding the needs of customers and suppliers, and were not able to develop a successful mass customization system.

Technologies that Facilitate MC

Mass customization can be considered as a production idea and a business strategy that is actualized by technology. Pine’s opinion (Pine, 1993a, 1993b) is that the application of advanced technology is the precondition in succeeding mass customization. On the other hand, Franke and Piller (2003; 2004), Franke and Shah (2003), and Davis (1987) argue that new tools utilizing IT, which is a main facilitator for MC, can create opportunities for MC.

Different technologies must be assimilated in order to combine the human and the technological factors. MC counts on IT and automation because they are the link between the consumer’s demands and the capability of the manufacturer to create the respective products. IT technologies make possible the communication of the manufacturer with the consumer in order to develop the customized products during production process.

Da Silveira et al. (2001), suggest that the most important enabling technologies according to Hirsch et al. (1998), Kanchanasevee et al. (1997), King (1998) are:

- Advanced Manufacturing Technologies (AMT),
- Computer Numerical Control (CNC),
- Flexible Manufacturing Systems (FMS) and communication and network technologies such as computer-aided design (CAD), computer-aided manufacturing (CAM), computer integrated manufacturing (CIM), and electronic data interchange (EDI).

AMT can improve the productivity and the manufacturing and can make MC really flexible (Meredith, 1987). Case examples, such as the National Bicycle Industrial Company (NBIC) in Japan, according to Kotha (1995), Eastwood (1996) and Perkins et al. (1979), point out the significance of using AMT in the MC system development. NBIC employed CAD/CAM, enhanced machines that are controlled by a computer and robots in implementation of an MC manufacturing system. Perkins et al. (1979) based their MC system on a hybrid CAD/CAE (computer-aided engineering system with flexible manufacturing assembly lines).

The main reason for the use of communication and networks is the improvement of the communication among the work-groups and the immediate response to customer requirements. These technologies aim to turn some old isolated parts into useful and productive tools. Examples of the use of IT to MC concepts are at Bally engineering structures (Pine & Pietrocini, 1993; Meredith, 1987). Bally used advanced technology based on artificial intelligence.
Facilitating MC with Information Transfer

Turowski (1999) suggested that an MC system’s success relies on the ability of the information to be transferred from the customers to the company (manufacturers). When MC systems are available, the customer can ask for something specific feature in the product and the corresponding unit of the production makes the already existing product to correspond to the consumer’s requirements. This manufacturer of course, arranges the range of changes that a customer can request. The customer-manufacturer communication level (Piller, 2004) depends on the development and efficiency of an MC system. In order for this communication to be successful these are the four stages according to Da Silveira et al. (2001):

- having a range of options for the customers,
- collecting and saving all the information regarding the customer’s opinions,
- transmitting of this information from retail to manufacturer and
- interpreting the customer’s opinions into marks of design and manufacture.

The above stages are the same regardless the range of changes that an MC allows the customer to make. However, the range of changes plays an important role to the volume of information that is transmitted among the above stages.

DIMENSIONS OF E-SERVICE CUSTOMIZATION

For an in-depth understanding of e-service customization we need to delve more into concepts of e-services. This is the subject of the current section. This section also proposes an e-service customization process from both provider and consumer perspectives.

As seen so far, mass customization is a wide encompassing term that borrows ideas from various disciplines, such as computer science, engineering design, marketing and manufacturing.

Customization is important today for all types of organizations since, in order to be successful, services have to be more innovative, flexible, and tailored to individual customers. To survive in the competitive environment, the fundamental strategy for all businesses and organizations is to adopt mass customization. The mass customization is the new competitive strategy that has replaced the old strategies such as mass production (Boynton et al., 1993). The concept of mass customization is delivering products/services to the same large number of customers as in mass production, but customized to meet individuals specific needs. Organizations have now to see customers as individuals, not as objects to be standardized. They have started, therefore, to collect and use customer information in order to meet their specific context, product or service needs and preferences.

In Web applications, customization has been implemented in interfaces that allow the user to select his/her own settings and preferences. For example, many Web sites offer custom products where a user can select own preferred choices. For example, sites such as hamaracd.com and homecraft.com, allow users to select music titles from online library to create their own custom music CD, while this service is not offered in the traditional stores (Turban et al., 2002). Another example of customization system is websites that offer functionality for users to customize their personal web pages. For example, my.yahoo.com website allows users to select preferred context and appearance (e.g. color, layout, size).
As Schilke et al. (2004) put it:

“Customization usually deals with the appearance of a website (e.g. colors, fonts or the appearance of the site, i.e. which information goes where- i.e. how information will be displayed)”

**Customization vs. Personalization**

A concept similar to customization is personalization. Hagen et al. (1999) defines personalization as

“...the ability to provide content and services tailored to individuals on the basis of knowledge about user preferences and behavior”.

