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Mass Customization for Personalized Communication Environments

Integrating Human Factors

Constantinos Mourlas & Panagiotis Germanakos

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Preface

Since 1994, the Internet has emerged as a fundamental information and communication medium that has generated extensive enthusiasm. It has been adopted by the mass market more quickly than any other technology over the past century and is currently providing an electronic connection between progressive businesses and millions of customers and potential customers whose age, education, occupation, interest, and income demographics are excellent for sales.

Organizations are increasingly offering personalized eService relationships as a way of connecting with customers over a number of platforms and of differentiating their services from those of competitors. Relevant channel and distribution strategies are critical for future advancement of eServices to achieve accessible, customer-focused and responsive services. Following the growing user demands and requirements as well as the rapid development of the technological advancements and infrastructure capabilities the development of eServices should not only focus on making the service available on the Internet, but also examine the different delivery platforms. A multi-channel (WAP, MMS, SMS, Web, Satellite etc.) and a multi-device (PC, mobile phones, PDA, tablet PC, Satellite handset etc.) access mix will improve the access of the services offered, since will be available anytime, anywhere and anyhow through a single point of access entry increasing consequently the business eServices sustainability.

New communication platforms beyond PC-based Internet access are now becoming available allowing the companies to meet these challenges by reengineering their front and back office and business processes, implementing new ways of interaction through a variety of channels (i.e. interactive digital television and third generation (3G) mobile systems driven by common standards open up possibilities for multiple platforms access to services), and restructuring services that accommodate their customers' needs. eBusiness aims to deliver better quality of eServices increasing mass customization and productivity with focused services to be provided by various channels, at a lower cost and time and in a personalized style.

Mass Customization and Personalization are widely appreciated as viable and promising strategies, which aim to provide product and services that best serve individuals' personal needs with near mass production efficiency. Personalization is adapting or sequencing solutions to fit individual differences, expectations, and needs. In contrast, mass customization is adapting to fit common characteristics identified for groups of users. Mass customization is actually the first step in building an individual customers relationship. It may not always be practical to support one user at a time or to build in total personalization capabilities specific to one user. It may be preferable to start with a mass customized solution that identifies a few common critical success attributes that are key for improved performance. However, based on recent technological advances it is possible to implement online services and communication environments accessed via Internet or Web technologies which may be personalized on the basis of individuals' preferences or even the intrinsic characteristics of the specific user like cognitive and emotional parameters, often referred as human factors. Both content and its way of presentation (modality, visual

layouts, ways of interaction, structure) as well as functional elements of such communication environments may automatically adapt their behaviour according to the user needs and preferences enhancing the quality of service delivery and user satisfaction.

CHALLENGES

Mass customization should be more than just configuring a specific component (hardware or software), but should be seen as the co-design of an entire system, including personalized services, experiences and human satisfaction at the individual as well as at the community level. The main objective of this book is to focus on the latest research results on customization of services and communication environments that provide adaptive content and functionality advancing the levels of user satisfaction and providing a total redefinition of the way goods and services are created or sold and customers and vendors interact. It presents the research results produced in this area covering a wide spectrum of strategies, applications, systems and architectures starting from the higher level of modelling human factors and mass communication strategies used and then presenting the lower level issues of mass customization systems and the adaptivity of content and functionality. Special emphasis is given to the integration of Human Factors with traditional factors supporting a built-in flexibility embedded in the product or service. This embedded flexibility will provide high levels of product adaptability and intelligent behaviour of service or product interface so that it will be able to react and automatically adapt its response in changes of user behaviour or the sorrounding environment (i.e. changing system requirements, availability of resources, variation of bandwidth, loose connections, network congestion etc.). Human factors and users characteristics carry the most important role during the entire design and implementation of a product or a service which has the inherent ability to interact with its environment and the user and transparently adapt its behaviour using intelligent techniques, reaching high levels of usability, user satisfaction, effectiveness and quality of service presentation.

ORGANIZATION OF THE BOOK

This book is composed of four sections, with a total of fifteen chapters, each of which is described briefly below:

Section 1: Mass Customization in Products and Services

Chapter 1 argues that service stores most often offer standardized services, which may not hit the customers' demands. As a new possibility to customize service offerings the life event cycle is introduced, which builds on traditional lifecycle concepts but refines them by a stronger individual perspective. It is shown that all marketing instruments could be used to enhance individualization of services and to respect the implications of the life event cycle.

