MCPC 2007 World Conference on
Mass Customization & Personalization

October 7-9, 2007 at the Massachusetts Institute of Technology
October 11-12, 2007 at HEC Business School Montreal

Program and Schedule
(updated on 6-Sep-07)

MCPC 2007 Conference Chair:
William J. Mitchell, Massachusetts Institute of Technology

MCPC 2007 Conference Program Chairs:
Frank T. Piller, RWTH Aachen University & MIT Smart Customization Group
Mitchell Tseng, Hong Kong University of Science & Technology

MCPC 2007 Conference Coordinators:
Ryan Chin and **Betty Lou McClanahan**, Massachusetts Institute of Technology

MCPC 2007 Business Seminar Chairs:
Louise Guay, My Virtual Model
Jacques Nantel, HEC Business School Montreal

MCPC 2007 Honorary Chair:
B. Joseph Pine II, Strategic Horizons

The World Conference on Mass Customization & Personalization (MCPC) is the primary event in this domain. Bridging between academic research and management practice, the biannual conference provides an interactive platform to learn about mass customization strategies and to discuss the latest technologies and enablers. This conference series was initiated by Frank Piller and Mitchell Tseng in 2001.

The 2007 conference will start at MIT in Cambridge/Boston, with an interdisciplinary focus on the new advancements in the field. The second part at HEC Business School in Montreal will address in the form of a business seminar opportunities to bring mass customization and personalization in retail.

www.mcpc2007.com

Contents

MCPC 2007 Conference Overview & Schedule

Sunday, October 7, 2007 (Cambridge/Boston, MIT Campus)

Registration and all events take place at the MIT Stata Center (MIT Main Campus, Building 32, 32 Vassar Street, Cambridge, MA 02139, USA). **General Conference Registration starts at 3pm** in the MIT Stata Center Lobby.

9:00-9:15	Workshop Registration*	
9:15 - 3:15 Pre-Conference Workshops	**Pre-Workshop I: An Introduction into Mass Customization Strategies and Implementation*** *Facilitators: Frank Piller, RWTH Aachen; Rajan Suri, University of Wisconsin, and Mitchell Tseng, HKUST* 9:15-9:30: Overiew and introduction 9:30-10:30: **MASS Customization Seen From the customers' Perspective** (Frank Piller) 10:45-12:00 **Connecting Customers Preferences and Supply Chain to Support Mass Customization: Product Family and Configurators** (Mitchell Tseng) 12:45-3:15: **QRM and POLCA: Manufacturing and Material Control Strategies to Support Mass Customization** (Rajan Suri) ** Note: Participation at the Conference Workshops requires pre-registration.*	**Pre-Workshop II: Mass Customization Design: An Interactive Workshop at the MIT Media and MIT Design Labs*** *Facilitators: William Mitchell, Ryan Chin and the MIT Smart Cities Group* 9:30 – 3:00: Your chance to become part of the MIT Design Lab for a day. Interact with Media Lab members and the MIT Design Lab team to co-create innovative solutions and latest designs for mass customization and personalization applications. You will work on an actual project and learn about MCP design and prototyping during the day. An highly interactive experience in a creative environment ** Note: Participation at the Conference Workshops requires pre-registration.*
3:45 – 6:15 Opening Session	**Conference Opening: Welcome to the MCPC 2007** **William Mitchell**, MCPC 2007 Chair **Ryan Chin** and **Betty Lou McClanahan**, MCPC 2007 Organizers **Frank Piller** and **Mitchell Tseng**, MCPC 2007 Program-Chairs **Opening Keynote** by B. Joseph Pine II: **The Past, Present, and Future of Mass Customization** **B. Joseph Pine II**, Strategic Horizons LLP, Author of "Mass Customization" and Co-Author of "The Experience Economy" **Opening Keynote: Mass Customization 2.0:** **Creating the Missing Link Between The Long Tail and MCP** **Brennan Mulligan**, Senior Vice-President, Zazzle.com	
6:15 – 7:00	**Opening Cocktail Reception at the MIT Stata Center**	

Monday, October 8, 2007 (Cambridge/Boston, MIT Campus)

Registration and most events take place at the MIT Stata Center (MIT Main Campus, Building 32, 32 Vassar Street, Cambridge, MA 02139, USA)**. Selected sessions may also take place at in the adjunct Building 66. <u>Conference Registration starts at 8am</u>** in the MIT Stata Center Lobby.

	Rooms & Sessions					
	32-123	**32-124**	**32-141**	**32-144**	**32-155**	**66-168**
8:30 - 9:45 Keynote Session	**Product Grammars, Customization, and Consumer Choice** **Prof. William J. Mitchell**, MIT Media Lab and MIT School of Architecture **Mass Customization and Architecture** **Kent Larson**, MIT Media Lab and MIT School of Architecture, House_n consortium, MIT Open Source Building Alliance					
10:00 - 11:15 Parallel Sessions I	2.4.1 **Creating New Markets by Innovative Mass Customization Offerings**	7.1.1 **Strategies and Cases of MCP in Architecture & Construction**	2.1.1 **Expanding Mass Customization Thinking: What is Next**	3.2.1 **Value of Customization: Why do customers value customization?** (I)	5.1.1 **Developing Powerful Product Platform Architectures**	
11:25 - 12:40 Parallel Sessions II	2.4.2 **MC Fashions: Learning From MCP Entrepreneurs in the Fashion Industry**	7.1.2 **Concepts & Tools of MCP in Architecture & Construction**	2.1.2 **Extreme Examples of Executing Mass Customization**	3.2.2 **Value of Customization: Why do customers value customization?** (II)	5.1.2 **Managing Complexity & Cost in MC Product Architectures**	
12:40 - 1:40	**Lunch** (Stata Center Lobby)					
1:45 - 2:20 Keynote Session	**Toolkits for Collaborative User Innovation** **Prof. Eric von Hippel**, MIT Sloan School of Management					
2:30 - 3:45 Parallel Sessions III	2.2 **What is Next in Open Innovation & Customer Interaction**	7.3.1 **Mass Customization of Apparel: Strategies & Technologies**	2.5.1 **Strategies and Conceptual Thinking in User Manufacturing**	3.2.4 **Creating MCP Systems that Sell**	5.1.3 **Setting the Right Degree of Variety**	2.6 **Panel: Mass Customization in Education**
4:00 - 5:15 Parallel Sessions IV	4.1 **User Innovation Strategies & Policies**	6.3.1 **The Elements of Successful MCP Manufacturing Systems**	2.5.2 **Examples and Capabilities for User Manufacturing**	3.2.3 **The Paradox of Choice: Complexity of MCP Configuration**	5.1.4 **Factors Influencing MCP Design**	2.6 **Panel: Mass Customization in Education**
5:20 - 6:35 Parallel Sessions V	4.2 **User Innovation in Practice: Real World Insights from User Innovation Accelerators**	6.3.2 **Manufacturing Cells for Mass Customization Manufacturing**	2.5.3 **Advances in Rapid Manufacturing Technologies**	7.3.2 **Mass Customization of Apparel: Case Studies**	5.2 **Comfort, Usability, and Safety by and for MCP**	
7:00-9:30	**A Night in the Museum: Conference Reception in the MIT MUSEUM**					

Tuesday, October 9, 2007 (Cambridge/Boston, MIT Campus)

Registration and most events take place at the MIT Stata Center (MIT Main Campus, Building 32, 32 Vassar Street, Cambridge, MA 02139, USA)**. Selected sessions may also take place at in the adjunct Building 66. <u>Conference Registration starts at 8am</u> in the MIT Stata Center Lobby.**

	Rooms & Sessions					
	32-123	**32-124**	**32-141**	**32-144**	**32-155**	**66-168**
8:15 - 9:30 Parallel Sessions VI	4.3 **How to Profit From Lead Users**	3.1.3 **Mass Customization Effectiveness**	5.3.2 **Linking Between Product Architecture & Configuration System Design**	3.2.5 **Best Practices & Experiences in MCP Marketing**	7.2.1 **Strategies for Customized Footwear: State of the Art**	
9:45 - 11:00 Parallel Sessions VII	4.4 **Application of Open Innovation Methods & Tools**	3.1.1 **Reality Check: Strategies for Mass Customization**	5.3.3 **Tools and Methods for MCP Toolkits**	2.3 **Showcase Panel: Design-Inspired Innovation**	7.2.2 **Case Studies and Technologies for Mass Customization in the Footwear Industry**	7.4.1 **Searching for a New Model of Mass Customization of Automobiles**
11:15 - 12:30 Parallel Sessions VIII	5.3.1 **Mass Customization Information Systems**	3.1.2 **Differentiating Mass Customization Strategies**	7.5.1 **Strategies for Service Customization**	6.1 **MCP Production Planning & Scheduling**	7.3.3 **Making the Clothes Fit: Body Measurement, Scanning, and Virtual Models**	7.4.2 **Panel: Mass Customization in the Automotive Industry**
12:30 - 1:30	**Lunch** (Stata Center Lobby)					
1:30 - 2:10 Keynote Session	**The Emotion Machine: Commonsense Thinking, Artificial Intelligence, and the Future of the Human Mind – and What We Can Learn From This For Mass Customization & Personalization** **Prof. Marvin Minsky**, MIT Media Lab and MIT AI Lab					
2:20 - 3:35 Parallel Sessions IX	5.3.4 **MCP Toolkits in Practice: Experiences and Insights**	3.1.4 **The Mass Customization Profit Chain: The Example of the Furniture Industry**	7.5.2 **Approaches and Tools for the Design of Service Customization**	6.2.1 **Supply Chain Design for Delivering Customized Products**	7.3.4 **Design, Virtual Garments, and Virtual Models**	
3:50 - 5:05 Parallel Sessions X	4.5 **Enabling Open Innovation & Customization in Consumer Electronics**	3.3 **Change Management for MCP**	7.5.3 **Case Studies in Service Customization**	6.2.2 **Managing Supply Chains for Delivering Customized Products**		
5:15 - 6:00 Closing Session	**Panel Discussion: The State and Future of Mass Customization & Personalization** *Chairs:* **William Mitchell**, **Frank Piller** and **Mitchell Tseng**					

Wednesday, October 10, 2007

Time for network meetings, research group discussions, or a MIT campus visit

Travel to Montreal *(on your own, rent a car for a nice four-hour drive or take a plane or bus)* and **Pre-registration for the MCPC 2007 Business Seminar will be available at HEC Montreal in the Main Lobby** (3000 Chemin de la Côte-Sainte-Catherine, Montreal, Quebec, Canada H3T 2A7)**.**

17:00 to 19:00 Evening Cocktail in Old Montreal

Thursday, October 11, 2007: MCPC 2007 Business Seminar (HEC Montreal)

Registration and all events take place at the HEC Business School (3000 Chemin de la Côte-Sainte-Catherine, Montreal, Quebec, Canada H3T 2A7)**. <u>Registration starts at 7 am</u>** in the IBM Auditorium.

7:00   Registration and Continental Breakfast: HEC Montréal IBM Auditorium

8:15   Opening remarks: *Louise Guay, Frank Piller*

8:30   *Keynote Speaker:* **Don Tapscott,** Chief Executive of New Paradigm, and Adjunct Professor of Management at the University of Toronto

> Don is an internationally renowned authority on the strategic value and impact of information technology. He has authored or co-authored eleven widely read books on technology and business, including his most recent **Wikinomics: How Mass Collaboration Changes Everything,** which will form the basis of his presentation. He is also the author of The Naked Corporation, Digital Capital and Growing Up Digital.

Presented by: Jacques Nantel

9:30   *Panel 1:* **An Extreme Makeover of Retail**

> Moderator: Jacques Nantel
>
> *Robert Bonneau,* President, of Global Wine and Spirits
> *Paul Miller,* Senior Vice President Direct Commerce Sears Holdings Company
> *Paul Cathcart,* General Manager E-Commerce, Sears Canada
> *Jacques Nantel,* Secretary General HEC
> *Jean-François St-Arnaud,* CEO and Founder of My Virtual Model
> *Christian Stegmaier,* Head of Life Style Reebok International Ltd.

10:45   *Panel 2:* **An Extreme Makeover of Logistics**

> Moderator: Frank Piller
>
> *Lukasz Gadowski,* President and CEO Founder of Spreadshirt Inc
> *Kirk Jones,* Director NIKEiD Innovation
> *Frank Piller,* Researcher, author, Chair Professor of Management at RWTH Aachen University Germany, Founding faculty member of the MIT Smart Customization Group
> *Marybeth Thomson Luber,* General Manager Custom Archetype Solutions Inc.
> *Joshua Young,* Product Imaging Operations Manager of Nike US Apparel US

12:00   Lunch

13:30   *Keynote Speaker:* **Mike Gray,** Supply Chain Evangelist – Dell, Inc.

> With Dell for over 15 years, Mike is considered an expert on Dell's unique approach to supply chain management. He has been a lead architect for many of the business processes that allow Dell to achieve its unprecedented levels of inventory while maintaining industry-leading customer service. Mike Gray is a lifetime Certified Purchasing Manager (C.P.M.) with the Institute for Supply Management (ISM) and is also certified in Integrated Resource Management (CIRM) by APICS, the Association for Operations Management.
>
> Presented by: Jean-François St-Arnaud

14:30 *Panel 3:* **An Extreme Makeover of Product Creation and Merchandizing**

Moderator: Christopher Dingle

Yoram Burg, President of OptiTex USA Inc.
Brion Carroll, Vice President, Global Business Development for Retail, Footwear and Apparel at Parametric Technology Corporation (PTC)
Christopher Dingle, Vice-President, CMO of My Virtual Model
Normand Laniel, Director, Manufacturers Sales – Residential for 20-20 Technologies

15:15 *Panel 4:* **An Extreme Makeover of Services Marketing**

Moderator: John G. Palfrey, Jr.

Sean Belka, Senior Vice President, Online Strategy for Fidelity Personal Investment
Michael Kahn, Vice President, Account Manager, DoubleClick - Performics
Kenneth Mowry, User Centered Design & Research Executive, Bank of America
John G. Palfrey, Jr. Clinical Professor of Law & Executive Director at The Berkman Center for the Internet and Society at Harvard Law School
Paul Trevitchick, CEO and Co-Founder, Parity Communications Inc.

16:15 *Panel 5:* **Avatar Marketing: An Extreme Makeover of the Self**

Moderator: Lukasz Gadowski

Louise Guay, President and Founder of My Virtual Model
Philip Jacob, Founder of StyleFeeder Inc, software architect and entrepreneur
Sean Ryan, CEO of Donnerwood Media Inc. (Meez)
Jarmo Suominen, Professor of Mass Customization, Director of the Future Home Institute University of Art and Design Helsinki, Guest Researcher at the MIT
Christopher Mahoney, Linden Lab's business development manager

17:00 *Closing:* **Internet and Society: The Ultimate Makeover**

John G. Palfrey, Jr. Clinical Professor of Law & Executive Director at The Berkman Center for the Internet and Society at Harvard Law School

Presented by: Louise Guay

18:30 **Cocktail**

20:00 **Official MCPC 2007 Conference Dinner**. Enjoy a spectacular evening with music and fine food in Old Montreal.

Friday, October 12, 2007 (MVM Montreal)

8:00 to 11:00

Workshop at MyVirtualModel: Using Virtual Models of Products, Customers, and Identities for Competitive Advantage: An introduction into the latest tools, technologies, and strategies

Special registration required. The free workshop will take place at MVM in Montreal, 80 Queen Street, Montréal (Québec), Canada, H3C 2N5

Abstracts and Presentations

1   Keynote Plenary Presentations

B. Joseph Pine II, Strategic Horizons LLP, Author of "Mass Customization" and Co-Author of "The Experience Economy"

The Past, Present, and Future of Mass Customization

When Stan Davis coined the term "Mass Customization" in 1987 it was an oxymoron. When B. Joseph Pine II popularized the term in his 1993 book of that name, he described it as "the new frontier". Today it has become an imperative for companies across a wide range of industries. Hear Joe Pine discuss the origins of the movement that led to MCPC, his views on the current state of the art, and where his continuing search for how businesses can add economic value through their offerings is leading him -- and where it could take us.

Prof. Eric von Hippel, MIT Sloan School of Management

Toolkits for collaborative user innovation

Toolkit development within the field of mass customization has so far focused on assisting individual customers in customize a product - for example, a custom Adidas shoe or a custom semiconductor designed by and for a particular user. But outside the boundaries of mass-customized production, toolkits for COLLABORATIVE user innovation are emerging like Google map mashup toolkits. Here, many users apply a toolkit to collaboratively design a rich and complex joint product. We explore the implications of this trend for mass customization.

Prof. William J. Mitchell, MIT Media Lab and MIT School of Architecture

Product Grammars, Customization, and Consumer Choice

In this presentation, I demonstrate the use of product grammars for concisely describing customizable products and specifying their ranges of variants. I show that this provides a rigorous way of defining customization possibilities, assuring that all possibilities are functional and safe, creating configurators, and exploring supply chain and assembly strategies.