Vassiliou et al. (2001) argue that

“The key to personalization is understanding the customer’s desires and needs”.

As well as adapting the interface like customization, personalization also focuses on adapting the information content to match individual needs and preferences (Blom, 2000; Schilke et al., 2004). According to Vassiliou et al. (2001) personalization can be split to two levels: presentation level and content level. The first level is to do with how the content is presented and second level is to do with which content is presented to the user. Moreover, Vassiliou et al. (2001) divide the presentation in two sub-levels: the layout of the individual pages and the structure of the entire web site. Furthermore, they argue that personalization embraces also recommender systems, customization and adaptive web sites as they all contribute to the provision of tailored products, services and information (Mulvenna et al., 2000).

For personalization, different type of information about the user can be used, such as demographic, past purchases, interests, hobbies attributes to dynamic attributes like the current position as used in location based personalization (Koch & Moslein, 2003).

In contrast to customization, personalization in Web applications is based on the individual users’ information, usually derived from user profile and user behavior. In Web applications, personalization has become an important technique for enhancing the user friendliness, usability and ‘stickiness’ of Web sites. Personalization techniques aim to provide useful information, reducing search time, increasing convenience and customer control over transactions (Rust & Kannan, 2003).

As explained in Allen et al. (2001)

“On the Web, the difference between customization and personalization usually comes down to who is in control of the content.”

In today’s digital era, businesses and organizations try to master the Internet technologies to increase their efficiency and productivity. However, they need to adopt a customer-centric approach to differentiate their products or services and remain competitive instead of offering standardized goods and services (Rust & Kannan, 2003). Therefore, there is a need to collect data about the customers in order to meet their specific context, needs and tastes. The advanced technologies of customization and personalization are key concepts in providing such high quality e-services, demanded by the technology savvy users.
While both techniques aim at providing focused information, reducing search time, increasing convenience and customer control over transactions (Rust & Kannan, 2003), there is a difference often overlooked regarding the initiator of the process.

Customization is system initiated by the fact that the system requires the user to select his/her own settings and preferences. For example, the system will allow the user to specify what kind of information should be displayed. In contrast, personalization is mostly user-initiated by the fact that it is based on user profile and user behavior. Besides changing the interface to match individual needs and tastes, it impacts on the “information content” (Blom, 2000; Schilke et al., 2004).

**What can be Customized in E-Services**

Four distinct generic customization strategies exist, namely:

1. Adding services around standardized products/services.
2. Allowing customization of standard products/services.
3. Customizing along the supply chain i.e. the steps, processes and organizations that contribute towards delivering the product/service to the final customer.
4. Customizing at the delivery point.

In this book, we will pay particular attention to the last method of customization, i.e. customization at the point where the consumer experiences the service. We shall call this approach **consumer driven customization**. As we will argue in the following chapters (in particular in Chapter 2), the new generation of online consumers are both technology savvy, and keen to add their own input to a service, rather than be mere passive recipients of what is on offer.

However, the ability for consumer driven customization has implications for the providers, and for all other parties participating in the service supply chain. This book, therefore, examines the organization strategies that make consumer driven customization possible (Chapter 1), as well as infrastructures underpinning such strategies (Chapter 3).

A question that naturally arises in service customization is as to what can be actually customized in a service. There is a spectrum of customization possibilities, from no ability to customize at all, to giving the consumers total freedom to design their own services. In this respect, the boundaries between service customization and service design (for example, by service composition) become blurred.

In this book, we propose that like customization needs to be tailored around the needs of individual consumers, the customization method itself needs to match specific users, needs and purposes. In some environments, customization of services must be controlled by the provider; consumers are given guidance and support, with the use for example, of special advisory systems (called recommender systems and reviewed in Chapter 3). This type of customization might suit for example, e-health and related types of services where expert knowledge lies mainly with the service provider. In other environments, users can be given more freedom to explore the customization possibilities and, in effect, to co-design the services with the consumers. This type of customization might suit more ‘artistic’ types of services where creativity plays a central role.