Chapter 2 suggests that a better understanding of consumer responses to mass customization can help companies to more successfully introduce mass customization strategies in new products. It discusses the specific conditions that affect the relative value of a mass-customized product. Based on this understanding, several strategies are presented on how companies could implement mass customization in order to optimize consumer responses and thus offer consumers the greatest value.

Chapter 3 explores the relationship between the capabilities of a manufacturing system and the participation of end-users in order determination. Using a simulated customer-direct mode for the

customization of selected wood products, it is examined the manufacturing of system attributes that enhance direct interaction with customers. It is further discussed the strategic implications of the choice of customization-mode on fundamental resource requirements, and set out practical recommendations for deploying mass customization as a competitive strategy.

Chapter 4 underlines that electronic markets and Web-based content have improved traditional product development processes by increasing the participation of customers and applying various recommender systems to satisfy individual customer needs. It introduces a multi-agent system to support customized product family design by recommending customers' preferences in dynamic electronic market environments. Through experiments, it illustrates that the proposed recommender system can determine the preference values of products for customized recommendation and market segment design in various electronic market environments.

Chapter 5 proposes a standard-based framework to assist industrial organizations to develop interoperability in mass customization Information Systems. After identifying the major challenges for business and information systems in mass customization, the authors propose an innovative standard-based conceptual architecture for a combined model-driven and services-oriented platform stimulating the adoption of mass customization concepts.

Chapter 6 suggests that configurable products are an important way to achieve mass customization. Configurators are information systems that support the specification of product individuals and the creation and management of configuration knowledge, therefore being prime examples of information systems supporting mass customization. However, since there is no systematic review of literature on how mass customization with configurable products and use of configurators affect companies, this chapter provides such a review, focusing on benefits that can be gained and challenges which companies may face, identifying also benefits and challenges from the customer perspective.

Section 2: Mass Customization Meets Personalization: The Case of Adaptive and Intelligent User Interfaces

Chapter 7 realizes that mass customization should be more than just configuring a specific component (hardware or software), but should be seen as the co-design of an entire system, including services, experiences and human satisfaction at the individual as well as at the community level. The main objective of this chapter is to introduce a framework, smartTag, for the dynamic reconstruction of Web content based on human factors. It presents initial results of the evaluation conducted, proving that the proposed framework do not degrade the efficiency (in terms of speed and accuracy) during the Web content adaptation process as well as increases users' satisfaction and efficiency of information processing (both in terms of accuracy and task completion time), while users navigating in the personalized condition rather than the original one.

Chapter 8 underlines that popularisation of mass customization and the need for integration of the user needs into the design, production and marketing phases has called for more innovative methods to be introduced into this area. The integration of ubiquitous computing technologies with machine learning and data mining techniques, which has been popular in personalization techniques, will serve to bring about innovative changes in this area.

Chapter 9 supports that personalized services and products are only successful when the usage context is taken into consideration. For interactive TV services, where usage is typically taking place in a living room, the question on how to develop an interaction technique to enable personalization is central. Based on an extensive literature review a set of requirements for personalized iTV services was developed, applied on a case study, called vocomedia, showing the development of an interaction concept for interactive TV supporting personalization by using a fingerprint recognition.

Section 3: Innovative Applications and Services with Customized Adaptive Behaviour

Chapter 10 argues that the fulfillment of affective customers needs may award the producer extra premium in gaining a competitive edge. This entails a number of technical challenges to be addressed, such as, the elicitation, evaluation, and fulfillment of affective needs, as well as the evaluation of capability of producers to launch the planned products. To tackle these issues, this research proposes an affective human factor design framework to facilitate decision-making in designing product ecosystems. A case study of designing living room ecosystem is reported with dual considerations of customers' perceptions and producer's capacities.

Chapter 11 suggests that psychological customization systems can customize the experiences of users of various information technology-based products and services. In this context customization entails the intelligent automatic or semi-automatic adaptation of information per user profile, which may systematically manipulate transient psychological states of the user such as emotion or cognition. The chapter presents the psychological and technological fundamentals of psychological customization and discusses an example of an application area in emotionally adapted games.

Section 4: Case Studies and Evaluations of Mass Customization

Chapter 12 supports that product configuration systems (PCS) are a technology well suited for mass customization and support the task of configuring the product to the individual customer's needs. PCS are at the same time complex software systems that may be tailored to solve a variety of problems for a firm. It further reports findings from a study of 12 Danish firms, revealing that expected and realized benefits are consistent within the given investigation context.