Prof. Marvin Minsky, MIT Media Lab and MIT AI Lab

The Emotion Machine: Commonsense Thinking, Artificial Intelligence, and the Future of the Human Mind – and What We Can Learn From This For Mass Customization & Personalization

Marvin Minsky is one of the founders of the study of Artificial Intelligence, and also has made many contributions to computer science, psychology, mathematics, linguistics, robotics, and optics. Since the early 1950s, Professor Minsky has developed computational models of human mental processes and, in recent years has worked chiefly on ideas about how human commonsense reasoning works. He is the author of the 1987 bestseller 'The Society of Mind' (which is also the title of the course he teaches at MIT) and its new sequel, The Emotion Machine. This book suggests that we can best understand human emotional states by regarding them, not as different or complementary to 'intellectual' or 'rational' mental conditions, but as being among our many different, alternative mental strategies or "Ways to Think." In his presentation, he will connect his latest thinking with the design of better customization and personalization offerings.

Note: This is the main contact. All co-authors & affiliations will be shown in the final printed version of this program. For more conference information, please refer to www.**MCPC2007.com**.

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Kent Larson, MIT Media Lab and MIT School of Architecture, House_n consortium, MIT Open Source Building Alliance

Mass Customization and Architecture

Kent Larson is director of Changing Places: a joint MIT Department of Architecture and Media Laboratory research consortium. He also runs the associated House_n consortium and the MIT Open Source Building Alliance within the Department of Architecture. Current research focuses on strategies for creating responsive places of living using new design/fabrication strategies, defining system level standards for an open source approach to building design and construction, and developing ubiquitous sensing/computation technologies that do useful things for people related to proactive health, energy conservation, communication, and learning. Larson's group, with TIAX, has developed a unique research facility called the PlaceLab to systematically prototype and test new technologies and design concepts in the context of everyday life. Larson practiced architecture for 15 years in New York City in partnership with Peter L. Gluck, and more recently as Kent Larson, Architects P.C.. His book, Louis I. Kahn: Unbuilt Masterworks was selected as one of the Ten Best Books in Architecture, 2000 by the New York Times Review of Books. Related work was selected by Time magazine as a "Best Design of the Year" project.

Brennan Mulligan, Vice President, Zazzle.Com; Founder & Former CEO of Timbuk2, USA

Mass Customization 2.0: Creating the Missing Link Between The Long Tail and MCP

Zazzle is the world's creativity marketplace that enables thousands of users every day to customize their own products, but also to shop for products created by their peers. Zazzle created a profitable and scalable business model that delivers what it promises. The company was originally started on the concept of "create your own". But time passes, though, and sales are shifting to the Zazzle marketplace, where semi-pro designer shop their wares to consumers. This is where mass customization meets the long tail. Brennan Mulligan has a long track record in mass customization: He was founder and CEO of Timbuk2.com, the first online customizer of bags. later, he helped Nike and rebook, among others, to start their mass customization initiatives. He last company, confego, was acquired by Zazzle.com.

Further Executive Presentations from, *for example*:

- **Fred Kimball,** Former CTO, Freightliner, USA
- **Art St Onge,** St. Onge Company
- **Anthony Ulwick**, Strategyn, USA
- **Johan Wallin**, Synocus Oy, Finland

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MCPC 2007 Business Seminar Keynote Presenters (HEC Montreal, Oct 11, 2007)

Don Tapscott, Chief Executive of New Paradigm, and Adjunct Professor of Management at the University of Toronto

Don is an internationally renowned authority on the strategic value and impact of information technology. He has authored or co-authored eleven widely read books on technology and business, including his most recent **Wikinomics: How Mass Collaboration Changes Everything,** which will form the basis of his presentation. He is also the author of The Naked Corporation, Digital Capital and Growing Up Digital.

Mike Gray, Supply Chain Evangelist – Dell, Inc.

With Dell for over 15 years, Mike is considered an expert on Dell's unique approach to supply chain management. He has been a lead architect for many of the business processes that allow Dell to achieve its unprecedented levels of inventory while maintaining industry-leading customer service. Mike Gray is a lifetime Certified Purchasing Manager (C.P.M.) with the Institute for Supply Management (ISM) and is also certified in Integrated Resource Management (CIRM) by APICS, the Association for Operations Management.

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2 MCP Showcase & Panel Sessions

This track presents selected presentations and panels on advanced thinking in mass customization, personalization, and open innovation – and how to bring these strategies to the next level.

2.1 Extreme Customization: Bringing Mass Customization & User Integration to the Next Level

2.1.1 Expanding Mass Customization Thinking: What is Next

Mass Customization and Highly Individualized Solutions: Stretching Mass Customization beyond the Traditional Paradigm of Industrial Production (MCPC-118-2007)

Presenter:* Morelli, Nicola (Denmark)

Abstract: Globalization if creating large changes in our social and economic system, whereas demand patterns are becoming more and more diversified and highly localized. The difference between global production and local demand relates to a paradigmatic shift in the way of looking at production and consumption patterns. The reference to a paradigm shift helps emphasizing the inherent limits of industrial production and the elements of changes brought about by the possibility to generate highly individualized solutions. The concept of mass customization was introduced to extend the domain of industrial production beyond its original limitations, however it is strongly linked to the paradigm of industrial production and not always usable to support and explain new ways of organizing value creation. This paper proposes an analysis of this paradigm shift through three cases, which emphasize some elements of mass customization that are still relevant to the new paradigm. At the same time the paper emphasizes the limits of this concept and the need for a new perspective view to interpret the ongoing change in production and consumption systems.

Designing in the Domain of Desire – An Exploration of Design in Virtual Worlds (MCPC-113-2007)

Presenter:* Krishnapillai, Anandasivam (Singapore)

Abstract: Virtual worlds are convincing examples of customer creations. They are fantasy worlds made entirely out of customer created objects, building and landscapes. Many companies are now actively involved in Virtual Worlds as they begin to appreciate that understanding fantasy is as important as understanding functional requirements if they are to fulfill the desires of their customers. The design technology behind virtual worlds is built on animation and the games, which have been a fertile ground for design with an unprecedented hunger for new designs of people, planets, products, buildings and landscapes. The design tools used to create them are now virtually identical to those that are used to create real life products. We are now beginning to see the merging of the real and virtual worlds. Technologies such as rapid prototyping and generative design will soon empower customers to realize their virtual goods in real life. Fashion cycles spun off from the virtual world may start hitting the real world. The implications of this, along with ways in which companies are strategizing to tap the fantasy and the creative potential of the virtual worlds into real world products will be discussed with examples.

Enhancing the Luxury Experience Through Customizing Luxury Goods: Applications & Obstacles of Customization in the 21st Century Luxury Industry (MCPC-169-2007)

Presenter:* Okonkwo, Uche (France)

Abstract: Customization of products and services is one of the key requirements of current luxury consumers as the luxury consumer desires an exceptional and exclusive total experience with luxury brands. Luxury consumers are also becoming more individual in their fashion tastes and increasingly seeking customization as an outlet to their fashion creativity. Despite this apparent need, the luxury fashion goods sector is yet to make customization a core aspect of the corporate strategy. Currently, several luxury brands offer bespoke products and services but these services are often reserved to a narrow client base. This is mainly as a result of the view of some luxury practitioners who regard mass customization as an approach that is at odds with the need to retain the 'exclusivity' attribute of luxury brands. Their argument is that if customers are provided with the tools to customize their products, the products could lose their 'superiority' appeal. This presentation will provide an in-depth examination of the place of customization in the luxury goods industry and its role as a tool for enhancing the brand experience from the customer viewpoint, and increasing the brand equity from company's perspective.

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2.1.2 Extreme Examples of Executing Mass Customization

The MedCo Story: A Modern Marvel of Mass Customization (MCPC-9xx-2007)

Presenter:* St Onge, Art (United States)

Abstract: Few examples of large scale mass customization programs compare with Medco's highly automated prescription processing, preparation and delivery to millions of individual patients. From two fulfillment facilities, Medco prepares and delivers over two million unique prescriptions each week at unparalleled quality levels and with virtually no human involvement. St. Onge Company, a consulting/engineering firm known for its creative engineering, joined the Medco team in developing this system. At the time, the idea of automating heretofore extensive manual functions involved in the preparation and fulfillment of mail order prescriptions was being considered, despite seemingly insurmountable challenges. Undaunted, the Medco team met these challenges and created a technology solution that allowed Medco to dominate its industry sector. Arthur St. Onge, founder of the firm, will provide us with an overview of the challenges and solutions incorporated within this remarkable example of large-scale mass customization. He will also challenge the mass customization community to focus its learnings and creative thinking on assisting supply chain communities to overcome inventory distortions that result from supply chains extending over thousands of miles. Many of the learnings developed over the past decade through implementation of mass customization techniques could be used to eliminate the effect of long lead times for finished products sourced from Asia destined for European and American consumption. This is a key opportunity for the mass customization community to provide a practical solution to a situation that annually creates severe economic problems for suppliers and retailers.

Redundancy Elimination and Dynamic BOM Creation within Mass Customization (MCPC-033-2007)

Presenter:* Kimball, Fred (United States)

Abstract: The ability to support increased levels of mass customization is limited by the amount of redundancy within a company. Documentation redundancy is extremely destructive. The single BOM and modular BOM concepts should be leveraged to resolve this problem and to enable higher levels of customization. The modular BOM concept can be extended into the "dynamic BOM" parts lists to address the redundancy problem as well as satisfying other needs. The dynamic BOM is also the solution on how to effectively couple dissimilar ERP systems. This coupling of ERP systems capability is critical since no single ERP system is able to adequately address the upstream configuration, compatibility, and translation processes for mass customization. The dynamic BOM is able to satisfy the needs for line sequenced modules, custom built major components from suppliers, and sophisticated sub-assembly build up of product in feeding plants to take advantage of plant specific capabilities.

Customization: Making a More Sustainable Environment (MCPC-073-2007)

Presenter:* Piroozfar, Amir (United Kingdom)

Abstract: Customization has offered a very promising prospect in manufacture and service industries whenever it has been well understood, employed evolved and promoted. It is still somehow new to building industry and even newer when it happens to be investigated with regard to some critical, if not controversial, issues within the built environment i.e. sustainability. It becomes even more complicated as this paper tries to focus on the areas which have been even less studied and researched; the non-economic impact of customization on its surroundings generally and on sustainability in particular within the context of building industry. Setting this scene the paper will have a look on the notion of sustainability. Then it will outline the impacts of customization on building industry; mostly non-economic ones. It will then investigate different hypotheses around the reciprocal relation of the two fields and tries to magnify the positive links between them. Using the finding of the research, whose findings has been used to prepare this paper, it will then try to conjure some general suggestions and warnings up on how to promote sustainability using the positive correlation between the two.

2.2 What is Next in Open Innovation & Customer Interaction

Semi-Open Innovation in Services (MCPC-109-2007)

Presenter:* Wallin, Johan (Finland)

Abstract: To keep customers satisfied companies often have to provide more added value in their offerings through knowledge based services. This implies that they have to increasingly take the role of intermediaries, combining own activities with those of third parties, to make their offerings attractive. Proactive intermediaries, business orchestrators, will have to consider how to leverage and build distinctive capabilities when developing their service strategy. By

examples from service development cases it is shown how the capability based view on service development, here introduced as semi-open innovation, presents both a creative but also efficient way to address service innovation. The experiences from the case companies offer rich insights into the peculiarities of service development in general, and especially into the interlinking of customer preferences and capability development during the initial phase of service innovation. In addition the paper puts forward some concrete suggestions for any networked company looking for ways to activate customers as partners in a semi-open innovation process.

What is a Customer Need? (MCPC-170-2007)

Presenter:* Ulwick, Anthony (USA)

Abstract: To innovate, companies know they must be able to discover customers' unmet needs, but lack of standards as well as outdated Voice-of-the-Customer (VOC) thinking are acting as roadblocks to success. With a true customer perspective and refined VOC practices, companies can dramatically improve their ability to innovate. The presentation by Anthony W. Ulwick, founder and CEO of Strategyn, an innovation management consultancy firm based in Aspen, Colorado, will address these questions. Mr. Ulwick is the author of What Customers Want (McGraw- Hill, 2005) and "Turn Customer Input into Innovation" (Harvard Business Review, January 2002).

Using Virtual Models of Products, Customers, and Identities for Competitive Advantage (MCPC-9xx-2007)

Presenter:* Guay, Louise (Canada)

Abstract: Communities and virtual worlds are ubiquitous in the media and in perceptions of people as trends. We went from mass media to personal media; the advertising is also morphing to customer relationship and avatar-based advertising. These changes were possible because of the wiki and the user-generated content applications: dictionaries, encyclopedias, Flickr, etc. Crowdsourcing and the open source movement are allowing a true democratization of innovation. Eric Von Hippel has shown how logical it is for corporations to open their innovation centers to users. With virtual models, the personalization is now visual, providing a true interface for customization and co-design. It seems that mobility with standards and interoperability will reach out with devices like cells, iPhones, PDAs, etc. Personal communities and networks as virtual worlds will surround users in unprecedented ways. It will start by personal catalogs and stores and extend wherever it will be needed and wanted by the users. The passage from 2D to 3D on the Web as well as the virtual identity is the next big thing, as this talk will discuss.

2.3 Panel: Design-Inspired Innovation

Chair: Utterback, James M (USA) (MCPC-174-2007)

When an innovation is inspired by design, it transcends technology and utility. The design delights the user, seamlessly integrating the physical object, a service, and its use into something whole. A design-inspired innovation is so simple that it becomes an extension of the user. It creates meaning and a new language. This panel is inspired by the book Design-Inspired Innovation (World Scientific Publishing, 2007). It takes a unique look at the intersection between design and innovation, and explores the novel ways in which designers are contributing to the development of products and services. Through a variety of cases and cultural prisms, the panel extends the traditional design viewpoint and stretches the context of industrial design to question — and answer — what design is really all about. A special focus of the panel will be the relationship between design and product customization.

Panelists:

- **James M Utterback** is David J McGrath jr (1959) Professor of Management and Innovation in the Sloan School of Management and Professor of Engineering Systems in the School of Engineering at the Massachusetts Institute of Technology. He is an associate editor of the journal Research Policy, a member of the AAAS, the Academy of Management and INFORMS, a Fellow of the Royal Swedish Academy of Engineering Sciences and a member of the Board of Governors of Argonne National Laboratory.

- **Eduardo Alvarez** is a graduate of MIT where he did his thesis on Managing Creativity for Effective Innovation. He is a designer and entrepreneur and is President of VIGIX, Inc, which he founded.

- **Susan Walsh Sanderson** is a Professor at the Lally School of Management at Rensselaer Polytechnic Institute in Troy, New York.

- **Roberto Verganti** is Professor of Management of Innovation at the School of Management and at the Faculty of Design of Politecnico di Milano. He is Director of the Alta Scuola Politecnica, the School for Talents of Politecnico di Milano and Politecnico di Torino. He is also Director of Made in Lab, the laboratory for advanced education on Marketing, Design and Innovation of MIP-School of Management of Politecnico di Milano and Co-Director of the Master in Strategic Design Program.

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2.4 Mass Customization Entrepreneurs: Case Studies on Successfully Founding and Running your MCP Business

2.4.1 Creating New Markets by Innovative Mass Customization Offerings

Edelwiser Customized Skis - Experiences and Learning from Running a Toolkit for Individual Ski Design (MCPC-145-2007)

Presenter: Werdenigg, Erwin (Austria)

Abstract: Austria based, 2004 founded, edelwiser Sporthandel GmbH offers a professional range of high-quality, sidewall laminated, all-mountain and carving (shaped) skis. Each pair of skis shows its individual topsheet (graphic) design, brought by the customer in an interactive process. Edelwiser skis retail at the same price as comparable mass production ski. Individual designed edelwiser skis will directly be delivered within 1 and 3 days after the customer finished his personal ski design.

PersonalNOVEL - Beyond personalized novels and books (MCPC-017-2007)

Presenter: Goetze, Jan-Christoph (Germany)

Abstract: PersonalNOVEL is Germany's leading producer of personalized books and novels. Through its website it offers a growing variety of more than 80 titles from different topics, like detective stories or romance novels. The customer becomes the star in his own book on every page including his own personal dedication. All books are printed in volume one and more. Upgrades from the basic paperback include personalized cover, own photograph and bindings like hardcover, linen or leather. Its services are based on a highly sophisticated software which covers all aspects from gathering the customers' data, formatting and layouting the text and managing the data feed with the print shop. The paper will present a quick overview of PersonalNOVEL with its different aspects and highlights from all perspectives the way the customer creates his own novel. It also focuses on the demographics of the customer and showcases the adjusted process of configuration.

American Power Conversion (APC): Product Configuration of Infrastructure Systems for Data Centers (MCPC-041-2007)

Presenter: Hvam, Lars (Denmark)

Abstract: This article describes how American Power Conversion (APC), a company in the electronics industry, has used product configuration systems as a central part of the company's mass customization strategy. APC sells, designs, produce, delivers, and installs large complex infrastructure systems for data centers, and components and systems for these systems. At the heart of its mass customization strategy are a module-based product range and the use of product configuration systems for sales and order processing. In addition, the company has implemented a manufacturing concept, which involves the mass production of standard components in the Far East, and customer order-based final assembly at various production sites around the world within close customer proximity. The results of applying mass customization principles include a reduction of the overall delivery time for a complete system from around 400 to 16 days. Also, production costs were significantly reduced. The use of product configuration systems also supports a widely distributed process of selling APC's products via more than 10,000 sales associates and dealers worldwide. At the same time, the company's capability for introducing new products has increased. Each year, APC introduces more than 1,000 new products to the market.