In general, by customizing the service, consumers seek to maximize the benefits they acquire from it. Such benefits, as argued earlier on, are not necessarily financial, but can include aesthetics, and other senses of enjoyment and, fulfillment, experienced by the consumer. Often, consumers do not customize
for their own benefit alone; altruistic motivations and a sense of contribution to the community can be motivators behind consumer service customization. To facilitate customization, providers need to know what service parameters contribute towards the customization motivators and how. If for example, a consumer customizes in order to improve his/her perceived quality of the service, we need to know what the service quality factors are and how they impact on quality. Via customization, the service providers (or the consumers themselves) should seek to amplify factors that increase service quality and weaken factors that impact negatively on service quality. Service quality factors that are neutral, i.e. do not impact on the consumer’s benefit from the service, should not be included in the customization parameters. The cost of the service is often an important QoS criterion, and consumers can appreciate the ability to control it and fine tune it themselves. If the cost impacts other customization parameters that in turn impact the service’s perceived benefit, the consumer should be made aware of those, and of the trade-offs involved. As we shall see again in Chapter 6, if the trade-off decisions involved are complex, the consumer should be supported by a recommender system that offers, for example, preset configurations, or the choices made by other consumers in similar situations.

**Consumer Involvement in MC**

Social Judgement Theory, as cited in Solomon (1991) suggested that involvement is initially defined as “the intensity of the quite enduring psychological linkage between an individual and an object”. The involvement construct from Social Judgment Theory, has been applied to consumer behavior research for close to 30 years. Since the publication of Krugman’s (1965), as cited in Roger and Scheifer (1993), the concept of involvement has been applied to explaining how consumers react to advertisements.

Houston and Rothschild (1978) were the first researchers to operationalize involvement as multi-dimensional concept. They identified three major types of involvement: situational, response, and enduring. Situational and response involvement are considered to be temporary types of involvement or concern with a product at the time of purchase. Enduring involvement is the perception that the product is related to centrally held values, such as identity, and it is long lasting.

Involvement has been classified as *personal relevance* according to Engel and Blackwell (1982), Zaichkowsky (1985), and Greenwald and Leavitt (1984), as cited in Roger and Scheifer (1993), *amount of triggering interest*, or *drive evoked by a particular stimulus* (Mittal, 1983, cited in Jamrozy et al. 1996; Roger & Scheifer, 1993), *a person’s activation level*, (Cohen, 1982; Roger & Scheifer, 1993), and *goal-directed arousal capacity* (Park & Mittal, 1985; Roger & Scheifer, 1993).

According to Laurent and Kapferer (1985), “Involvement is an unobservable state of motivation, arousal, or interest. It is evoked by particular stimulus or situations...Its consequences are types of searching, information processing, and decision making”. Mittal and Lee (1989) and Roger and Scheifer (1993), on the other hand, conceptualized involvement as reflection of inherent need fulfillment, value expression, or the interest a consumer has in a product.

Duray (1997) and Duray et al. (2000) empirically tested the concept of mass customization using three levels of validations: case studies of 15 companies using mass customization, plant visits and interviews in the furniture industry, and a survey of 639 companies in the furniture, fabricated metal products, machinery, electric and electronic equipment, transportation equipment, and instruments industries. Duray (2002) used point of customer involvement and modularity in four production phases—design, fabrication, assembly, and use—to classify the firms into four categories: fabricators, involvers, modularizers and assemblers. Results confirmed that point of customer involvement and modularity differentiated
the firms on process choice, planning technique, technology use, and business performance variables. Furthermore, Duray (2002) argued that mass customization at the product design stage could integrate the marketing, manufacturing, and engineering functional areas.

**Social Dimensions of Service Customization**

Customization processes and outcome can benefit single consumers or a wider group of consumers—a community. Information captured in user profiles is used not only for customization but also for community support. Many web-based services offer community support functionality where users can interact with other users i.e. communicate and exchange information (Koch & Moslein, 2003). The *virtual communities of transactions* are groups of Internet users who use advanced online media and tools to collaborate and buy or sell products (Turban et al., 2002). Such types of communities are based on the sharing of information about products/services and about the community members, through user profiles. In the virtual community, user profiles are used as means of identity. As Donath (1998) says:

“In communication, which is the primary activity in communities, knowing the identity of those with whom you communicate is essential for understanding and evaluating an interaction and for building trust.”

**Service Customization Parameters**

Understanding the service customization process requires the definition of core concepts such as service provider and consumer. These are defined below.