Chapter 13 discusses that usability and user experience are two important factors in the development of mass-customizable personalized products. A broad range of evaluation methods is available to improve products during an user-centered development process. This chapter gives an overview on these methods and how to apply them to achieve easy-to-use, efficient and effective personalized products that are additionally fun to use. Eventually, it presents a case study on the development of a new interaction technique for interactive TV helping to understand how to set up a mix of evaluation methods to cope with some of the limitations of current usability and user experience evaluation methods.

Chapter 14 underlines that product customization is an important facility that e-commerce offers to its users. On the Web, choiceboard systems have become quite prevalent as the means by which users are able to customize their products. In this context, of choiceboard environment, this research examines the impact of system and information quality and information presentation on interface satisfaction and decision satisfaction. Further, it examines the impact of the latter two satisfaction factors on overall user satisfaction and intention to use. The research reveals that improved system quality, vis-à-vis choiceboards, leads to better information and decision satisfaction on the part of the users.

IN SUMMARY

The contribution of this book may be considered innovative and multi-fold since it brings together many research areas to the benefit of the end-user. This book aims at providing relevant theoretical foundations, principles, methodologies, frameworks, best practices and the latest research findings for the design and development of mass customization of traditional products as well as eServices with personalized features based on user preferences and human factors to professors, researchers, graduate and undergraduate students, and practitioners working on fields related to computer science, human computer interaction, e-business, software engineering, electrical and computer engineering, Web technology, information systems, e-commerce, e-marketing as well as to business leaders and consultants.

This book is a useful tool for academics, teachers and researchers, professionals in the field of mass customization and Web personalization, and to people that belong to the broader field of the information communication technologies (ICT). It provides pragmatic references, analysis, new methodologies, and architectures that tend to approach the subject more comprehensively providing latest suggestions and solutions.

Constantinos Mourlas and Panagiotis Germanakos
Athens, 2009

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Athens, Hellas
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Section 1
Mass Customization in Products and Services

Table of Contents

Detailed Table of Contents

In this chapter it is argued that service stores most often offer standardized services, which may not hit the customers' demands. As a new possibility to customize service offerings the life event cycle is introduced, which builds on traditional lifecycle concepts but refines them by a stronger individual perspective. In the first part of the chapter, a short introduction in service management, kinds of services and the relevance of a long term customer relationship for service stores is given. Then the idea of life cycles is shown in general, before in the main part the life event cycle is explained. It is shown that all marketing instruments could be used to enhance individualization of services and to respect the implications of the life event cycle. The paper ends with limitations and future trends.

A better understanding of consumer responses to mass customization can help companies to more successfully introduce mass customization strategies in new products. Only if consumers believe that the value of the mass-customized product significantly exceeds that of an off-the-shelf product, consumers are willing to mass customize a product. This chapter discusses the specific conditions that affect the relative value of a mass-customized product. Characteristics of the consumer who is performing the customization task, the product category that is mass customized, and the specific mass customization

process can affect the perceived benefits and drawbacks of mass customization. Based on this understanding, several strategies are presented on how companies could implement mass customization in order to optimize consumer responses and thus offer consumers the greatest value.

This study explores the relationship between the capabilities of a manufacturing system and the participation of end-users in order determination. Using a simulated customer-direct mode for the customization of selected wood products, it is examined the manufacturing of system attributes that enhance direct interaction with customers. It is further discussed the strategic implications of the choice of customization-mode on fundamental resource requirements, and set out practical recommendations for deploying mass customization as a competitive strategy. End-user participation in configuring customized products requires that beyond desirable attributes such as agility in manufacturing systems, compelling service capability be developed to enhance customer experience.

Electronic markets and web-based content have improved traditional product development processes by increasing the participation of customers and applying various recommender systems to satisfy individual customer needs. This chapter introduces a multi-agent system to support customized product family design by recommending customers' preferences in dynamic electronic market environments. In the proposed system, a market-based learning mechanism is applied to determine the customers' preferences for recommending appropriate products to customers in the product family. It demonstrates the implementation of the proposed recommender system using a multi-agent framework. Through experiments, it illustrates that the proposed recommender system can determine the preference values of products for customized recommendation and market segment design in various electronic market environments.

This chapter proposes a standard-based framework to assist industrial organizations to develop interoperability in mass customization Information Systems. After identifying the major challenges for business and information systems in mass customization, the authors propose an innovative standard-based conceptual architecture for a combined model-driven and services-oriented platform. The chapter