2.4.2 MC Fashions: Learning From MCP Entrepreneurs in the Fashion Industry

The power of web platforms in a user-centric apparel market (MCPC-012-2007)

Presenter: Bijvoet, Michel (Belgium)

Abstract: Michael Bijyoet will share in this presentation his experiences in setting up one of Europe's largest mass customization organizations in the apparel industry. The power of web platforms (working through ASP) based on modular design in a B2C user- centric apparel market is the base for an effective Mass Customization implementation. The online configuration toolkits are linked with the 2D design-patterns for simultaneously cutting in offshore manufacturing plants. (Customer driven integrated manufacturing). Digital tailoring technology provides the customer with a perfect fit without the use of a measurement tape.

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Spreadshirt – The Community Cometh! The Mass Customization of Apparel Utilizing Virtual Communities (MCPC-127-2007)

Presenter:* Fletcher, Adam (Germany)

Abstract: Case study of Spreadshirts experiences delivering Mass Customization over the internet. Presenting results from surveys and questionnaires we show apply our experiences to the academic literature surrounding Mass Customization. Spreadshirt is Europe's largest on demand apparel producers making over 1000 unique items every day.

The Personalization of Fashion Media and Shopping for Fashion on the Web through Online Communities and User Generated Content (MCPC-141-2007)

Presenter:* Girald, Catalina (United States)

Abstract: Moxsie is a next generation shopping and entertainment platform for online fashion. We connect brands, stores, consumers and their content in a centralized online community. Our software allows brands and stores to create profiles to display their collections and media—including glossy images, video, and other content. Consumers create profiles where they can connect with their favorite brands and stores by adding them as "friends"; thus creating personalized shopping spaces that are unique to each consumer. These shopping spaces will act as a consumer's personal hub from which they can manage all of their online apparel purchasing and browsing across the web. A suite of user tools allows consumers to import images of clothing from anywhere on the web and mix and match them to create outfits; they can create "closets" with lists of clothes they have and clothes they want, and they can also receive personalized recommendations and advertisements from merchants that they have added as "friends". Like, Facebook's news feeds, we also deliver automated, personalized fashion news to users from the brands and stores they choose to add as friends; in effect, creating for each user their own personalized magazine about the brands they care about.

> *Note: A further session with exciting case studies of mass customization in the apparel industry will be Session 7.3.2.*

2.5 Changing the Rules of the Game: How Fabbing, Rapid Manufacturing & User Manufacturing Enables a Next Generation of Mass Customization

2.5.1 Strategies and Conceptual Thinking in User Manufacturing

User Manufacturing: Conceptualization, Cases, and Strategies (MCPC-9xx-2007)

Presenter:* Piller, Frank (Germany / United States)

Abstract: User manufacturing is an alternative (or supplemental) idea to mass customization, building on the notion that users are not just able to configure a good within the given solution space, but also (at least partly) to develop such a solution space by their own and utilize it by producing custom products. As a result, users (customers) are becoming not only co-designers, but also manufacturers, using an infrastructure provided by some specialized companies. User manufacturing is enabled by three main technologies: (1) Easy-to-operate design software that allows users to transfer their ideas into a design without much experience in how to operate a CAD software. eMachineshop's software is a good example for this. (2) Design repositories where users upload, search, and share designs with other users. This allows a community of loosely connected users to develop a large range of applications. (3) Easy-to-access flexible manufacturing technology. New manufacturing technologies, first of all rapid manufacturing, enable users to transfer their ideas into concrete objects -- even of they are no pure digital products. The presentation will discuss recent trends, case studies, and enabling technologies of user manufacturing to develop an early conceptualization.

It's about people - how the digital industrial revolution is changing the way products are created, made, sold, distributed, bought and loved (MCPC-9xx-2007)

Presenter:* Elley, Derek (New Zealand)

Abstract: Ponoko is the world's first personal manufacturing platform. It is for people to create and consume individualized products on demand. It does this by connecting creators direct with consumers and a global network of digital manufacturing hardware controllable from any PC. For creators, making and delivering (individualized) products

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is a time-consuming, complex and expensive process, especially without established networks. For consumers, it's tough to find affordable unique products. For digital manufacturing hardware and service providers, finding profitable customers is an ongoing challenge. And for the environment, today's manufacturing model is a heavy burden. With Ponoko creators can now click to make, sell and distribute their product ideas. Consumers can buy individualized products which they can tell great stories about. Digital manufacturing hardware and service providers can plug into a thriving community that wants to make products of their dreams. And in doing this we bypass today's traditional product making and distribution model, reducing the environmental impacts of manufacturing. It's all about connecting these people together to unleash an explosion of unimaginable products from an increasingly connected world to accelerate the course of human advancement.

Extreme Customization: Rapid Manufacturing Products that Enhance the Consumer (MCPC-162-2007)

Presenter: Tuck, Chris (United Kingdom)

Abstract: Body-fitting customized products are becoming an increasingly important area of research in terms of increasing a product's marketability and performance. Through the capture of simple scan data using Reverse Engineering techniques and the application of Rapid Manufacturing the production of bespoke components and products is possible, both technically and economically, due to the removal of labor and tooling from the manufacturing process. This paper provides a holistic view of the concept of personalized manufacturing, incorporating results from a global survey on the propensity for body-fitting customization, specifically, on the customization of motorcycle seating. It outlines that the important geometry capture stage must capture the deformed geometry rather than simple body scan data for the customization to be effective. In addition the methods and issues associated with manufacturing personalized seating are explored and the service requirements for motorcycle seat consumers are identified, as well as providing a route to manufacture using wholly digital techniques.

2.5.2   Examples and Capabilities for User Manufacturing

RepRap: The Replicating Rapid Prototyper - Maximizing Customizability by Breeding the Means of Production (MCPC-045-2007)

Presenter: Bowyer, Adrian (United Kingdom)

Abstract: This paper describes progress on RepRap, the replicating rapid prototyper. RepRap is a filament-deposition rapid prototyping machine that has been designed to manufacture the majority of its own parts. All other parts of the machine are standard materials and components available everywhere in the world. RepRap is intended to maximize the customizability of both the products that it makes and also itself. It achieves this by several complementary mechanisms: it is intended for individual (as well as industrial) use, so its users may employ it to manufacture whatever they want; it can make copies of itself, and those copies can be customized; it is extremely low cost, and so ownership can be widespread; and finally it is open-source, so all its designs and software are available for modification. Prototype RepRap machines have been built and are described. These have made parts for themselves and each other, and this is depicted. The design principles and specifications of the machine are given. The paper concludes with a discussion of the possible impacts that the machine may have on personal manufacturing and product customization.

The Factory in your Kitchen (MCPC-116-2007)

Presenter: Evan (United States)

Abstract: Mass customization reaches is fullest potential when individuals are able to personally customize and personally fabricate their own products. In this paper, we describe one avenue towards this goal through personal, compact factories, or "fabbers", which can be made capable of manufacturing complete, fully-assembled functional devices, and can be produced cheaply enough to be a consumer product as common as a kitchen appliance. In this paper we report on the development of a fabber system, based on multi-material, additive, layered fabrication processes, capable of autonomous manufacture not only of passive parts, but of active integrated devices, and even food. With our prototype system, we have demonstrated freeform fabrication of thermoplastic and elastomer structures and flexures, conductive wiring embedded in structural materials, elastomer strain gages, complete batteries, and soft actuators. To accelerate the transfer of this technology from the laboratory and into personal fabricators, we have developed the Fab@Home Personal Desktop Fabricator, which individuals can build, operate, and experiment with, using open-source designs, instructions, and software. The enormous public response to Fab@Home demonstrates the broad appeal of the concept of personal fabrication, and the substantial potential market for personal fabbers.

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Enabling DIY-Design (MCPC-112-2007)

Presenter:* Krishnapillai, Anandasivam (Singapore)

Abstract: Mass Customization, in the form of built to order - is beginning to happen and as companies succeed in solving, related logistical and cost issues. However, current forms of customization are limited to selecting, (as in the case of shoes) from different, models, size and the color of component - from a precompiled list. The next stage of customization is about letting the customer enjoy as much creative design freedom as a designer would have. This poses new types of challenges as customers do not posses domain knowledge that designers have. A way of solving this is by building a "live model" – by embedding domain knowledge into the CAD model itself and ensuring that the design always stays within manufacturing, cost, branding and performance limits. By structuring 3D models in a genetic format, it is possible to allow consumers to make very significant alterations to form design. By limiting these variations to pre-compiled constraint envelopes it is possible to ensure that the designs stay within manufacturing, cost branding and performance limits. A way of doing this will be demonstrated with a model of an electronic device that customers can easily re-design.

2.5.3   Advances in Rapid Manufacturing Technologies

A Concept of Manufacturing System Enabling the Creation of Custom-Fit Products (MCPC-009-2007)

Presenter:* Gerrits, Anton (Netherlands)

Abstract: The ambitious scope of the European initiative CUSTOM-FIT, a Framework 6 Integrated Project, is to create a fully integrated system for the design, production and supply of individualized custom - products. Personalized and customized both to fit geometrically and functionally the requirements of the citizen for (initially) the medical & consumer goods sectors. In the paper the following subjects are described: project background, output descriptions, technical, scientific, social & policy objectives, description of work and the enabling technologies.

E-Manufacturing – Making Extreme Mass Customization Real by Laser-Sintering (MCPC-103-2007)

Presenter:* Stotko, Christof (Germany)

Abstract: e-Manufacturing means the fast, flexible and cost-effective production directly from electronic data. Laser-sintering is the key technology for e Manufacturing. With these systems you can turn your most complex design ideas into reality. Directly by solidifying plastic or metal powders or foundry sand. This allows for manufacturing almost any shape, at any stage of the product life cycle in any industry. With e-ManufacturingTM you can secure your competitive advantage in a business environment that is dominated by ever-decreasing product life-cycles and increasing numbers of product variants. This makes laser-sintering the method of choice when it comes to mass customization. By adding freedom of design and flexibility laser-sintering helps making products convincingly attractive, both from the manufacturers' and the customers' points of view. Allowing for sheer impossible designs - including living hinges - laser-sintering results in adding product value. This value add customers are willing to pay for stems from increased functionality, vivid design and reduced delivery times. At the same time, laser-sintering allows for manufacturing customized products at less costs than with conventional manufacturing methods. Saving on molds saves time and costs. Economies of scale are fading thus liberating manufacturing decisions from lot size optimization, forecast accuracy and break even points.

Reliable CAE of Layered Manufacturing (MCPC-110-2007)

Presenter:* Jansen, Alfard (Netherlands)

Abstract: Before CAE can be considered for the engineering, optimization and verification of MC products, the calculated results must be reliable. Mass Customized products can be produced with Rapid Manufacturing techniques. Rapid Manufacturing mostly is layered manufacturing, causing non-isotropic mechanical behavior of the material and the product. Engineers are not used to this, common CAE software can hardly cope with it. It is a new capability required for MCP. Our company has extensive experience in FEA with plastic materials and uses this experience to create lighter and stronger products. Currently we are developing the tools and methods for reliable simulation of layered materials. The first results are promising. In October we will present the first cases: FEA results of complex layered products verified by practical tests.

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2.6   Panel: Mass Customization in Education

Mass Customization in Education - A Feature Panel Session (MCPC-146-2007)

Chair:* Klinger, Hermann (Germany)

Abstract: Discussions on education all over the world show clear need for change. One direction for change is driven by latest findings in neuroscience and enabled by new technologies around topics like social computing, WEB2.0 etc. The session on MC in Education benchmarks experiences of MC in industry with scenarios in education worldwide and presents practices and lessons learned at University level and for lifelong learning. In a discussion with the audience experts from educational institutions in different continents, from companies and organizations developing technical enablers and research institutions focusing on global systems will share experiences, bring up risks and create questions and ideas to be worked on. **Presentations:**

Individualizing education, visions, concepts and challenges: Personal learning in a landscape of distributed knowledge

Presenter: Pöppel , Ernst (Germany)

Abstract: Some 20 years ago the inventor (with several hundred personal patents), the scientist (with his RETINEX-theory of colour vision), the entrepreneur (being the founder of POLAROID), and the great supporter of MIT, Dr. Edwin Land, went along the Charles River, in front of his newly founded ROWLAND-Institute, and showed a young lady (my daugther Lili), how to train a dog. During this training with the lab-dog „Desi" Edwin Land gave the young lady a special advice, i.e. that she has to try when she is learning something to become the best in the world in one special activity. The personal challenge is to find and to create this own field of expertise and to become a specialist. With this remark Edwin Land gave an advice for everybody who wants to learn; Edwin Land should be a personal example for everybody. To be the best in a special field is, however, not sufficient for personal education if we do not know anything of other fields of expertise. Thus, modern education should realize the complementarity of individual learning and distributed knowledge. Distributed knowledge experience (or DIKE, named after the Greek goddess) is a necessary condition for a new concept of advanced education that provides the frame for personal trajectories of goal-oriented learning or individual „learning by consequences". Modern cognitive neuroscience provides a useful frame for the realization of personal learning and DIKE. To explain this complementarity as a generative principle, several aspects of neuroscientific reasoning will be touched. In my talk I will present a hierarchical model of goal-oriented learning; this model provides a unifying frame of basic neuronal and cognitive processes.

Printable 3D Models for Customized Hands-on Education

Presenter: Lipson, Hod (USA)

Abstract: Physical models are an important form of hands-on active learning that is increasingly being replaced by virtual simulations. In this paper I propose that rapid prototyping technology has the potential to reverse this trend, and reap the educational benefits while eliminating many of the logistic difficulties that have lead to it. Moreover, the use of rapid prototyping can offer new opportunities to enhance accessibility to physical teaching models and customize them for specific personal learning needs, thereby opening new educational possibilities. To accelerate this opportunity, we have established a repository of 3D-Printables models for education at www.3dprintables.org.

Practice Report on MC for Lifelong Learning

Presenter: Benz, Alexander (Germany)

Abstract: The thread of an approaching knowledge driven economy made the company Festo to develop and set up an educational system for lifelong learning. The MC core concept of "co-creation of value with the customer" is one of the most challenging changes needed for implementing MC in educational organizations and processes. Traditionally learners are seen as 'containers' which have to be filled with explicit knowledge like theories, concepts and data in the most efficient way. In most cases this does neither meet today's nor future customer's needs. The basic assumptions for the Festo MC model for lifelong learning are that technologies and ideas from WEB 2.0 today are powerful enough to create a bidirectional interface between the learner's context and the contents provided by educational institutions, media or communities. With this interface the learner and the educational institution are for the first time able to configure together in a highly individualized process and with nearly mass-production like costs the framework for the intended learning.

Panel Discussion: Mass Customization as a Chance for Global Development through Education

Panellist include: **Manfred Euler**, Director, Leibniz Institut, University Kiel | **Rolf Pfeifer**, Director AI Lab, University Zurich | **Ernst Pöppel**, Chair Human Science Center, LM-University Munich | **Elzbieta Szelag**, Academy of Sciences, Poland | Moderator: **Hermann Klinger**

3 Mass Customization Management

3.1 Business Models and Strategies for Mass Customization

3.1.1 Reality Check: Strategies for Mass Customization

Mass Customization Strategies (MCPC-018-2007)

Presenter: * Moser, Klaus (Germany)

Abstract: The objective of this research is to identify the strategic considerations companies follow when Pursuing the mass customization concept and to differentiate the existing types of mass customization. The argumentation of this research builds on the competence-based framework of organizational systematics by McKelvey. The long-term work with the German industry research group on mass customization and the international mass customization casebook project deliver the empirical data for deriving the dominant competencies for mass customization. The study of dominant competencies is the prerequisite for building hypotheses of the types of mass customization and the empirical data from the case study research are also applied for formulating these hypotheses. The results presented show seven mass customization strategies and eight dominant competencies applied by mass customization companies today. Based on the viewpoint of this work, mass customization should be seen as a term for covering a range of possible strategic roles and not one uniform business strategy. The case study research shows, that many firms do not see mass customization as a profitable business strategy, but just use this approach to support other purposes – even if they think that their mass customization offering is profitable of its own.

Reality Check: Strategic Objectives and Generic Strategies of Companies Offering Innovation Toolkits (MCPC-121-2007)

Presenter: * Pruegl, Reinhard (Austria)

Abstract: The strategic objectives a company expects to reach by offering a toolkit to its customers strongly influence the whole business model of a company. The literature suggests many highly reasonable objectives a manufacturer could focus on by implementing of a toolkit. But to date there is no systematic study on (1) which objectives are more or less important to a manufacturer offering an innovation toolkit (relative importance) and (2) if these objectives can be reached by implementing a toolkit (performance) and (3) which types of generic strategies companies follow in reality. Additionally we look at the consequences the strategic set-up has on the implementation quality of the toolkit approach.

Is the Best Product a Unique Product? A Study of the Online Virtual Community of Threadless.com and their Attitudes to Mass Customization, Mass Production and Collaborative Design (MCPC-124-2007)

Presenter: * Fletcher, Adam (Germany)

Abstract: This paper presents both questionnaire and ethnographic research undertaken with the virtual community of Threadless.com. It challenges the literary assumption that a unique product is a superior product by exploring the business model of limited, batch production offered by Threadless and supported by a large, active virtual community. In an industry where multiple providers offer consumers the chance to easily design their own products, this paper looks at what Threadless' model may offer over its pure MC competitors. Threadless' business model instead aggregates user's opinions of user submitted designs and manufacturers the most popular. The results challenge a number of assumptions which can be found in the wider MC literature. It recommends that industry considers business models between mass customization and mass production, concluding that consumers place involvement and design quality over uniqueness of the end product. Just as Internet technologies make it easier to receive want information from consumers, it also facilitates the sharing of this information amongst consumers, and the forming of small groups with heterogeneous needs which can be served by small batch production.