**The E-service Provider**

The provider of e-service is defined as that entity (human, organization unit, computer program, etc) that provides a service to consumers (defined below). Thus, the provider is responsible for things such as supplying the service, managing the infrastructure required for its delivery, managing QoS parameters and any contracts, about the service, between provider and consumer that need to be negotiated, monitored or enforced. Note that the provider is not necessarily the original author of the service. A provider, for example, could be a service aggregator that combines services from other providers. This concept will be explained further in Chapter 4. In the next chapters of this book, we shall also examine the different types of e-service providers, what motivates e-service providers to customize e-services, how e-service customization is linked with the provider’s business objectives, goals and strategies. In Chapter 1 of the book, we examine the central role of service in today’s organizations, the different types of services, the organization structures that support them and their relations with other organization concepts such as marketing strategy.

**The E-Service Consumer**

E-service consumer is defined as the entity (individual, organization unit, computer program, etc) that consumes the service and directly benefits from the service’s intended outcome. Note here that we restrict this definition to those entities that directly interact with the service and are not impacted by the service in an indirect manner. Often, there is the case that the final consumer of the service is dif-
ferent from the entity that negotiates the service delivery (enters in a contract with the provider) and from the one that pays for the service (if the service is provided on a ‘paid for’) basis. Usually, what we define as the service’s ‘benefit’ for the consumer is some positive change in the consumer’s state that could mean, more information, or some new capabilities, or some kind of pleasant experience is acquired by the consumer. Consumers of an educational service receive, therefore, different types of benefits (enhanced knowledge or awareness) from consumers of entertainment services (‘aesthetics/enjoyment/pleasure’).

In this book, we are more concerned with human service consumers. While it is perfectly feasible today to have customized e-services exchanged between software agents, the notion of a human service consumer entails new dimensions in the concept of service customization. Thus, e-services customization must be studied within a certain psychological, social and cognitive contexts defined by their (human) consumers. Chapter 2 examines the service consumer as an individual that needs to be understood in order for customization to be perfectly aligned with his/her profile, cognitive characteristics and personal needs and wants. This Chapter discusses consumer behavior, preferences, cognitive limitations, biases etc, the user context (time, place, weather, companion, situation, etc) and other factors influencing the customization process on the consumer side.

The Business Process Context

For an e-service to be created and delivered (equally also for it to be consumed) a process must be in place and become enacted. E-Services are therefore realized by business processes that are coordinated steps of activities carried out by organization actors that utilize organization resources. Since we cannot have e-services customization without business processes (Sagev & Gebauer, 2001, cited in Fairchild 2003), Chapter 6 examines the organization infrastructure needed to support e-service customization. The term infrastructure means the various organization units, processes and tasks, the IT systems and other resources that must be in place for the customization of the service. Chapter 6, utilizes the fuzzy logic technology and in particular draws on the Fuzzy Cognitive Map (FCM) theory in order to investigate customization scenarios and evaluate their impact at strategic, services, business process and e-service levels. IT systems are of particular interest in this book, as they make possible the mass-customization of e-services. Chapter 6 examines such types of systems, collectively named as workflow management and business process management. The modeling approach discussed in Chapter 6 provides the foundation for the development of e-services recommender systems.

The Consumer’s E-Service Customization Infrastructure

While it is possible for consumers to enjoy a customized e-service with the minimum of input (i.e. just using a standard Web browser), the new generation of consumers, as we shall see in this book, they are increasingly Web technology savvy and want to have an active role in the service customization process; in other words they do not want to be passive consumers. Thus, service consumers require an infrastructure for service customization, equivalent to that of the providers. In Chapter 4, we shall look at consumer oriented service customization tools, i.e. Web based tools that allow the consumer to compose services and create new ones.
The E-Service Contract

Contract is any agreement (implicit or explicit) that exists between provider and consumer, regarding the customization’s ‘terms and conditions’. A ‘contract’ could, for example, be a one sided ‘promise’ of the provider to the consumer to offer ‘useful’, ‘enjoyable’ or ‘highly personalized’ service. Such promises though are not legally enforceable contracts. Usually a provider will not enter into contract agreements with every consumer, separately. It will instead provide a ‘terms and conditions’ standard contract that the consumers accept (‘abide by’), before they are allowed to start using the service. In some occasions, this contract specifies the limits of how a consumer can use the service (e.g. on a personal only basis and not for resale), or who retains the intellectual property rights of the (customized) e-service. Although today ownership of services and the terms of usage (i.e. for free on a fee basis, pay as you go, etc) are clear, as we shall see in this book, in the future consumer customized e-services may be co-owned by consumer and provider. Also, the role of third parties and their intellectual rights with regards to services will be defined more clearly in the future. If a service for example has been customized based upon recommendations received from third parties, these may have certain rights in the commercial exploitation of the service.

The E-Service Context

The context in which a service is delivered and consumed usually defines the purposes, methods and outcome of customization. Context can be defined from both provider and consumer perspective. The provider’s context is its business strategies, processes and infrastructure that determine why services will be customized and how. This is studied in the next chapter (Chapter 1) of the book. Arguably, the consumer’s context is more complex, as there are many consumers for a single provider, and because their approaches to customization is influenced by psychological (e.g. emotions, mood), cognitive (skills abilities) and physical context (environment, time, company). The role of consumer context in service customization is investigated in Chapter 3.

The Process of E-Service Customization

It has been generally agreed that to fully understand a service and to guarantee its effectiveness and efficiency both provider and consumer perspectives of the service need to be considered (Chase, 1978; Chase, 1981; Glushko & Tabas, 2008; Walton et al., 2005). Several studies, for example, have shown that the key to successful new product and service development are in-depth knowledge of consumers and their needs (Cooper, 2001). However, traditional service development approaches only cover the service interface with the consumer and overlook the consumer own process and the associated activities, context, resources, preferences, goals, and events.

The concept of consumer processes has already been investigated by several researchers. Green and Simister (1999) apply the concept of consumer process in a B2B context and use it to support strategic briefing, and for conceptualizing potential solutions. In Alt and Puschmann (2005) consumer process is used to develop service offerings on Web portals. Rajala and Savolainen (1996) propose a method and framework that integrates business processes and consumer requirement. Donaldson et al. (2006) apply the technique of consumer value chain analysis to product design, in order to better recognize product requirements and their priority with different users of a product.
Other approaches that incorporate the consumer viewpoint in the new service development process, usually aim to obtain information about the consumer such as consumer preferences. Although several concepts for consumer involvement have been introduced, e.g. (Alam & Perry, 2002), no formalized model has been defined that describes the steps, mechanisms and processes (cognitive and other) involved on the consumer side, during service creation and consumption.

For example, existing methods such as user-modeling (reviewed in Chapter 2), aim to describe consumer processes but mainly from the perspective of IT applications such as recommender systems (Chapter 3), dialog systems and adaptive hypermedia systems (Jameson, 2007). In the field of recommender systems (as we shall see in more detail in Chapter 3), two concepts, user-modeling and context-awareness, are used to observe the users and their context and to derive predictions about the user preferences and to recommend suitable products/services (Heckmann, 2005). Nevertheless, these approaches are limited to the interaction between the IT system and the user and do not consider the wider context of interaction.

Other approaches, for example, (Edvardsson & Olsson, 1996; Goldstein et al., 2002) do not provide the necessary level of modeling in order to be useful in service customization.

Another related area of research is behavioral science applied to improving consumer experience (Chase & Apte, 2007). Nevertheless, no systematic approach has been formulated for integrating such ideas into a consumer process framework.

Answering the question ‘what happens during service customization’, is an essential prerequisite to understanding the e-customization concept. The answer to that question is of course that ‘processes take place’, at different places (e.g. within the provider and consumer), and that these processes have different goals, objectives and outcomes. More importantly such processes are interrelated. Consumer processes create an outcome for the consumer (Edvardsson & Olsson, 1996), since consumers may take part in the service development. Provider processes are the activities performed by the provider to mobilize all resources and capabilities needed to provide the customizable service. These are often called ‘back end’ processes as they are not visible by the consumer who deals only with the service interface.

Naturally, the steps of each process are specific to each service provider and consumer, the actual e-service that is being customized, and the service’s context. Therefore, it is impossible to describe a universal customization process. However, although the behavior of consumers and the consumer process that represents this behavior is unique for each individual consumer, it is possible to model the consumer process on the basis of reference models (Rayport & Jaworski, 2002). Figure 1 instead visualizes such a reference model for e-service customization, without, however, making claims that this is the only way to customize services.

The diagram of Figure 1 uses fundamental e-service concepts that were discussed in previous sections. The key things noticeable in this diagram are as follows:

1. E-service customization is not a ‘one-way’ process, i.e. one controlled by the provider, where the consumer acts as the passive recipient of the outcome. Instead, the process is an iterative (‘loop’) interaction between the provider and the consumer, with both of them participating in the production, customization, and delivery of the e-service, and communicating with each other using ‘feedbacks’. The concept of ‘feedback’ which is here borrowed from Control Systems theory, represents the notion that neither the consumers are indiscriminate as to what service they are offered, nor the providers are oblivious to how the service has been received by the consumer. Instead, both provider and consumer learn from each other as the service is produced, customized and consumed.
2. In the boundaries between the customization process and the providers/consumers we have added the fundamental aspects of ‘process’ and ‘context’ (described in previous sections). Both providers and consumers need to have processes (and associated resources) in place, in order to implement service customization. Providers, for example, need processes and resources to create the services that they provide. Consumers equally need processes and resources to consume services. Also, providers and consumers operate within a ‘context’ which is defined as the ‘state of their affairs’, when the service is produced, customized or consumed. We cannot have accurate understanding of the customization process, nor of its by-products, without considering context and feedback.