Mass Customization in Content Related Industries: The Mismatch Between Empirical Prospects and Missing Market Take Off (MCPC-171-2007)

Presenter: * Schoder, Detlef (Germany)

Abstract: The first part of the presentation presents empirical evidence highlighting the underlying processes that drive the customer's adoption of mass-customized content products. Based on findings from an empirical study (n = 2,114) using covariance based structural equations modeling, we suggest that the degree of customer's willingness to invest

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effort into mass-customized products (time, money and opportunity costs) is one of the main factors explaining anticipated adoption. Some corresponding insights from corresponding studies are discussed. The second part - based on entrepreneurial experience of setting up an individualized printed newspaper - contrasts the rich prospects of mass customization in content-related industries by its recent missing market take-off. Some preliminary explanations are given for these discrepancies. Conclusions highlight scenarios of mass customization blended with Web 2.0 in content related industries. In essence, we try to imagine unparalleled media objects of its own going well beyond today's notion of a newspaper or magazine.

3.1.2 Differentiating Mass Customization Strategies

A Simple Simulation Model to Demonstrate Mass Customization Strategies (MCPC-099-2007)

Presenter: Badurdeen, Fazleena (United States)

Abstract: Many companies are now pursuing mass customization as a source of competitive advantage against others who still offer mere product differentiation. Sustaining continued interest to conduct more research and develop better approaches to successful mass customization requires more effective methods to disseminate existing knowledge. Therefore, innovative teaching aids, such as models and simulations, need to be developed and shared among the academic community to promote learning of and interest in mass customization. The teaching of scientific phenomena as well as engineering applications can be enhanced to a great extent through practical demonstrations. Educational simulations can facilitate increased awareness, understanding or know-how of the environment being simulated. This paper presents a simple but versatile mass customization simulation to demonstrate the importance of customer involvement and co-design in mass customization, different types of mass customization strategies as well as challenges encountered in implementing mass customization, particularly with a focus on managing manufacturing-related issues such as inventory control, production planning and control etc.

Bundling, mass customization and competition under consumption uncertainty (MCPC-076-2007)

Presenter: Somma, Ernesto (Italy)

Abstract: This research focuses on information goods and extends existing literature on MC along two avenues. Firstly, we consider the effectiveness of bundling as a mean for delivering mass customization. In the case of information goods, bundling allows producers to customize their customers' consumption experience and to shift the focus from product to consumption customization. This entails a number of advantages on both the producers and consumers sides. Firms do not have to design complex self selecting price mechanisms and bundling allows for in-built flexibility. On the consumer side, information requirements are simplified as the increased flexibility reduces the impact of ex-ante consumption uncertainty on purchasing decisions. The consumer faces a problem of investment under uncertainty and irreversibility. The associated option value may induce the consumer to delay the purchase of a good with little or no salvage value and of uncertain utility. The model analyses how bundling can be used to reduce this option value. The second novel aspect of this research deals with the analysis of new business models for the delivery of mass customization for information goods. We ask whether the are lessons to be drawn from the type of organization typical of Open Source Software (OSS) projects.

The state of art of mass customization practices in Finnish technology industries – Preliminary results of multiple case study of 40 companies (MCPC-090-2007)

Presenter: Mäkipää, Marko (Finland)

Abstract: Mass customization literature has grown a great deal in recent years and today it covers a wide range of topics ranging from customer integration to modular product architectures. However, extant literature is biased; it seems to concentrate on business-to-consumer commerce and is more concerning theoretical development than empirical studies. This paper seeks to tackle this issue by presenting preliminary results from business-to-business case study conducted in 40 Finnish companies. Results suggest that although the mass customization as a term was not always identified by companies, mass customization strategies and practices are utilized widely in Finnish industry. Mass customization fits well with Finnish industry where traditional mode of production is customer specific production and short production series. In the current state, the product qualities and its production is managed well, but cross-functional cooperation, product configurators and integration of different information systems is still providing challenges.

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3.1.3 Mass Customization Effectiveness

Reflections on the Transition from Engineer-to-Order to Mass Customization (MCPC-055-2007)

Presenter:* Haug, Anders (Denmark)

Abstract: Most literature discussing the concept of mass customization focuses on cases where companies move from mass production to mass customization. In some literature also ETO (Engineer To Order) companies are claimed to have become mass customizers. However, it can be questioned if these companies conform to popular definitions of mass customizers. This issue raises two questions. Firstly, under which conditions is it reasonable to label ETO companies as mass customizers? Secondly, what are the differences in the characteristics of the transition when mass producers and ETO companies move towards mass customization? This paper argues that some ETO companies could be labeled as mass customizers although the products are not at prices near mass produced ones. To avoid dilution of the concept of mass customization, while not excluding ETO companies, it is suggested to start out with a broad definition of mass customization under which separate definitions of different kinds of mass customizers are created. The need for specific definitions of different kinds of mass customizers is illustrated by pointing out some of the differences in the transition to mass customization for mass production and ETO companies.

A Prioritization Algorithm for Configuration Scheduling in a Mass Customization Environment (MCPC-147-2007)

Presenter:* Kumar, Ashok (United States)

Abstract: Although the mass customization strategy was introduced two decades ago and its implementation has significant bearing on operations management (OM), supply chain management (SCM), and marketing functions, there has been a glaring paucity of research work in OM and SCM areas that addresses the decisions needed to be made in OM and SCM areas. Specifically, the deployment of MC has serious implications for production scheduling, inventory and routing policies in manufacturing and SCM, yet the issues in these areas remain largely unaddressed. In this work, we recognize that any manufacturer has a limited production capacity and finite budgeted dollars over a given period. As such it may become necessary to prioritize the production of items in compliance of the capacity constraints. We formulate a mixed integer program that will allow compliance with the demand, capacity, and budgetary constraints. We also develop three distinct metrics that assign weight to each product variant based on its profitability potential. This metrics is used to develop a prioritizing algorithm that generates a solution to the MILP referred to above.

A Study of Mode-Specific Interactions between Customers and Manufacturing Systems in Mass Customization (MCPC-057-2007)

Presenter:* Kodzi, Emmanuel (United States)

Abstract: The focus of this study was to examine, by simulating a customizing scenario, the interactions between customers and a manufacturing system offering mass customization. For a customer-direct mode of offering mass-customization, we examined what attributes of the manufacturing system enhance the purchasing process for patrons of customized products. Given the participation of end-users in the customization process, it was of research interest to examine the implications of direct customer involvement on the capabilities of manufacturing companies. This paper takes a resource-based view of manufacturing competitiveness to discuss interactive elements of mass customization from the manufacturers' perspective. The context of the customization scenario was wood products manufacturing.

Customization Through Negotiation: Manufacturing Service Supply Contracts (MCPC-125-2007)

Presenter:* Pasek, Zbigniew (Canada)

Abstract: The rapid evolution and the fierce competition that characterize many markets today calls for suitable instruments to achieve high effectiveness in production. While the new concepts, such as Reconfigurable Manufacturing Systems (RMS), are expected to provide a desirable solution to combine effectiveness with responsiveness, their implementation relies on traditional division of labor between manufacturers and their suppliers. The concept of a Manufacturing Service may also be used to cope with the current needs of modular and customizable durable-goods producers. This paper analyzes evolutionary changes in relationships between the traditional manufacturers and the suppliers of their manufacturing capacity. The compatibility of new manufacturing paradigms with mass customized goods and services, is investigated, in particular in the context of effectiveness of the manufacturing service supply, as viewed from the suppliers and users perspective.

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3.1.4 The Mass Customization Profit Chain: The Example of the Furniture Industry

Furniture Manufacturer's Perception of Mass Customization (MCPC-117-2007)

Presenter: Lihra, Torsten (Canada)

Abstract: The North American furniture industry is facing important challenges. Imports from low labor cost countries did increase significantly over the last five years while US and Canadian manufacturers lost market shares. Mass customization (MC) is considered as a potential means to gain competitiveness on the North American market. The present study sheds light on furniture manufacturers' perception of MC, its potential and implementation challenges. A furniture manufacturer survey conducted in Canada, the USA and Germany showed that developing modularity and agility, integrating the supply chain and pursuing a competitive cost structure are critical elements of a furniture customization system. Manufacturer perceived end users design capacities as the true limit of customization. In consequence, offering the highest number of options directly to end users should not be the target. Assisting end users through the personalization process and suggesting a limited number of pre packaged options should be the favored approach.

From Traditional Production to Mass Customization: Developing a Procedure Model for Small and Medium Sized Furniture Manufactures (MCPC-101-2007)

Presenter: Walcher, Dominik (Austria)

Abstract: The objective of this work in progress project is to develop a generic procedure model how to move from traditional production to mass customization in the field of small and medium sized furniture manufactures especially chair producers. The project is executed by Austrian furniture manufacturer Laengle & Hagspiel in cooperation with the Salzburg University of Applied Sciences. Basically a selected chair of the company's (batch produced) assortment is expected to be online co-designed by customers and subsequently produced with mass production efficiency. Based on the experiences of this change project a generic procedure model will be developed, which potentially can guide other furniture manufactures towards mass customization.

Identifying Potential Contributions of Lean Production to Business Model Evolution towards Mass Customization in the Wood Furniture Industry (MCPC-032-2007)

Presenter: Moreira, Matheus (Canada)

Abstract: Mass customization is one of the business model opportunities identified by the furniture industry in Quebec to remain competitive. Through the "Furniture Enterprise of the Future" project and a research partnership, an action plan was defined to help the transition to this new business model. Simultaneously, the tools and principles of lean production were identified as important contributors to a successful mass customization strategy. In this article we explored the specific competencies of mass customization researched by the sector under study then we focused on the potential contributions of lean production. A competence-based management approach was used. Through a Delphi research, the competencies perceived as sources of durable competitive advantage were identified. They were next compared with the sartorial action plan developed. A great alignment was observed between them. To maximize the synergy with this scenario, lean production should be used as a way to increase value for the customers and reduce the lead time, from order to delivery and from product concept to commercialization. In practice, this was prevented from happening because of the lack of reference in the action plan to the structured utilization of a problem solving methodology, an essential element of lean production.

A Model for Operational Mass Customization: Recent Studies in Furniture Manufacturing (MCPC-085-2007)

Presenter: Kodzi, Emmanuel (United States)

Abstract: We support the view of some experts that mass customization can improve the competitiveness of the US furniture industry, and discuss a contextual framework for furniture manufacturers to engage relevant manufacturing transformations. We provide a new perspective on the essence of mass customization and present a model for making its principles operational for a furniture manufacturing scenario. The comparable manufacturing principles permit extensions of our model for other industries.

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3.2 Marketing & Consumer Behavior in MCP

3.2.1 Value of Customization: Why do customers value customization? (I)

Typology of Potential Benefits of Mass Customization Offerings for Consumers and the Demand of Different Age Groups: An Exploratory Study on the Customer Perspective on Mass Customization (MCPC-026-2007)

Presenter: Schüle, Anja (Germany)

Abstract: In order to utilize the full potential of mass customization (mc), the first objective of this study is to develop a differentiated typology of potential benefits which different mc offerings can generate for consumers. Therefore, a theoretical-conceptual approach is complemented by 20 in-depth interviews. The results suggest that style customization especially is capable of generating symbolic, emotional, hedonic and epistemic benefits, and seems to be attractive with regard to presents. Fit and functionality customization mainly offer possibilities for the generation of functional benefits, such as quality and comfort, but also have positive effects on the physical health. Furthermore, personal and financial benefits are of importance. The second objective is to analyze the central factors influencing the evaluation of the attractiveness of mc offerings and the demand of different age groups. For this purpose focus group surveys with pupils, students, middle-aged employees and over 50s were conducted. Type, extent and place of customization, service support and type of purchasing decision could be identified as central factors of mc offerings. Budget and time shortage, use of attractive alternatives to mc, certain individual characteristics and dissatisfaction with standardized products represent important consumer-related factors. Finally, differences between the regarded age groups are laid open.

Does Individualization Increase Customer Value? An Empirical Analysis of Standard, Segment-specific and Individualized Products (MCPC-034-2007)

Presenter: Steger, Christoph (Austria)

Abstract: Recently, the marketing strategy of individualization gained much attention. A key assumption of the literature is that individualized products create more value for customers than standard products. Empirical evidence is scarce, however. We conducted a large-scale experiment in which we compare the customer value of individualized, segment-specific, and mass marketing products in the newspaper market. We find that individualized newspapers lead to a significantly higher value for customers, measured as willingness to pay, purchase intention, and attitude towards the product. We conclude that at least in markets where the costs of individualization decrease, individualization is a promising strategy.

Why consumers are willing to pay for mass-customized products? Dissociating product and experiential value (MCPC-089-2007)

Presenter: Merle, Aurelie (France)

Abstract: The objective of this paper is twofold. First, we propose to conceptualize the perceived value of mass-customization into two components: mass-customized product value on the one side, and "mass-customization experience" on the other side. Second, we test an integrative framework bringing together value components and willingness to pay (WTP) for mass-customized products. Three indicators of WTP are used. As opposed to previous research, the findings show an indirect effect of mass-customization experience on consumer's willingness to pay. Furthermore, no direct effect is found. The model explains more than 55% of the variance of willingness to pay.

3.2.2 Value of Customization: Why do customers value customization? (II)

Consumers Co-Design of Mass-Customized Products (MCPC-140-2007)

Presenter: Deng, Xiaoyan (United States)

Abstract: This presentation looks into the customer co-design process of Nike ID. 348 subjects designed their own Nike shoe in pretest and study 1. The number of unique designs equals the number of subjects, demonstrating an extremely high level of preference heterogeneity. In study 2, subjects from study 1 evaluated a set of 30 different shoe designs of the same model. Unknown to them was the fact that their self-design was included in the set. The time elapse between study 1 (when they designed) and study 2 (when they evaluated) was either 1 week or 1

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month (including the spring break). We found that first, preference ratings for "self-design" were much higher than preference for other designs in the set and, second, more than ¾ of subjects correctly identify their own design. The intensity of preference and memory does not decay over time.

Variables Driving the Amount of Customized Product Features Chosen by a Consumer in the Car Market (MCPC-016-2007)

*Presenter:** Dabic, Marina (Austria)

Abstract: Flexible manufacturing systems, the internet and increasingly fragmented markets have led to an increased supply of and a growing demand for customized products. Previous research on mass customization has focused mainly on the optimization of the production process and the cost structure. This study examines the influence of a number of variables on the amount of individualized product features chosen by the customer on the basis of a cost-benefit framework in the product category cars. Therefore an innovative car configuration software was used. The findings show two important target groups for customized products. First, consumers with high lasting product involvement and product expertise and, second, a symbolically or hedonically driven consumer with a strong need for unique products and brands. The configuration software used for the survey has turned out to be a very useful data collection tool. When combining personal data and car configurations, data of individuals and/or target groups can be analyzed and interpreted. This makes it possible to identify not only an "ideal product" from the perspective of particular customer groups, but also to identify the configuration process most appropriate for specific individuals or target groups.

I Made it Myself! Exploring Process Utility in Mass Customization (MCPC-097-2007)

*Presenter:** Schreier, Martin (Austria)

Abstract: Recent studies have provided empirical evidence for the main argument in favor of mass customization toolkits: Customers are willing to pay a premium for self-designed products as opposed to conventional "off-the-shelf" products. To date, this value increment has been attributed exclusively to the preference fit of the resulting products, that is, the closeness of fit between product characteristics and individual preferences. However, toolkit-designed products are not only unique products tailored to individual needs, they are also self-designed products. In this paper, we analyze whether or not mass customization toolkits generate customer value beyond an increased preference fit because the mere process of "making" a product oneself bears utility for the originator. Theoretical support for this idea can be found in the theory of the extended self, which argues that the energy and accomplishment involved in the process will symbolically enrich the resulting product for the customer. Therefore, she will be willing to pay more for it, all other things being equal. In the course of three studies, we confirm the existence of such an effect. This has important implications for manufacturers planning to develop or improve mass customization toolkits.

3.2.3   The Paradox of Choice: Complexity of MCP Configuration

Choice for Choice: The Effects of Consumer Choice Task Framing on the Decision to Use a Recommendation Agent (MCPC-046-2007)

*Presenter:** Köhler, Clemens (Netherlands)

Abstract: Despite recent evidence that recommendation agents can significantly improve product decisions, consumers are still relatively reluctant to use such agents. In this research, we focus on variability in recommendation agent descriptions in order to better understand consumers' reluctance to adopt this website functionality. In particular, we examine how consumers trade-off recommendation agent benefits (e.g., outcome utility) versus costs (e.g., complexity). Moreover, we investigate the impact of different ways of framing benefits and costs on consumers' decision to use the recommendation agent. A comprehensive framing study was designed, incorporating commonly used dimensions of valence (positive vs. negative) and domain (gain vs. loss). We extend the framing literature by introducing the semantic opposite as a new framing dimension. Instead of the common approach to use a negation (i.e., not using an agent), we include an antonym (i.e., searching oneself vs. using an agent). We conducted an online experiment to test the framing effects. Our results reconfirm previous findings in the field of message framing and indicate the need to focus on the semantic opposite as a new framing dimension. Results show that the semantic opposite (i.e., searching oneself) was more effective at increasing recommendation agent usage.