3. Customization can take place at different locations, i.e. at the point where the service is created, at the place where the service is consumed, but also during service delivery/distribution. The continuum of service customization is shown in Figure 1.

Figure 1 shows the two ‘extremes’ of service customization. The one ‘extreme’ refers to the case where all customization is carried out by the provider. While this view would be typical of traditional product customization methods, as we will argue in this book, the e-service customization process is fundamentally a lot more complex than product customization and, therefore, it requires increased participation from the consumer. Thus, the situation shown in Figure 1, i.e. where the service provider owns/controls all the processes and resources for service customization is atypical. In reality, the provider will need to use feedback from the consumer to (perhaps) adapt the processes/resources as well as the service itself.

The other extreme side of customization is also shown in Figure 1. Here the consumer is almost totally in control of the customization process. In this scenario, consumers customize the service using processes/resources that they control, and providers ‘learn’ from the feedback they receive from the consumers in order to (perhaps) adapt their processes/resources. We will argue in later chapters that many emerging examples of e-service customization migrate towards this extreme of the continuum. Many customizers on the Web today, for example, give consumers the tools and resources to create their own artifacts. The well known case of Second Life (www.secondlife.com), is a virtual world which, although owned by a commercial organization, is entirely generated by its users- the consumers. We expect this
trend to spread eventually to services where, by using tools offered by the provider, or available in the public domain, consumers can pickup and customize the service to their likings (Franke, 2003). Today, the content of Web based information services can for example filtered, personalized and combined (‘mashed up’) by consumers, as we shall see in Chapter 4. As we shall argue again in the final Chapter of this book, we expect this trend to appear in all types of e-services.

Service Customization Steps

However provider or consumer biased a service customization process is, it still consists of a number of steps. In the literature, these steps have been studied from the perspective of provider or consumers alone, without considering their interactions, nor the whole context of the process. In an article by Balke and Wagner (2003), for example, only the consumer selection process is considered. In their approach, these are the steps of the selection process:

- The user’s intentional goal, i.e. the step where the user’s reason for customizing the service are described.
- The service discovery, i.e. the step where all available services are identified.
- The service composition, where the user’s goal is translated into an implementation plan in terms of a composition of services that will support the goal.
- The service selection, i.e. the step where actual services will be selected.

As the above view represents only a partial view of the process, in the following figure, we define a more complete customization process from both provider and consumer perspectives.

Figure 2 shows typical high level activities (steps) performed by providers and consumers respectively, during service customization. They are shown in a functional tree (hierarchical) fashion, in order to make their interdependencies more clear. Some of these activities (and also some more detailed ones) are briefly described below.

**Browse Preset Service Customization Options/Customized Examples**

This activity implies the availability of a set of preconfigured options in a service customization environment. This is similar to making a selection from a menu of options. What customization options are made available to the consumer can be determined automatically by the provider, based on information he already has about the consumer (e.g. an existing consumer profile as we shall see in Chapter 2). Preconfigured services have been previously customized by either the provider, other consumers (in a virtual community) or both and serve as a repository/library of reusable service customizations.

**Select Customization Parameters**

As there are typically several possible ways to customize a service, this activity is about selecting the customization variables/options that need to be included in the customization of the service. This activity can be assisted by filtering/recommender tools (see Chapter 3).

**Customize QoS Parameters**

This activity will help to assign values to the parameters that have been selected for customization. In general, the problem of selecting the right (or valid) combination of values is combinatorial, i.e. the
number of possible combinations can soon become very large, even with relatively few parameters and value ranges are used. At this stage, a recommender type of system (reviewed in Chapter 3) can be employed and Chapter 6 proposes how this stage can be supported with recommender systems that utilize fuzzy logic.

Customize Interface/delivery

With a continuously increasing number of software applications that realize services and e-services users need to become familiar with a wide range of interface. In addition, the interfaces should address users’ different needs and cognitive styles. For the average user increased interface complexity results in frustration and decreased performance. So interface customization refers to interface designs that adapt their presentation to user priorities (Bunt et al., 2007). However, in the case of web services where they invoke other web services to compose a new e-service the interface (i.e. the input-output parameters that are requested for a service to be executed) can also be customized in order to reduce complexity and increase software efficiency. The delivery customization is part of the service design, since delivery means and methods (e.g. deliver on mobile, by post, in person, etc.), places and time can be specified by the consumer to meet individual needs.

Customize Process Workflow (Provider’s Perspective Only)

The customization of the process workflow refers to filtering and hiding the details of a process to be made visible to external business partners, e.g. in a B2B workflow. Such details are for the consumer irrelevant or non value adding tasks. The service providers design a customized process view aiming at reducing the complexity of the process and its interface. Providers may also design to omit parts of a process that are not required by customers, thus creating a process with different set and sequence of activities (Liu & Shen 2004; Eshuis & Grefen, 2008).
**Customize Contract**

Depending on the chosen configuration, a contract might need to be setup between provider and consumer. The contract might stipulate the price of the customized service, other terms and conditions etc. In many cases of service customization on the Web, a contract will be displayed on an electronic form, which the consumer has to ‘accept’ before he/she can proceed.

**Confirm Choice with Provider/submit Service Request**

Assuming both parties are happy to proceed, this step represents the consumer’s commitment/agreement to proceed with the customized service.

**Consumer Service**

This activity comprises all actions performed by the consumer, required to receive and consume the service.

**Renegotiate Service/adapt Service**

This optional activity applies to cases when the consumer wants to adapt/renegotiate the service. This could mean going back to activity “Design configure variables” or using another interface/tool for service customization.

**Provide Ongoing Feedback**

Feedback can be collected during the performance of the service. This, in an online environment, which can be done automatically, by, monitoring, for example, Web services performance variables such as execution time, reliability, etc. Another common approach is the use of electronic online questionnaires to collect consumer feedback immediately after the service has been delivered. Internet telephony providers will often ask customers, for example, about the quality of their call as soon as they are disconnect.

**Terminate Service**

Ideally the consumer should have the option to terminate the service at any time, and go to the next step (Post-feedback) or back to the top to create a new customized service. Feedback about the reasons the service was terminated can be collected at this stage too.

**Post Feedback**

Post feedback activities are necessary for the consumer as they provide information about how successful the service customization was. Post feedback activities are used to improve the customer profile (likes/dislikes) and the provider’s learning/adaptation processes (see Chapters 5 and 6).

**Customization Activities from the Provider’s Perspective**

Providers perform several activities as part of the service customization concepts, namely

- They configure and setup the customization infrastructure.
- They design services to be customizable, in terms of process, quality parameters and method of delivery (as shown in Figure 2).
They monitor the customization process such as service configuration, delivery and feedback from the consumer. They dynamically adapt service parameters as the service is delivered/consumed. They employ consumer feedback based learning to improve the customization process.

Internet service providers (ISPs), for example, can these days employ sophisticated monitoring and control tools to manipulate service delivery dynamically, as it happens. ISPs can control QoS parameters, based on customers’ profiles, actual behavior, context (e.g. Traffic on the network) and other context information. In congested networks, providers for example can give priority to premium users and hold back bandwidth from less privileged users. They are also capable of ‘throttling’ the bandwidth of users who are using excessive bandwidth—thus, altering QoS parameters dynamically.

Customer feedback from actual usage (service consumption) is very important information used for improving service infrastructure and ultimately service customization strategies. As Sagev and Gebauer (2001), cited in Fairchild (2003) argue, adaptive customer oriented companies must have a sense and response architecture.

Customization Activities from the Consumer’s Perspective

Consumer driven customization refers to the development of the necessary and suitable methods, technologies and tools that would allow consumers to customize a service without having programming skills or experts’ knowledge. Such tools thought as still to be developed. They are in the prototype/research stage.

STRUCTURE AND ORGANIZATION OF THE BOOK

One of the objectives of this book is to construct a framework of requirements and attributes of e-service customization from different perspectives. The following list contains service customization research issues. These categorizations are used as the basis for discussion in subsequent chapters of the book.

- Business Models/Organization Strategies and processes for Customization (Chapters 1, 5, and 6)
- Context-aware e-service customization (Chapter 3)
- Ontologies, fuzzy models and knowledge discovery in e-service customization (Chapters 3 and 6)
- Other factors affecting customization such as environmental influences, context, and other consumer characteristics (Chapter 4)
- Service Recommender and Composition Systems (Chapter 3 and 4)
- User Cognitive/Psychological factors involved in customization (Chapter 2 and 4)
- User Interface Customization (Navigation, Content, Presentation, mainly in Web sites) (Chapter 3).