The Impact of Channel Context and Task on Consumers' Evaluations of Personalized Health Recommendation Systems (MCPC-024-2007)

Presenter:* Dellaert, Benedict (Netherlands)

Abstract: We investigate consumer perspectives on complex, multistage systems designed to provide personalized health recommendations. We conceptualize the underlying benefit trade-offs that consumers make in evaluating such systems as the manifestation of a psychological contract in which consumers contribute their personal information and effort in exchange for a more useful, tailored recommendation by the firm. We show that consumer benefit perceptions are differentially affected by the stages of such a system, and that the channel context in which the use of a personalized health recommendation system originates moderates the impact of consumer benefits perceptions on consumer willingness to use such systems.

Psychological and Behavioral Consumer Responses to the Mass Customization of Product Aesthetics (MCPC-010-2007)

Presenter:* Mugge, Ruth (Netherlands)

Abstract: Although there is a growing body of research regarding the mass customization of products' functional features, we lack a clear understanding of the antecedents and psychological processes underlying consumer responses to the mass customization of product aesthetics. This study investigates the processes and conditions that explain the latter type of customizing products. In this study, members of a consumer panel were presented with different versions of a product aesthetics customization tool. In all instances, the focal product was a cordless telephone; however, the configuration of the customization tool was varied and allowed for different levels of aesthetic customization control (number of visual design options) and public visibility of the customization outcome. Our findings suggest that consumers' evaluations of aesthetic mass customization are positively related to the amount of customization control offered and negatively related to the perceived complexity of the customization task. Furthermore, the evaluation is more positive when consumers perceive that the personalized products' ability for self-expression increases; this last construct being positively related to the public visibility of the mass customization outcome and the amount of aesthetic customization control. Finally, we show that as customization evaluations increase, so do behavioral intentions (e.g., purchase intention) toward the personalized product.

The Influence of Customer Integration Competence on Customer Satisfaction with Mass Customization Offerings (MCPC-004-2007)

Presenter:* Müller, Melanie (Germany)

Abstract: From the customers' perspective, the defining element of mass customization is the interactive sales and co-design process. Based on research from the area of service marketing, we argue in this paper that the quality of fulfillment of the co-design task is highly dependent on the competence of the particular customer performing this task. We assume that this customer integration competence comprises four facets: the customers' product and application competence, social skills, methodological knowledge, and personal motivation. We show that customer integration competence is multi-dimensional and is an important antecedent of perceived service quality and customer satisfaction with mass customization offerings.

3.2.4   Creating MCP Systems that Sell

Using Complementary Services to Support Online Mass-Customization (MCPC-015-2007)

Presenter:* Dellaert, Benedict (Netherlands)

Abstract: This study investigates the structure of consumers' preferences for mass-customization on the Internet. We study how complementary online services (such as online visualization, online sales person interaction, and post-purchase product adaptation) affect consumers' perceived product outcome, control, enjoyment and complexity of this process. We show that in contrast to increasing the extent of mass-customization, providing complementary online services to consumers enhances their preferences for using an online mass-customization process without increasing perceived complexity. We also demonstrate that all four proposed types of cost-benefit perceptions affect consumers' preferences for an online mass-customization process, which extends previous analyses of consumers' preferences for mass-customization. Finally, our study sheds light on the mediating role of perceived control in explaining the negative effect of perceived complexity on consumers' preferences for mass-customization on the Internet.

Format Customization: The Impact of Info Presentation Format and Consumer's Learning Style on Communication Efficiency and Purchasing Decision (MCPC-131-2007)

Presenter:* Aljukhadar, Muhammad (Canada)

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Abstract: This research review information acquisition and analysis processes in both marketing and education literature and will empirically test the applicability of the VAK (visuals, auditory, kinesthetic/tactile) perceptual learning styles model to customize online info presentation format. This is performed by studying the effect of matching distinct online presentation formats with consumers' learning style on communication efficiency and purchasing decision. A 3(visual-rich, auditory-rich, and interactive/simulation-rich for online presentation format)X 3(visuals, auditory, kinesthetic/tactile for consumer's learning style) experiment is under development. While the purpose of experiment is to test for presentation format and learning style congruency effect on communication efficiency and purchasing decision and present a reliable scale for consumer perceptual learning styles, it would also reveal a potential superiority of one format for the general population, i.e. indifferent learning style, and enable to verify specific response patterns, i.e. for individuals with two prevalent learning styles, for kinesthetic/tactile individuals. Communication efficiency will be measured by memory recall and website assessment; purchasing decision is reflected by product evaluation time, perceived purchase risk and intention to buy. Different product categories with different complexity and tangibility levels are included at the simulated site to reduce product-characteristics effect and allow for generalizability of findings.

Consumer Perceptions of RFID and 3-D Body Scanning in Apparel Retail (MCPC-077-2007)

Presenter: Tiwari, Sanchit (United States)

Abstract: This work-in-progress paper empirically investigates the consumer perception of Radio Frequency Identification (RFID) and 3-D body scanning for mass deployment in apparel retail. Consumer response towards the benefits and issues (privacy and price) of both technologies were evaluated based on Rogers' Theory of Innovation Diffusion. Demographic and behavioral segmentation based on the responses identify markets for retailers to target when deploying these technologies. Possible retail scenarios are presented to describe potential mass customized customer services by integrating RFID and 3-D scanning in a single retail scenario.

3.2.5 Best Practices & Experiences in MCP Marketing

Personalization for Superstore Mass Communication (MCPC-093-2007)

Presenter: Quatse, Jesse (United States)

Abstract: A product called LoyaltySuite was developed by a small entrepreneurial enterprise in Berkeley California. The company was acquired by the biometric company, Pay By Touch, and merged in January 2006. The purpose of the product was to provide personalized communication technology for bricks and mortar superstores. Recommender systems were in wide use in e-commerce but as yet no successful technology was widespread through the much greater market of bricks and mortar superstores. Several search-based products had been developed over the years, but none had captured the market. LoyaltySuite was an entirely new approach based upon fully automatic statistical modeling rather than by laborious and difficult manual association of database query to commercial message. The product underwent a six-month trial in a commercial superstore and began general installations in two grocery chain stores in January, 2007. The results appear to be much more effective as well as fully automatic. This presentation describes the reasoning behind the product, the design objectives, the design problems, and the encouraging preliminary results.

The Obsolescence of Operational Marketing Methods in a Mass Customization Business (and some experimental alternatives) (MCPC-080-2007)

Presenter: Wilson, Jeff (Canada)

Abstract: The modern market-driven corporation developed more or less in parallel with the introduction and widespread implementation of mass production. As such, ubiquitous marketing tools underlying traditional corporate structure have been found to be entirely inappropriate for a Mass Customization business model. Such failure begins with a firm's initial Product Definition, which seeks to identify and specify features and characteristics for a "Product" that will appeal to an aggregate consumer group. This one-to-many relationship of Product to multiple Customers, referred to as the "Target Market", is inappropriate for Mass Customized goods, yet permeates the marketing process: Market Research, Pricing, Promotion, Market Positioning, Channel Management and Inventory Control all center on the concept of selling a single product to many likeminded customers, the antithesis of Mass Customization. This paper reviews the author's progress in creating a Mass Customization business model for a real world start-up custom furniture enterprise, the inadequacies that have been encountered while using classic marketing methods in the development of this business, and various alternatives that have been developed in their stead.

Communication Planning for Mass Customization and Personalization (MCPC-133-2007)

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Presenter:* Hoggan, Alyce (United States)

Abstract: Just as auditory noise obscures the clarity of a message, visual noise, inherent to over 80% of the messages delivered, results in unclear and unfulfilled customer needs. Communication planning and information design is necessary for the clear comprehension of an intended message. While focusing on communication planning, we consider the complete experience from initial customer awareness to the delivery and retirement of a product or service. If designed well, a message can be communicated to a customer and a customer will communicate their needs and desires clearly, allowing for satisfactory order fulfillment. Mass Customization and Personalization (MCP) requires clarity in messages communicated from every one involved. In the core of the communication circle is the communicator. At the circumference are the receivers. The space between requires visual design aesthetics and semantic meaningfulness to deliver a clear message and obtain the desired results. Predicting customer needs, preplanning the ingredients necessary to fulfill just-in-time orders combined with the delivery and follow up stages all require clear communication channels. Efficacious communication planning and information design is the key to facilitating mass customization and personalization.

Improving Solution Communication through Interactive Expertise (MCPC-151-2007)

Presenter:* Ihlenburg, Ditmar (Germany)

Abstract: The information exchange between suppliers and users of automation technology must be designed more efficiently and effectively to simplify the marketing of complex solutions that may require explanation. To do this, a new type of expertise that many companies have not yet been able to establish is required: interaction expertise. The company Festo AG & Co. KG and TU Munich have risen to this challenge and are collaborating on research for a new interaction platform that will provide knowledge on solutions and technology. It will be possible to highlight the expertise of automation specialists as problem solvers and visualize complex relationships on this platform. The platform has thus been conceived of as a service for those companies that want to develop their interaction expertise for customers in cooperation with other companies. The goals of the project will be explained and preliminary findings on the new interaction platform will be presented in the lecture. By using the platform, new solutions and technologies will reach the public more quickly. In addition to efficient market communication, platform users will receive a cross-manufacturer view of the market highlighting the performance and innovation capacity of expert problem solvers in the automation industry.

3.3   Change Management for MCP

Change Management Challenges in MC Transition (MCPC-049-2007)

Presenter:* Peltonen, Linnea (Finland)

Abstract: The decision to go for mass customization has been recognized to eventually change not only organization's business processes but also its values and beliefs. Therefore we argue mass customization (MC) transition to be an organizational change affecting the entire organization and its processes. Hence the managers responsible for MC implementation are indeed also change managers but often left without adequate assistance with their extensive change project. There is clearly a lack of tools in the existing MC related literature to help the management with their problematic management challenge. That led us suggest the organizational functionality framework to be a suitable tool for change managers who are struggling with MC transition in their organizations. To verify our assumption, we compared the framework with a real-life MC transition case study.

From Mass Production to Mass Customization: Hindrance Factors, Transition Hazard and Structural Inertia (MCPC-142-2007)

Presenter:* Salvador, Fabrizio (Spain)

Abstract: Research on Mass Customization has largely overlooked the issue of organizational change associated with the Mass Production-to-Mass Customization (MP-to-MC) transition. To address this gap in the literature, we conduct a quasi-longitudinal case study of a manufacturing facility belonging to a division of a Fortune 1000 discrete manufacturing firm as it seeks to transition from MP to MC. We empirically derive five factors hindering the MP-to-MC transition within the research site. We propose five corresponding analytical generalizations explaining how and why these hindrance factors relate to the MP-to-MC transition hazard (i.e., how and why they threaten the likelihood of a successful MP-to-MC transition). To lend credibility to these theoretical insights, we then juxtapose the five factors and analytical generalizations against the more general constructs and prescriptions of Structural Inertia Theory. We conclude with a discussion of the significance of the findings and opportunities for future research.

Change Prediction for Mass Customized Products: A Product Model View (MCPC-070-2007)

Presenter:* Keller, Rene (United Kingdom)

Abstract: In the automotive industry, engines are complex products, with a need to satisfy stringent legislation emission targets. In addition, off-road diesel engines are faced at the same time with a highly fragmented market of different customers demanding highly customized products. A main enabler to be competitive in such a situation is to manage changes effectively without running over time and budget. Every change request from new customer requirements must be analyzed for potential costly knock-on effects to other, not necessarily connected components. This paper describes how the Change Prediction Method (CPM) can be applied for the assessment of knock-on change risks which supports companies in planning for changes before being implemented and allows for an improved planning towards mass customization.

Management Innovation the Key Element for Extreme Mass Customization (MCPC-042-2007)

Presenter:* Schairer, Steffen (United States)

Abstract: This article will discuss the potential of Management Innovation being the key success factor of Mass Customization. A framework will provide an overview of core competencies and success factors. The core competencies will be evaluated with the help of a cube. The cube provides different views, which allows a transformation of the success factors into their underlying activities and application areas. Built upon the new categorization, requirements will be defined with regards to the supporting elements to successfully implement Mass Customization. The requirements for supporting elements will lead to the hypothesis that Management Innovation should be considered the key success factor for Mass Customization. Once the hypothesis has been formed, Management Innovation will be discussed. A definition of Management Innovation will be provided. It will elaborate on what Management Innovation is, what its strengths are and how it can be employed. The employment method will be tailored to support a Mass Customization environment and its specific need.

4   User Innovation: Linking Mass Customization and Open Innovation

4.1   User Innovation Strategies & Policies

What Consumers' Expect from Virtual Co-Creation (MCPC-135-2007)

Presenter:* Füller, Johann (Austria)

Abstract: In this article, we investigate what consumers who engage in virtual co-creation activities expect from their participation. In this empirical study, 825 consumers part taking in virtual co-creation projects were asked about their motives and expectations. Our research shows that consumers' expectations are heterogeneous and depend on their motivations. Based on consumers' set of motivations, four different types engaging in virtual co-creation have been identified: need driven, reward oriented, intrinsically interested, and curiosity driven consumers. Expectations of those consumer groups towards the design of the virtual dialogue differ significantly. Need driven consumers, for example are only interested in tasks contributing to the solution of their problems while intrinsically interested consumers look for enduring innovation engagement, powerful tools, and communication between participants. Our findings contribute to a better theoretical understanding of consumer behavior during virtual co-creation activities and provide practical recommendations how to design a compelling virtual co-creation experience.

Managing Customer Involvement in the Context of Transition to Open Innovation (MCPC-052-2007)

Presenter:* Järvilehto, Mikko (Finland)

Abstract: We address the management of customer involvement in new product development (NPD), in a situation, where industry is in a transition phase towards open innovation. We'll focus on one main point of open innovation management practices with customer involvement. How to get committed customers at the first place, how to motivate customers to participate in NPD-programs and how to keep them involved? The open innovation management theory is approached from the perspective of communication. The goal is a multidisciplinary theoretical framework of open

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innovation, management strategy, communication, motivation and incentives. Throughout theory development practical methods, guidelines or best practices are presented for managers and consultants, who build up committed customer communities. The research questions: 1. What principles guide the manager coordination of communicational acts leading to customer commitment? 2. Which elements of company's communicative actions attract the customers and lead to the growth of the commitment? We conduct a longitudinal process study and our research strategy is multiple case study. We interview both managers and consumers during 2007-2008. The cases will vary from the finish start-ups to large international companies. A common denominator for the cases is that they all are on the brink of starting to develop customer commitment practices with NPD.

User Innovation and European Manufacturing Industries: Enablers, Roadmaps and Policy Actions
(MCPC-027-2007)

Presenter:* Warnke, Philine (Spain)

Abstract: The paper reports insights from a research project that has been developing roadmaps towards the integration of users and customers into innovation processes in European manufacturing industry. As it is common for a Foresight approach the road mapping served not only to generate insights on possible steps towards the uptake of user innovation by industry but at the same time to stimulate future oriented debate among stakeholders. Accordingly, the emphasis of the paper is on out-of-the-box thinking and thought provoking presentation of the ideas generated. After a short introduction of the project rationale, approach and methodology, the following main insights generated to date are described: (i) Two typologies of joint user manufacturer innovation, one with respect to the type of interaction and the other looking at the nature of the product innovation generated. (ii) Two pilot scenarios describing possible realizations of user centered innovation for furniture industry, (iii) Generalizations from the sector specific scenarios towards general visions of manufacturing for user driven innovation, (iv) A set of enablers for these scenarios in terms of technologies, organizational and individual skills, (v) Proposals for policy makers how to support these enablers through targeted research and other measures

Customized Solutions to Common Management Problems: Are Toolkit Methods an Answer?
(MCPC-130-2007)

Presenter:* Mooney, Marta (United States)

Abstract: In this paper I propose that management scholars and consultants, the primary suppliers of new management products, consider adapting toolkits for user innovation to develop customized solutions to common management problems. I argue that a design for constructing the requisite toolkit is available in a framework developed by W. Edwards Deming. Deming's framework, rooted in modern theory of knowledge, works to enable managers to successfully balance stability and change. It highlights the importance of innovation to business success and survival, treats prediction as management's central responsibility, assumes environmental instability, and systematically enables rational prediction in ways that take the full range of contextual variables into account. I contend that Deming's framework is compatible with toolkits for user design in both its aims (predictive accuracy) and means (adaptive learning), and ideally suited for mass customization by its emphasis on standardization of currently discretionary organizational elements that include management education, problem solving processes, and team problem-solving techniques. I conclude that toolkits offer an ideal vehicle for testing Deming's framework and that a successful test might possibly be a first step towards constructing a practical, unified theory for managing business operations in interdependent, unstable environments.

4.2 User Innovation in Practice: Real World Insights from User Innovation Accelerators

Rules of the Game: Innovation, Competition, Constraint and Customization (MCPC-166-2007)

Presenter:* Lefford, Nyssim (United States)

Abstract: Idea Crossing, Inc. designs and produces idea competitions that generate and capture fresh concepts from a broad range of participants. Our open innovation processes and web-based, automated system effectively streamline the management of idea competitions. Constraints are something the mass customization community tries to minimize. However, when it comes to the process of generating innovative ideas, constraints are an invaluable tool for fostering creativity. This talk will introduce the notion of the "Idea Competition" and discuss how customizing the structure of a competition through engineered constraints facilitates innovate problem solving. Competition and games have pre-defined constraints, or rules, and goals. Contestants bounded by rules strive to strategize optimal solutions to meet a competition's goal. In the competitive context, limitations facilitate effecting strategizing. In idea

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competitions, removing some of the idea generators' control over the process of idea generation (ideation) aids the process of developing creative solutions by limiting choices and degrees of freedom in the problem space. We will discuss the types of constraints imposed in idea competitions. Three different types of user/participant are considered. They include: the competition sponsor (who poses the challenge), the contestant (who generates the ideas), and the judge (who evaluates the contestants' ideas). Why constraints help meet the needs of these differing participants and the resulting structure of the interactions between these participants within the competition community will also be covered.

User Design in Practice - The Audi Virtual Lab (MCPC-115-2007)

Presenter: * Bartl, Michael (Germany)

Abstract: The aim of this practitioners` contribution is to outline the application of the user design method in practice. The authors will present insights, learnings and the resulting advancements from two consecutive user design projects termed the Audi Virtual Lab I and the Audi Virtual Lab II. The projects were conducted in Germany, Japan and USA with more than 7.000 participating customers. The presentation highlights both, the experiences made in management practice as well as the theoretical foundations of user design in academic research. The presentation is structured in the following parts: (1) General principles for user design of customized products; (2) Application of the user design method for automotive infotainment systems at Audi; (3) Insights, learnings and advancements of the Audi Virtual Lab; (4) Future perspectives of User Design

The Business Smarts of Strangers: Great Concept, But What About the Practice? (MCPC-173-2007)

Presenter: * Robert, Ruben (Netherlands)

Abstract: A few years from now, some exiting new words and terms will be in common use. Words like Wikinomics, Crowdcasting, Open Innovation, Prosumers and Cocreation are emerging. The 'New Web' can be a great equalizer, enabling the smallest of companies to utilize the wisdom and creativity of consumers and experts worldwide efficiently, and affordably. Despite the first available success stories, open innovation is still in its infancy. Organizations are experimenting and learning how to effectively harness the limitless availability of global expertise and talent. More success stories are sure to follow. The main question is not so much IF, but HOW organizations can fully profit from this tremendous opportunity. This presentation offers practical guidance on open innovation – how to implement it as a core business process and how to make it a common part of the way you conduct business each day. Learn from the best practices, see examples of how organizations run innovation challenges, decide how 'open' your organization can go. This how-it-works guide includes the topics: innovation briefing, incentives, social networks and managing input & feedback. It is an interactive presentation that focuses on the practice of 'Tapping the Business Smarts of Strangers'.

4.3 How to Profit From Lead Users

The Value of Lead Users beyond Product Development: An Empirical Analysis of their Role in the Adoption and Diffusion of New Consumer Products (MCPC-039-2007)

Presenter: * Pruegl, Reinhard (Austria)

Abstract: Lead users are proposed as a valuable resource for marketers in terms of the (1) development, (2) adoption, and (3) diffusion of new products. We present the first consumer study to provide evidence that the latter two suggestions are justified. First, we find that lead users demonstrate stronger domain-specific innovativeness than more "ordinary" users. Second, lead users perceive new technologies as less "complex" and might therefore be better prepared to adopt them. Third, we find that lead users demonstrate stronger opinion leadership and weaker opinion seeking tendencies. Finally, we discuss the implications of our findings for the marketing of new products.

Evaluating the Influence of Lead Users as Opinion Leaders on Innovation Diffusion (MCPC-144-2007)

Presenter: * Hassan, Salah (United States)

Abstract: This paper presents an integrative model for innovation diffusion using a lead user approach. The proposed an innovation diffusion model using the lead user method. It is argued that opinion leaders and lead users can potentially influence the innovation diffusion rate. Also, mangers are advised to use both lead users and opinion leaders while developing and introducing a new innovation. Finally, research propositions are offered based on model relationships in order to drive future empirical research

The Role of Lead Users in New Product Concept Testing (MCPC-9xx-2007)

Presenter: * Katharina Braun (Austria)

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Abstract: Concept tests are a widely-known means of early stage evaluation of new products. The primary goal is to select the most promising concepts out of a bunch of ideas before committing substantial resources to the development of a full product. A – or maybe the - crucial step in carrying out a concept test is selection of appropriate respondents. We suggest selection based on "leading-edge status" or level of "lead user-ness" of respondents as a possible solution to this crucial problem. The level of "lead user-ness" as a respondent selection variable shows major conceptual advantages as well as a superior empirical performance Compared to well-known respondent selection criteria in concept testing literature. Major theoretical as well as practical implications are set forth.

4.4 Application of Open Innovation Methods & Tools

How User Integration can Stimulate the Development of Great Entrepreneurial Teams (MCPC-008-2007)

Presenter: * Doll, Bernhard (Germany)

Abstract: The integration of users in the development process of new products or services is widely regarded as an effective way to turn a business idea into a successful innovation. Over recent years, many suggestions have been made for the integration, ranging from the cooperation with lead users to understand future market needs, the provision of well-designed toolkits to shift design activities to users and a systematic testing approach of ideas with users to evaluate the potential of the entrepreneurial opportunity. Our experience at the Technical University Munich's Center for Entrepreneurship shows that the integration of users and other stakeholders into a systematic development and testing process with models helps entrepreneurial teams at the very beginning of the entrepreneurial process not only to improve the product or service but also the team itself. Mapping the team's idea onto the right model at the right time, asking the right people for feedback can not only provide valuable information to tailor the product or service to market needs, they can also change the meaning of the business idea for the team and develop cohesion, motivation and teamwork, which are important pre-requisites to overcome the commitment barrier to venture creation and future venture's success.

Exploring Ideation Patterns among Ordinary Users: The Case of Mobile Telecommunication Services (MCPC-161-2007)

Presenter: * Magnusson, Peter (Sweden)

Abstract: Managers aiming at utilizing the potential of involving ordinary users in ideation for innovation have at the present very little guidance from the existing literature regarding how to do this in an adequate way. This paper aims filling this knowledge gap by contributing to a better understanding of how users contribute to, and how they could adequately be managed in the ideation process of technology-based services. This is accomplished by identifying and investigating different ideation patterns and their effects on the created ideas' characteristics, in the context of mobile telephony services. The paper is based on a quasi-experimental study lasting over twelve days involving 56 ordinary users and 12 professionals as idea creators. Three different groups of users and one reference group of professionals were used. The paper inductively identifies four different ideation patterns that lead to different types of ideas in regard to their innovativeness (incremental/radical). These are further related to the existing literature. The paper concludes with managerial implications regarding how to manage this type of user involvement in order to obtain either more incremental or more radical ideas.

An Empirical Study To Identify New Sources Of Radial Service Innovation Ideas Using The Toolkit For Idea Competition (MCPC-078-2007)

Presenter: * Duverger, Philippe (United States)

Abstract: Toolkit for Idea Competition (TIC) is a method drawing on the stream of research pretending to the co-creation of innovations between the client and the firm. Previous research has empirically shown its usefulness in generating radical ideas for the development of new product. We propose in this paper to evaluate the merit of TIC in identifying sources of Radial Service Innovation ideas within the firm client's base, and also amongst the firm's client defectors. The study will validate, in the context of services, several hypotheses uncovered in the literature and pretending to the development of new product. The study will also show that, not only best ideas can be found within a firm's customer base, ideas generated by frequent guests and defectors are superior to ideas created by others. A prototype of a TIC for services was developed and launched in partnership with a service business unit. The evaluation of the results from the TIC has deep implications for services organizations wishing to rejuvenate their brand and provides elements for further research.

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4.5   Enabling Open Innovation & Customization in Consumer Electronics

Personalizing Devices via Open Source Hardware (MCPC-9xx-2007)

Presenter:* Semmelhack, Peter (United States)

Abstract: In this discussion, Peter Semmelhack provides an overview of the emerging open source hardware movement, how it impacts the traditional consumer electronics provider's approach to manufacturing and marketing, and what role the online community has played in driving the demand for extreme customization and personalization. By highlighting the success of the open source business model within other industries, Peter will also discuss how the "long tail" of hardware devices can finally be realized, and how consumers are now empowered to create new devices and, potentially, new markets. His company, Bug Labs, develops BUG, an open, modular consumer electronics hardware platform which intends to bring to the world of hardware gadgets what the Internet, open source, XML and web services have brought to the world of software and media. The success of online communities and open source business models have pushed the demand for mass customization to industries beyond software. For example we're now seeing durable goods (such as apparel, automobiles, and even pre-fab housing units) becoming personalized to fit an individual's exact preference. Additionally, open source hardware is gaining market traction. Will it drive innovation and disruption in the same way as Open Source software? The potential is now there for any individual with basic technical proficiency to tap into a community of enthusiasts for assistance in creating the device and application that fits his or her exact needs. The open source model has been "validated," as it's crossed the chasm from a competitive differentiator to a keystone of success for any new entrant, posing both a unique challenge and boon to the multi-billion dollar consumer electronics industry.

Note: This presentation is followed by a general discussion of the User Innovation Track.

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5   Designing Solution Spaces: Product Architectures and Configuration Systems for Mass Customization

5.1   Product Design, Modularity, and Product Platforms for MCP

5.1.1   Developing Powerful Product Platform Architectures

WordPress: Blogging software as open, modular, multi-level platform (MCPC-082-2007)

Presenter:* Watson, Andrew (United States)

Abstract: WordPress is blogging software. It is widely distributed and deeply customizable. It is a family of products built on a common platform. It is the focus of a vibrant community. It is a for-profit business for Automatic, the company founded by its lead developer. This paper considers WordPress from each of these perspectives. It derives implications for WordPress itself, and for mass-customized software more generally.

Market-Based Strategic Platform Design for a Product Family Using a Bayesian Game (MCPC-136-2007)

Presenter:* Moon, Seung Ki (United States)

Abstract: Mass customization depends on a company's ability to provide customized products or services based on economical and flexible development and production systems. Product family design provides a way to achieve cost-effective mass customization by allowing highly differentiated products to be developed from a common platform while targeting products to distinct market segments. In dynamic and uncertain market environments, however, we only have incomplete or uncertain information regarding market trends, customer's preferences, production costs, and the company's strategies for product development. The objective of this paper is to propose a methodology for strategic platform design in a product family using concepts from game theory to model the situations of uncertain market environments. We identify module-based platform design for a product family and consider a module selection problem as a strategic game with incomplete information. In particular, a Bayesian game is employed to model uncertainty situations regarding market environments. The proposed Bayesian game is used to decide strategic equilibrium solutions for selecting modules in the product family being designed. To demonstrate implementation of

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the proposed Bayesian game, we use a case study involving a family of power tools.

Knowledge-Based Configurable Product Platform Models (MCPC-153-2007)

Presenter:* Johannesson, Hans (Sweden)

Abstract: The main driving force for platform based development and manufacturing is the possibility to combine customization with economy of scale. The means to achieve this is reuse of common resources, i.e. the product platform, in multiple customized product variants. Configuration of product variants is achieved by combining the parts in the platform with variant specific parts. Although much have been gained with this strategy it has its limitations, and it needs to be further developed in order to prevent the amount of part numbers to be managed in a developing and manufacturing company to grow out of hand as well as to improve knowledge reuse efficiency. In order to address these problems a new more system oriented and abstract knowledge based approach is proposed to define and describe configurable product platforms in the present work. A modeling procedure and a new fully configurable platform model concept, consisting of linked fully configurable generic sub-systems, have been developed. The model has been implemented as a separate platform configuration (PFC) system being the base for system configuration. The proposed platform model has been partly verified and validated in cooperation with the industrial partners participating in the referred research project.

Toward a Knowledge Support System for Product Family Design (MCPC-098-2007)

Presenter:* Moon, Seung Ki (United States)

Abstract: Knowledge-intensive and collaborative support has been increasingly important in product development to maintain future competitive advantages. A knowledge support system can provide a solution for iterative design and manufacturing activities that are performed by sharing and reusing knowledge related to product development processes. Sharing and reusing product design knowledge can help reduce cost and lead-time when developing new products as well as facilitate product family design. This paper describes research toward creating a knowledge support system (KSS) that consists of knowledge representation, knowledge discovery, and recommendation for product family design. For the proposed KSS, we use an ontology to represent products as functional-based hierarchical structures and describe cost information related to product design. Fuzzy clustering is employed to partition product functions into subsets for identifying a platform and modules in a given product family. Rules related to design knowledge among products are developed using association rule mining. A reasoning tool is used to inference knowledge represented by an ontology and obtain design solutions. We present a prototype system to demonstrate the KSS using a case study involving a family of power tools.

5.1.2   Managing Complexity & Cost in MC Product Architectures

Before Pine and Dell: Mass Customization in Urban Design, Architecture, Linguistics, and Food (MCPC-155-2007)

Presenter:* Chin, Ryan (United States)

Abstract: Long before B. Joseph Pine II established a viable economic strategy around the concept of Mass Customization, and Dell Computer's execution of a custom build-to-order strategy, combinatorial theory (configuring of modular components) and generative systems have been employed in biological systems, grammatical sentence structure in linguistics, and also in architectural and urban design. This paper will trace the conceptual roots of Mass Customization through the examination of historical precedents: 1) Design of cities via biological analogy (Aristotle), 2) Architectural form via grammatical analogy (Mitchell), 3) Precis des Lecons d'architecture (Durand), 4) Combinatorial Optimization (Newell, Simon), 5) Culinary Arts. I will then discuss the limitations of such combinatorial methods and then lay out a conceptual framework for achieving high levels of customization using combinatorial methods. The work on the MIT Concept Car by the Smart Cities group of the MIT Media Lab will illustrate these principles.

How Expensive are Product Variants? (MCPC-059-2007)

Presenter:* Metzger, Uwe (Germany)

Abstract: Times are over when Henry Ford declared "People can have ... any color - so long as it's black." Customers nowadays demand individual products meeting their requirements exactly. At the same time it is expected that products become more and more high-performance and cost-effective. .... The systematic listing of variant-specific expenses opens up unexpected opportunities for optimization. Recommendations for the handling of the complete process chain can be directly drawn from the cost drivers observed, and include concrete indications

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for reducing set-up times, inspection and qualifying costs or suppliers' manufacturing costs. The potentials in developing new products are even greater. If the variant-specific expenses are well-known, the complexity costs of the total product line can be simulated in advance and thus systematically reduced. That is where unexpected potentials often remain unused.

Product Family Configuration Design Based on Hybrid Real Options Valuation (MCPC-105-2007)

Presenter: * Jiao, Roger (Singapore)

Abstract: The rationale of configuring individual products based on product families and platforms has been well recognized by both academia and industries. The general gist of existing approaches coincides with the traditional principle of capital budgeting that is based on discounted cash flows (DCF) analysis. The DCF-based methods assume a priori to embed a single operation, which implies management's passive commitment to a certain operating strategy. Considering numerous options associated with product family configuration design (PFCD), the DCF approach tends to underestimates the upside potentials to a design project from management flexibility. This paper employs a real options approach such that PFCD is modeled as an investment strategy being crafted by a series of real options that are continuously exercised to achieve expected returns on investment. A hybrid real options model is proposed to recognize the value of flexibility either inherent in a project or that can be built in product platforms. The hybrid approach surmounts traditional PFCD evaluation methods in that it excels in integrating engineering analysis and financial analysis into a coherent framework. Also reported is an application of the hybrid real options framework to a vibration motor manufacturer.

5.1.3   Setting the Right Degree of Variety

Designing for Co-Design: Using the Product Envelope Model as a Framework for Reflection (MCPC-056-2007)

Presenter: * Herd, Kate (United Kingdom)

Abstract: This paper reports on work that is being undertaken to build upon existing knowledge in the field through the generation of a new conceptual model for MC product offerings. The first generation of this model, the product envelope, seeks to develop the existing notion of the solution space into a more complete model which reflects the wider context within which the solution space resides, that of the entire co-design and product purchasing experience This customer-centric approach assists in unpacking the less tangible service, interaction and experience touch points which surround and provide access to the tangible MC product at the core of the product envelope. The product envelope model has been used in this paper as a framework for reflecting upon a co-design experience at Puma's Mongolian BBQ.

Optimum Level of Customization for Mass Customization Systems (MCPC-107-2007)

Presenter: * Spahi, Sami (United States)

Abstract: Mass customization (MC) was developed to capitalize on the combined benefits of economies of scale and economies of scope. Balancing the tradeoffs involved in an MC system warrants the determination of the degree or the extent of customization. Most of the literature views the degree of customization as how early or how far the customer is integrated in the production cycle. This is defined as the order decoupling point. This paper presents a model that will determine the optimal degree of customization from a product structural design perspective. The paper introduces a Customization Scale (CS) as a measure for the degree of customization. The CS is based on quantifying the extent of optional combinations for customizable modules or feature for a product in an MC system. An analytical optimization model is implemented to generate a solution as to how far an organization should customize a product to meet certain strategic goals subject to resource constraints.

An Approach for the Configuration of Profit-Optimized Product Programs (MCPC-159-2007)

Presenter: * Nußbaum, Christopher (Germany)

Abstract: Companies in the industrial goods sector are increasingly forced to deliver customized products to meet diverging market requirements. An inconsiderate increase of product variety is usually followed by negative effects on cost structures of the business process. One of the main challenges for today's companies is to figure out the ideal range of product diversity in terms of mass customization. There exist no approaches to determine the profit-optimized diversity of variants. Our paper will present an approach for the configuration of profit-optimized product programs meeting the requirements of the mass customization thought.