This book has been organized for a smooth and gradual introduction to the methods, approaches and issues involved in e-service customization. It strives to balance the two perspectives of customization, namely provider and consumer. While a few other books deal with issues of web personalization and customization, they often neglect the provider’s perspective, in favor of a consumer viewpoint. In this book, we show ‘what makes e-service customization tick’, i.e. the provider organizations strategies, processes and IT that drive customization initiatives. Equal coverage and attention however, is paid to
service customization from a consumer perspective. What makes the consumer customize, what consumer knowledge is involved, the tools that can assist consumer driven customization, are all topics treated in this book’s chapters. However, service customization is not a mere academic exercise; it is a paradigm with huge economic consequences. Therefore, the book also tackles the practical application of customization in early adopter industries such as e-finance and e-health.

The book, as shown in Figure 3, is organized around three sections, with each section dealing with a particular facet of service customization and comprising several chapters. In addition, the book contains an introductory chapter (this one) and a chapter with overview, conclusions and recommendations.

In this, introductory chapter, we have set the scene for service customization, defined basic concepts, gave a brief history of mass customization, and introduced the service customization process from both provider and consumer perspectives.

Section 1 (‘Methods and Techniques for Service Customization’) covers concepts and theories of customization. It comprises four chapters.

Chapter 1 (‘Service Customization: The Provider Perspective’) contains business examples, theories and models for service design, and service quality issues from a service perspective. The chapter argues about the importance of Mass Customization and quality management in services. An e-Service customization model, from a business perspective is also given.

Chapter 2 (‘Service Customization: The Consumer Perspective’) is concerned with the understanding of the service consumer. It discusses computer based consumer service models, consumer ontologies, consumer behavior theories, the process of service selection, cognitive limitations of service consumers, and related issues, from a consumer perspective.

Chapter 3 (‘Technologies for E-Service Customization’) discusses customer profiling and CRM approaches, process modeling techniques and standards, service driven business processes and workflow management, and service modeling approaches using Fuzzy Cognitive Maps.

Chapter 4 (‘E-Service Composition’) discusses web service composition models, composition tools and environments such as mashups.

Section 2 (‘Strategies and Modeling for E-Service Customization’) comprises two chapters.

Chapter 5 (‘Service Customization Strategies’) introduces service oriented business strategies and models. The chapter presents a methodology for service identification that starts with opportunities analysis and strategy formulation, and involves managers, employees and IT experts. The interaction between the closely interdependent information technologies and service sector needs and priorities are described. This Chapter integrates several frameworks presented in the literature that partially address the complex interactions between IT and business in service design.

Chapter 6 (‘Business Processes Design for Service Customization’) draws on the methodology for e-service customization presented in Chapter 5 and discusses the modeling approach based on fuzzy cognitive maps for realizing the service customization strategies proposed in the previous chapter.

Section 3 (‘Applications of Service Customization’) of the book contains case studies in e-services customization. It comprises three chapters.

Chapter 7 (‘Case Studies in Customization of E-Health Services’) discusses existing customization projects in the health sector.

Chapter 8 (‘Health Services Case Study’) presents the current state of e-customization practice in e-health services and identifies patient requirements for customizable e-health services.

Lastly, Chapter 9 (‘Banking Services Case Study’) is concerned with service customization in e-banking, and contains case studies of customization strategies from real financial organizations.
Figure 3. Organization of the book
The final chapter of the book, Chapter 10 (‘Conclusions’) gives an overview of the area, discusses limitations of current e-service technologies, draws a future for e-services customization, and ends with some practical advice for e-service customizers.

CONCLUSION

Today’s consumers have evolved from consuming out of needs, to consuming out of wants and desires. They have shifted their spending priorities from products to experiences through services. For organizations the challenge has therefore shifted from developing products that meet the consumer needs, to creating services that capture their imaginations. Service customization has become therefore the new imperative, as only via customization, an intangible and infinitely entity like a service, can be brought close to the expectations of the individual consumer. The issue today is not only how to customize services; the information technologies and data to help us achieve that are in abundance; but also what to customize. We hope that the chapters that follow will provide some useful answers to these crucial issues pertaining service customization.

Dimitris K. Kardaras
Athens University of Economics and Business, Greece

Bill Karakostas
City University, London, UK

REFERENCES