5.1.4 Factors Influencing MCP Design

Mass Customization in the Ophthalmic Lens Industry: Progressive Addition Lenses for your Visual Map (MCPC-035-2007)

Presenter:* Mateo, Begoña (Spain)

Abstract: The paper describes the Progressive Addition Lenses (PAL) personalization system obtained as a result of the joint R&D project conducted by Indústrias de Óptica, S.A. (INDO) and Institute of Biomechanics of Valencia (IBV). Traditionally, users have been asked to adapt to progressive lenses that are made to fit an average wearer. INDO proposal is that a customized progressive lens that mimics the natural vision can be obtained by measuring the visual strategy of each individual user. The result is EyeMADE "made by your own eyes" and represents a major scientific advance and has positioned INDO at the head of the progressive lens' field. The advantages of EyeMADE over conventional lenses are clear since it optimizes the visual comfort and allows for an easier adaptation process. A simple, robust and reliable system known as VisualMap DEVELOPER was developed after a 5-year-long research project in laboratory conditions to measure the visual strategy. Research showed that this simplified technique of measuring the visual strategy was equivalent to the more complex laboratory measurements. The individual visual strategy obtained with the VisualMap is then used by INDO to manufacture the personalized EyeMADE PAL using the latest ophthalmic lens technology using computer numerically controlled systems.

Cross Cultural Influences in Semantic Space on Public Transit Interiors (MCPC-050-2007)

Presenter:* Solves, Clara (Spain)

Abstract: Mass transit is becoming increasingly market-driven, thus it is more and more important that passengers are provided with a pleasant environment that reflects the operator's desired image. A powerful tool such as Kansei engineering has proven to be key to achieve this goal. However, public transportation is oriented to many different markets with specific requirements and companies need to know which are the aspects more appreciated by passengers, in order to offer a product design adapted to the different cultures. In previous research works, it has been proved that perception elicited by products is affected by the variability associated to the cultural factor. Therefore, before analyzing the influence of the design factors in users' perception, it was posed the question of if this users' perception could be measured on the same pattern for different geographical regions. Solving this question led to consider the development of semantic analysis in three European countries in order to analyze if it was possible to extract a common core of semantic concepts and which were the specific aspects of each country. The main advantage of the results is that the market segmentation will allow companies saving time and budget and to avoid critical errors.

Analytical Affective Design with Ambient Intelligence for Product Ecosystems (MCPC-106-2007)

Presenter:* Jiao, Roger (Singapore)

Abstract: Consideration of human-product-environment interactions is consistent with the wisdom of 'product ecosystems', which essentially entail a scenario of affective design of the entire system with customer experience in the loop. Existing work has been inadequate to capture the affective customer needs, let alone to incorporate affective design into the product ecosystems. This paper proposes an analytical affective design modeling and evaluation framework for developing product ecosystems. Customer affective needs are elicited using ambient intelligence, and they are further analyzed and evaluated based on analytical methods. The configuration of product ecosystem is generated using computational tools. The commercial applications are manifested through the interior design of Volvo truck cab involving both the product and the ambience through human interactions.

5.2 Comfort, Usability, and Safety by and for MCP

Towards a mass-customized, full surround simulation of concert-theater effects when listening to music presented on a pair of earphones: challenges and research progress (MCPC-028-2007)

Presenter:* So, Richard (China)

Abstract: Music played on a theater stage provides listeners with a sense of auditory spatial presence as well as a clear perceivable incident angle of where the music is coming from (Ando, 1985). In other words, listeners inside a theater can close their eyes and feel that they are inside a spacious building as well as being able to hear where the

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stage is. On the contrary, listening to music presented through a pair of earphones lacks both the auditory spacious feeling and, very often, listeners would perceive that the music is coming from the center of their heads (Blauert, 1997). Using personalized head-related transfer function (HRTF) filtering technology, it is possible to simulate the acoustics effects of a concert-theater for music presented on a pair of earphones. However, such a personalized solution can cost over US$2000.0 and may not be feasible for consumer products. Non-personalized solutions, on the other hands, do not work well. This paper discusses the problems associated with the non-personalized solutions and challenges and opportunities of mass-customized solutions. Progress in tackling various challenges is also reported. Potential industrial applications include high-end surround sound solutions for iPods and MP3 players.

Digital Human Modeling for Perception-Based Safety Design (MCPC-037-2007)

Presenter: Duffy, Vincent (United States)

Abstract: A digital human model is a digital representation of the human inserted into a simulation or virtual environment to facilitate prediction of safety and/or performance. It includes visualization and the math/science in the background. Perception-based safety design applies fundamentals of human factors and ergonomics toward optimal product and process design in various application domains including manufacturing, automotive, military and healthcare. Findings of recent studies of Purdue researchers that are based on recent peer reviewed research in digital human modeling will be highlighted. Early successes in DHM related research led to funding from UGS, Nissan, General Motors and the U.S. Army. Current affiliations with the Regenstrief Center for Healthcare Engineering provide additional perspective for new research initiatives and academic endeavors such as editing the forthcoming Handbook of Digital Human Modeling and organizing the 1st International Conference on Digital Human Modeling to be held in Beijing, China in July '07. Opportunities will be briefly outlined for the systematic application of these engineering principles to manufacturing, product design and healthcare delivery.

Certifying of Mass Customized Products (MCPC-111-2007)

Presenter: Jansen, Alfard (Netherlands)

Abstract: Mass Customization shines new light on certification. Testing some samples does not cover the complete production series, because every product is unique. Computer Aided Verification can certify all designs before products are made. Besides technical challenges, this requires a change of attitude of consumers and legislators. In future designs for MCP, standards may be incorporated. Instead of certifying products or production, the entire chain, including the automated design processes will be certified. We will show cases that illustrate the credibility of Computer Aided Verification for certifying, as well as the implications for development of norms and design processes.

5.3   Configuration Toolkits for Customer Co-Design

5.3.1   Mass Customization Information Systems

Developing Mass Customization Information Systems – A Theory-Based Approach (MCPC-058-2007)

Presenter: Dietrich, Andreas (Germany)

Abstract: Information management is one of the key success factors for implementing mass customization (MC). In order to support MC scenarios in an efficient way, specific information systems are needed. In this paper, a theory-based approach for the requirements engineering process is documented. Based on a dynamic view of enterprises working together, an exemplary MC supply chain is introduced. The MC specific requirements for information systems are derived by using transaction cost theory and principle agent theory. Based on the list of requirements, a 3-level architecture for mass customization information systems is proposed.

Realizing Extreme Customization with EC: Theories, Reality & Empirical Knowledge for Constructing Intensively Interactive Mass Customization - EC Sites (MCPC-065-2007)

Presenter: Huang, Jimmy (Japan)

Abstract: Customer interaction is a pre-requisite for intensive or extreme mass customization. Existing studies and theories have focused on manufacturing, inventory and outsourcing. Yet, the key success factor of MCP is the shopper interaction with the merchants, leading to the sales of mass customized products. The only way to fully execute a shopper-oriented mass customization operation is via e-commerce (EC) over the Internet. This is what we

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call MCP-EC. OneMarket is the only company in the world with MCP engine and operation experience and we have a MCP-EC methodology that has its core foundation in engine-based software solution. This methodology allows us to easily tackle BTO challenges, as well as conventional end product inventory challenges employing the same core engine. Furthermore, we have a customer-oriented philosophy which lends to agile product development. We do not rely upon conventional marketing schemes. We listen to the actual users and make only what is needed by them. This is how our evolutionary approach becomes reality. What do we get out of all of this? Satisfied shoppers who get the exact product they desire. Everyone is treated specially and differently (in a good sense) and isn't that what MCP should be about?

5.3.2   Linking Between Product Architecture and Configuration System Design

Effectiveness of the Product Configuration Task: Theory Formalization and Test (MCPC-149-2007)

Presenter:* Forza, Cipriano (Italy)

Abstract: Quick and reliable response to customers' needs has been argued to be a key competitive advantage when manufacturing customized products. Anecdotal evidence and case-based research point to the importance of the effective management of information on feasible product configurations in order to achieve good responsiveness. However, no empirical, large-sample test of this contention has been done as yet. Our paper begins to close this research gap by testing a theory-derived model of how information relating to product configuration determines the responsiveness in serving customers. We find that availability of information supporting the product configuration task indeed allows companies to serve their clients faster and more accurately. We also find these benefits to be mediated by the availability to learn from past product configurations.

Handling the Early Phases of Configuration Projects (MCPC-163-2007)

Presenter:* Mortensen, Niels Henrik (Denmark)

Abstract: During the early phases of configuration projects very important decisions are made which will heavily influence the performance of the company, benefits in different functional areas (production, sales, purchase, product development, service etc), maintenance of the configuration system and quality of the dialog between the configuration system and the users. Today there exists very sparse tools and procedures which can assist the early phases, i.e. conceptual modeling of the products and product assortment. This paper presents a five-phase procedure for conceptual modeling in configuration projects. Each of the five phases is supported by a set of tools. The main idea of the procedure is utilization of a so-called Product Family Master Plan, which is a formal description of the product assortment and its variation. The procedure has been tested at one of Baan's (SSA Global) customers with very convincing results.

Product Family Modeling - Working with multiple abstraction levels (MCPC-022-2007)

Presenter:* Joergensen, Kaj (Denmark)

Abstract: Product configuration in manufacturing-to-order (MTO) companies and engineer-to-order (ETO) companies is significantly different compared to mass-producing companies and for some companies, the situation is made extreme by market conditions, which imply long order horizons and many changes of the orders both before and after order acceptance. With focus on these challenges, a specific approach is presented for modeling of product families on multiple abstraction levels in a way where customer driven product configuration is concentrated on decisions, which are relatively invariant throughout order processing. Higher abstraction levels are typically related to identification of basic functionalities of the product and considerations about the ability to perform functions, which are required by the customer, are very primary and should clearly be addressed in sales and tendering. By the modeling approach, it is shown how the focus of product configuration can be shifted to identification and definition of attributes instead of modules and components. The approach, which is used here, is based on the theory of general systems and outlined in combination with the abstraction mechanisms classification and composition together with object-oriented analysis and design. The proposed approach shows that classification is a means for identification of multiple abstraction levels.

Product Structured Class Diagrams to Support the Development of Product Configuration Systems (MCPC-164-2007)

Presenter:* Haug, Anders (Denmark)

Abstract: For several companies the use of product configuration systems (PCS) has produced a range of benefits such as minimizing the use of resources and shortening the lead times in product specification processes. When developing a PCS, two kinds of models are often created, namely analysis and design models. The task of describing

domain knowledge in analysis models often involves domain experts, for which reason the analysis language has to be easily understandable in order to avoid extensive training. For this task the so-called Product Variant Master diagramming technique is often applied. On the other hand, the creation of design models does not involve domain experts to the same degree, and the requirements for the design language are more focused on having a formalized and rich language. For this task class diagrams are often applied. To avoid the use of different modeling languages in the analysis and design phase, this paper proposes the use of a layout principle, named Product Structured Class Diagrams (PSCDs), which incorporates the usability of Product Variant Masters (PVMs) into the class diagram notation. To support this proposition, it is investigated if PSCDs hold the qualities of both PVMs and class diagrams.

5.3.3   Tools and Methods for MCP Toolkits

Toolkits as Problem Solving Assistants: An Empirical Study of how to Facilitate the Use of Heuristics in Self Design Processes (MCPC-156-2007)

Presenter: Keinz, Peter (Austria)

Abstract: Toolkits for User Innovation and Design have turned out to be successful means of integrating users into the new product development process. But experience shows that the Toolkit approach does not always work well in practice. Due to the high complexity of self design processes and their limited problem solving capabilities, especially novice users often feel overwhelmed by the new task of designing an individualized product on their own. The aim of this study is to give insights on how to improve Toolkits in order to make them effective problem solving assistants providing substantial support to users during self design processes. The results of our experiment show that certain Toolkit functions can help users to employ special problem solving heuristics which enhance the users' problem solving abilities. These improved problem solving abilities help users to come up with products that better fit their needs and therefore lead to an increased willingness to pay and a higher purchase intention for the self designed product.

System for Configuring Offers for an Extended Company in Graphics Arts (MCPC-038-2007)

Presenter: Mendizabal, Begoña (Spain)

Abstract: This article presents a practical case of applying configuration systems based on programming by restrictions in order to respond to company requirements in graphic arts, in two complementary fields: organizational and technological. The product is characterized by having sophisticated restrictions and extended production processes that are closely interlinked. In order to respond to these problems, this system provides global integration of sub-processes and full customization of the product, taking the "Mass Customization" paradigm to its ultimate extreme. The system provides a global view of the group where joint capacities are optimized and related, making it possible to determine, which is the best means of production for each of the needs, storing critical information in order to optimize future investments and the global management of the company. The benefits obtained by the company have been as expected: an increase in the number of estimates issued and an improvement in the competitiveness of said estimates by improving the use of joint capacities and having more reliable figures. Furthermore, thanks to it being a swift and simples system, doors are opened to extend the commercial network or to allow access to the customers themselves to the on-line form system, in the near future.

Conceptual Configuration of Pharmaceutical Plants in 3D (MCPC-048-2007)

Presenter: Ladeby, Klaes (Denmark)

Abstract: In the conceptual design phase of pharmaceutical plants as much as 80%-90% of the total cost of a project is committed. It is therefore essential that the chosen concept is viable. Configuration and 3D models can help validate the decisions made in the conceptual design process. Designing 3D models is a complex task and requires skilled users. We demonstrate that a simple 2D/3D configuration tool can support conceptualizing of pharmaceutical plants. Present paper reports on preliminary results from a full scale implementation project at a Danish engineering company.

Supporting the configuration process of highly customizable and individual components by flexible and adaptive configuration dialogues (MCPC-066-2007)

Presenter: Oestreich, Erik (Germany)

Abstract: The success of the implementation of a mass customization strategy in practice depends on the ability of a company to cope with product complexity in an effective way. This research is focused on product configuration of complex individual packages, namely the automotive industry. In the centre of interest are packages that are – in

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contrast to conventional optional equipment – specified by a high number of features, which can be modified by a customer according to their personal needs. For these kinds of packages it is often necessary to draw up some creative documents, describing the ordered components in a very detailed manner. For this purpose this paper presents a new approach towards configuration that supports the automatic generation of such documents, the so called construction notifications. By the use of this strategy it is possible to reduce complexity of the product model noticeably and optimize procurement processes for individual parts. The current complexity is almost completely handled by a flexible configuration model.

5.3.4 MCP Toolkits in Practice: Experiences and Insights

Ever Configured a Cement Plant? Product Configuration for Making Quotations for Complex and Highly Engineered Products at FLSmidth A/S (MCPC-040-2007)

Presenter: Hvam, Lars (Denmark)

Abstract: This presentation will describe a practical implementation of a configuration system at FLSmidth A/S, which is a Danish cement plant manufacturer. The prototype of this system was developed from 1998-1999, and it was based on a procedure for building product models developed by the Centre for Product Modeling at the Technical University of Denmark. The first version of the configuration system was implemented in 2000 and has now been in operation for more than seven years.

The Quest for an Optimal Interface: Practical Lessons from Product Configurator Projects (MCPC-128-2007)

Presenter: Blazek, Paul (Austria)

Abstract: Growing media knowledge and stronger self-assurance of customers require companies to respond with increasingly interactive communication solutions. Instead of simply presenting products, companies can benefit from new information and communication technologies to obtain direct input and involve customers at all levels of value creation – from the initial product design to marketing and sales. The product configuration systems used in mass customization market models are particularly dependant on interactive communication between companies and customers. The benefits of mass customization, such as cost reduction, competitive differentiation, innovation leadership and improved customer relationships usually presuppose a configurator with a workable and readily accepted digital interface. Our company has conducted extensive research on the mechanisms of configurator acceptance and identified four crucial principles of successful configurator design: 1. Ensure maximum usability, 2. Visualize your products, 3. Build emotional appeal, 4. Optimize your sales strategy. In the proposed presentation we will detail our findings, illustrating these with case studies. We will subsequently show how these results were used in an own client project, where a configurator is now an integral part of a participatory company culture that builds on the strengths of individual players by enabling and recognizing individual achievements.

How to Improve Customer Interaction through the Concept of Multiple Competences (MCPC-119-2007)

Presenter: Freund, Robert (Germany)

Abstract: The interaction among companies and customers is a complex interrelationship, in which the capability towards self organization (competence) from the side of the customers as well as the companies plays a very important role. In this paper, approaches will be examined that deal with Mass Customization and Interactive Value Creation in order to determine if they respond to today's requirements. Finally it will be shown how the concept of multiple competences can improve the process of customer interaction.

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6 Manufacturing, Operations, and Supply Chain Management for Mass Customization

6.1 MCP Production Planning & Scheduling

Case Studies on the Relationships between AMT, Competitive Priorities, and Customization Strategies in the Canadian Furniture Industry (MCPC-043-2007)

Presenter: Azouzi, Riadh (Canada)

Abstract: This paper describes the methodology and findings of industrial case studies that investigated the relationships between the agility of Advanced Manufacturing Technologies (AMT), the competitive priorities, and the customization strategies in furniture industry. Empirical data was collected using structured surveys of two strategically selected furniture enterprises in the province of Quebec, Canada. The goal behind the case studies was to explore the appropriateness of the authors' typology framework that links the manufacturing strategy of the enterprise with its technology infrastructure. Basically, this typology hypothesizes that the fit between technology and strategy results in higher performance. It defines three agility levels concerned with the specific capabilities that an enterprise needs to develop throughout its processes in order to achieve some competitive priorities. An integral part of this typology is an agility reference model that helps to identify the key properties that should characterize the technologies employed to develop each capability. The typology and the agility reference model are based on literature and on conceptual reasoning by the authors. The findings of the case studies corroborate this line of conceptual reasoning.

Modeling of Scheduling Condition Changes in a Customized Large Scale Production System (MCPC-137-2007)

Presenter: Lu, Roberto (United States)

Abstract: Customized products such as ocean vessels and commercial airplanes require large scale production systems to encompass their unique demands in customization and complexity. Since it is not practically feasible to perform many trial-production runs on test units in such production system, almost every one of the unit produced is to be delivered to a revenue generating customer. Therefore, products produced prior to the production system reaches a steady state in the system are very important to the overall success of the program. Scheduling any condition changes in a customized large scale production system thus become a sensitive task. This research aims to provide a methodology to model such scheduling challenge.

Identifying Generic Routings for Product Families Based on Text Mining and Tree Matching (MCPC-104-2007)

Presenter: Jiao, Roger (Singapore)

Abstract: Product customization leads to an exponentially increased number of product and process variants, which exaggerates the difficulties in building up customization capabilities for make-to-order production systems. It is imperative for companies to configure existing operations routings by exploiting similarities among product and process families so as to take advantage of repetitions. Corresponding to a product family, a process family comprises a set of similar production processes that share certain common operations routings (namely, generic routings). In addition to leveraging the costs of delivering variety, exploiting process families around generic routings can reduce development risks by reusing existing facilities and proven process elements. This paper applies data mining techniques to identify generic routings from large amount of production information and process data available in a firm's legacy systems. Generic routing identification encompasses three consecutive stages, including routing similarity measure, routing clustering and routing unification. Text mining and tree matching techniques are applied to cope with the textual and structural types of data underlying generic routings. A case study of mass customization production of vibration motors for mobile phones is reported to illustrate the feasibility and potential of generic routing identification.

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6.2 Supply Chain Management for MCP

6.2.1 Supply Chain Design for Delivering Customized Products

Customize-to-Order: Optimized Planning and Control of Global Automotive Supply Networks
(MCPC-051-2007)

Presenter: Timm, Thorsten (Germany)

Abstract: To be competitive in a globalized market producing highly individualized cars the European Automotive Industry must internally adapt their supply chain to future needs. Based on a recent study by Mercer Management Consultants and Fraunhofer Gesellschaft done in collaboration with top management of companies from the European automotive industry, several drivers for the future automotive supply chain management have been identified. AC/DC (Automotive Chassis Development for 5-Days Cars, funded by the European Commission under proposal/contract no. 031520), an integrated project anchored in the European supplier industry, picks up these drivers and develops a new reliable concept for European automotive industry supply network management drastically shortening lead times while reducing stocks and network management complexity. AC/DC applies economies of scale using principles of mass customization enabled by usage of new mechatronic components while assuring the delivery reliability of highly customized cars. This article describes the main objectives of the recently started project. It gives a brief overview of the concepts that are used in AC/DC motivated by the demands of the supplier industry. AC/DC will be developed for the future European automotive industry with a focus on its application in 2010-2015.

Giving Customers the Vehicle They Want in Automotive Order Fulfillment, Part 1: Does Inter-Dealer Trading Improve Performance? (MCPC-053-2007)

Presenter: Brabazon, Philip (United Kingdom)

Abstract: In an effort to quickly meet customer requirements in terms of vehicle specification, automotive producers are increasing the flexibility of order fulfillment. In the first of a two part study, simulation is used to investigate the impact of inter-dealer trading in the context of an automotive virtual-build-to-order (VBTO) system. The key characteristic of VBTO is the ability to allocate products in the planning pipeline to customers, as well as using conventional stock and build-to-order fulfillment mechanisms. The model includes a producer, dealers and customers and its structure and logic are based on typical current practice. Different set-ups of the VBTO system are studied and compared, including stock replenishment methods, methods of searching for a product on behalf of a customer, and the relative market share of dealers. The study shows key insights on the effect of dealer trading on each of the three categories of stakeholder. Trading can benefit all stakeholders although its effects are influenced by differences in dealer size, wholesale allocation policies and search rules. Significantly, when there are dealers with different market shares, the pattern of impact for smaller dealers (and their customers) can be opposite to that for a larger dealer.

Leadtime-Variety Tradeoff in Product Differentiation (MCPC-132-2007)

Presenter: Alptekinoglu, Aydin (United States)

Abstract: The literature on mass customization generally focuses on the tradeoff between the increased fit between product specifications and customer preferences, and the increased fixed and/or variable cost of production associated with offering a broader, possibly fully customized, product line. Implicitly acknowledged, but less well-understood, is the tradeoff between the increased ability to precisely meet customer preferences and the increased leadtime from order placement to delivery often associated with customized products. In this paper we formulate an integrated model for a firm's optimal product line design that involves product positioning, pricing and inventory policy decisions, and propose a dynamic-programming-based solution procedure. We show that, although inventory control decisions are usually taken later and at a lower level than product line design decisions, ignoring inventory implications leads to suboptimal product line designs.

6.2.2 Managing Supply Chains for Delivering Customized Products

Procurement Mechanisms for Customized Products (MCPC-025-2007)

Presenter: Chen, Songlin (Hong Kong)

Abstract: Customization is essentially a pull system and customers' demand for customized products is the ultimate force that drives a customization business. Research in product customization has been primarily focused on improving manufacturers' efficiency in eliciting and fulfilling customers' needs; less attention has been paid to

customers' procurement decisions. Although systems like product configurators and design toolkits have been developed to facilitate customers in product customization, they are more sales-tools than procurement-tools. This paper views customization from customers' perspective and aims to understand the critical information, decisions, and incentives in procuring a customized product. Procurement of customized products is conceptualized as a contracting problem with an embedded co-design problem with information asymmetry. A decision framework for procuring customized products is constructed, different procurement scenarios are outlined and generic procurement mechanisms are surveyed and compared. This paper concludes by pointing out future research directions on procurement mechanism/system design towards improving customers' efficiency of procuring customized products.

Giving Customers the Vehicle They Want in Automotive Order Fulfillment, Part 2: Does Reconfiguration Flexibility Improve Performance? (MCPC-054-2007)

Presenter: Brabazon, Philip (United Kingdom)

Abstract: This paper reports the second part of a simulation based study of an automotive virtual-build-to-order (VBTO) system, the key characteristic of which is the ability to allocate products in the production planning pipeline to customers, as well as to fulfill them from stock or build-to-order requests. The simulation model comprises a producer, three dealers and their customers, and in this second part is used to analyze the impact of reconfiguration flexibility on the three categories of stakeholder across a wide range of product variety levels. Reconfiguration flexibility is the ability to amend a product in the pipeline. Different set ups of the VBTO system are studied and compared including different forms of trading between dealers and methods of searching for a product on behalf of a customer. The study finds that reconfiguration flexibility can be a benefit to all stakeholders but its strength of impact varies with the amount of product variety. Reconfiguration flexibility has a stronger effect on metrics than trading between dealers.

Intelligent Agents Assisted Value Adding Communities for MCP Supply Networks (MCPC-120-2007)

Presenter: Freund, Robert (Germany)

Abstract: This paper proposes the design of an innovative management model for supply networks. This model promotes the requirement for close cooperation and adaptability as well as flexibility of ad-hoc structures throughout the supply network of custom made products and services. Structures of this type will respect principles that differ from the classical model of the industrial age, and evolve towards becoming self organizing and self adapting entities. This type of structures will be organized, so that they provide flexible interfaces for plugging and adapting rather speedily into other ad-hoc co-operations for the purpose of providing custom made products and services. Once the purpose for which this "Virtual Integration" has been served, integration can be abandoned partially or completely and other structures can be formed in order to continue offering custom made and individual products or services in a new form.

6.3   Mass Customization Manufacturing Systems

6.3.1   The Elements of Successful MCP Manufacturing Systems

How to Implement the Mass Customization Strategy: Guidelines for Manufacturing Companies (MCPC-087-2007)

Presenter: Alfnes, Erlend (Norway)

Abstract: The attention on Mass Customization as a viable manufacturing strategy is increasing in academia. Also, more and more companies report from successful implementations. However, the transformation process necessary to become a mass customizer (from the company's outset as a mass producer or a handcraft type industry) is still not fully developed, and research on practical implementations is needed to gain experience on how to proceed. The research presented in this paper is based on two case studies in the Norwegian furniture industry. Efforts towards the new strategy in both companies are analyzed related to central decision areas when implementing mass customization. The decision areas are extracted from literature. Three performance objectives; low cost, short delivery time and degree of customization are considered to be the order winning criteria's, and it is argued that enterprises need to balance these performance objectives in their effort to realize mass customization. The lessons learned from the cases are structured in a set of guidelines for mass customization, which propose the necessary changes to undergo for a mass-producer as well as for a craft manufacturer.

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Individualized Serial Production for Mass Customization and Open Innovation (MCPC-138-2007)

Presenter:* Hinke, Christian (Germany)

Abstract: In this paper the strategy of individualized serial production and the according approach of open product platforms are presented and discussed. Individualized serial production (ISP) is one form of a made-to-order production system. As a differentiation from other made-to-order production systems ISP is characterized by two key elements: co-design and strong encapsulation. By enabling co-design, ISP provides a stronger individualization experience and has the potential to implement open innovation strategies, i.e. customers can use, vote or pay for designs, co-designed by other customers. Therewith ISP is a simultaneous implementation of two basic strategies: mass customization and open innovation. Open products platforms are a new approach adding co-designed and strongly encapsulated components to the approach of product platforms. The following three fields of actual and future research are derived from the approach of open product platforms: product structures, production technologies and co-design-toolkits.

A practical approach to mass customization - Lessons learned from Finish machine construction (MCPC-074-2007)

Presenter:* Mertanen, Markus (Finland)

Abstract: Customer requirements vary and "one size fits all" no longer fits anyone. Mass customization (MC), producing and delivering individually customized goods and services for a mass market, is offered as a solution to the problem. The concept of MC is well known, but research into its operational implications is limited. This paper draws on 34 in-depth company interviews, from which five advanced mass customizers were investigated to discover the similarities and differences in MC practices. The five companies selected are all machine construction companies manufacturing capital goods mainly for business customers. The aim of the research is to ascertain how MC is managed from the operations management point of view. The results indicate that component commonality, product modularity, and process commonality are prerequisites of well-operating MC. In the case companies, final products are assembled in paced lines and modular cells produce components and modules. The importance of delayed differentiation remains somewhat unclear. Some of the companies have managed to shorten the throughput time so that delayed differentiation is not considered necessary. Instead, variety management from the customer point of view was highlighted in order to avoid confusion.

6.3.2 Manufacturing Cells for Mass Customization Manufacturing

Performance Analysis of Minicell-Based Manufacturing System for Mass Customization (MCPC-108-2007)

Presenter:* Badurdeen, Fazleena (United States)

Abstract: Successful mass customization requires superior capabilities to integrate customers to achieve co-design through effective product configurator systems, efficient product variant management as well as organizational structures and processes that are capable of taking product specifications and transforming them into customized finished products. In this context, the need for highly flexible and responsive manufacturing systems that can produce the customized products within a short time and at competitive prices cannot be over emphasized. Companies follow different strategies to mass customization with customer involvement occurring at varying levels. The earlier in the value chain customer involvement takes place, the more challenging are the manufacturing capabilities needed for successful mass customization. Customization through intervention at the fabrication/production stage—tailored customization—in the value chain is less challenging than pure customization but still permits achieving a greater fit to customer needs than with standardized customization. This paper presents a modular manufacturing system design using 'minicells' that has potential to deliver the flexibility and responsiveness required for efficient tailored customization by extending and adapting group technology concepts. The performance of minicells under stochastic demand conditions and approaches to integrate minicells with final assembly cells to explore the potential of extending lean manufacturing principles is also examined.

Intelligent Production Monitoring and Control for Mass Customization of Automated Manufacturing Cells in the Automotive Industry (MCPC-158-2007)

Presenter:* Berger, Ulrich (Germany)

Abstract: The automotive industry is characterized by regionalization and customization of products, enabling innovations in light-weight vehicle structure, energy efficient power-train solutions and assistance systems. New manufacturing paradigms for automotive structures and components force the automotive industry to continuously

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promote the development of cost-efficient and innovative vehicles, with high-added customer value, increased personalization capabilities and environmental sustainability. A strong trend for on-demand manufacturing of components and small products to individual personal or corporate specifications is foreseen. Besides already existing manifold efforts in the sector of Rapid Manufacturing (RM), the introduction of such principles in automated manufacturing cells is still in the beginning. But the non-availability of ubiquitous operational knowledge and the absence of dynamic and explicit knowledge recuperation procedures minimize the achievement of on-demand capabilities. To overcome this limitations, an intelligent production monitoring and control for mass customization of manufacturing cells will be introduced and experimentally validated. The concept is based on three interlinked modules, (i) a technology data catalogue based on semantic nets, (ii) an automated scheduling processor based on graph theory, and (iii) an programmable automation controller (PAC) for real-time sensor/actor communication.

7 Applying MCP in Industry: A Focused View on Mass Customization & Personalization in Diverse Fields

7.1 Customization in Architecture & Construction

7.1.1 Strategies and Cases of MCP in Architecture & Construction

Four Keyboards to Sustainable Mass Customization in Architecture & Construction (MCPC-167-2007)

Presenter: * Richard, Roger-Bruno (Canada)

Abstract: Mass customization machinery is generally producing a fixed configuration determined at the moment the product is materialized, whereas an appropriate building system would need to allow for adaptability through the whole lifetime of the building, as a program very often becomes obsolete even before a building is completed. Nowadays, manufacturers have learned how to introduce mass customization within their mass production lines without any significant cost surcharge. Four keyboards can be extrapolated and some of them are already applied to the delivery of individualized and adaptable buildings in Japan and in the European Community: 1 FLEXIBILITY OF THE PRODUCT: The product itself is capable of geometrical variations while in use in order to respond to different needs over space and time. 2 FLEXIBILITY OF THE TOOL: The tool itself becomes the generator of diversified products 3 MULTIPURPOSE FRAMEWORK: The same product acts as a framework to different options. 4 COMBINABILITY: Generating a multitude of combinations from a set of basic components produced in large quantity. Simple dry joints are available to simplify site installations, reconfigurations and even dismantling: Industrialized building systems then become flexible and demountable (IFD), reaching a high level of sustainability by offering major changes without any partial or total demolition.

Implementing MC in the construction industry – experience and reflections from 9 case studies (MCPC-006-2007)

Presenter: * Thomassen, Mikkel (Denmark)

Abstract: For the last two years, as part of a grant giving foundation, The Building Lab DK has given financial and professional support to nine inter-disciplinary consortiums aiming at developing mass customized solutions. The consortiums cover a wide range of products, services, companies and customers within the construction industry. This presentation takes stock on the knowledge gained in this process. Particular focus is given to the following questions: (i) How a restructuring of the present fragmented value chain is needed in order to create firms and business models suited for MC. (ii) The competencies needed to develop MC – six competencies that are usually not found in construction companies are pointed out as crucial. (iii) The dilemmas and problems experienced along the journey of developing mass customized solutions. The presentation concludes by preliminary recommendations on how and when to implement MC in the construction industry.

Digitally Enabled Mass Customization in Residential Construction for Production Home Builders

(MCPC-139-2007)

Presenter:* Mishra, Manoj (United States)

Abstract: Home building industry industrialization to allow customer choices in home plans, elevations and interior fit-ups are currently offered using web based tools by some production home builders integrating sales through production and occupancy processes. Historically, component shapes and forms in home building industry were limited by the physical limits on construction workmen. But with the advent of digital tools based design and production processes provide a marketplace for production home builder to increase the degree of customization options. The current degree of customization options by production home builders support only a limited number of options for the buyer led changes to floor plans, elevations and interior fit-ups. Production builder are faced by decision making issues to allow new custom options both internal (within builder) and external (outside builder domain of control). In this paper a literature review is conducted to study the decision making issues and the current degree of customization in residential industry. A product based definition for mass customization for production home builder is articulated. Future research on the decision making issues are discussed based on the literature review.

Standardized Algorithms and Design Descriptions for "One-off" Designs (MCPC-129-2007)

Presenter:* Griffith, Kenfield (United States)

Abstract: Design artifacts produced within the practices of architecture are the embodiment of customization which branches from the term "one-off." With the introduction of technological enhanced design processes and engineering approaches, design forms and shapes are becoming more pervasive, intricate, and extremely difficult to solve. Current fabrication processes are limited to rationalizing form to be digitally fabricated as panels for cladding buildings that may limit the expression of the geometry and forms produced. The geometry that is extracted from the design is usually in the form of 2D panel information that lacks the intelligence of how the units are fitted and constructed. The aim of this research is to acknowledge the current practices and formulate systems for automated the fabrication solutions of these custom forms. This paper investigates the dialogue between Digital Project, Microsoft Excel, and Rhinoceros 3.0 for finding a method for creating construction information using joinery assemblies for fabrication as the connection mechanics for the construction of customized designs within architecture.

7.1.2   Concepts & Tools of MCP in Architecture & Construction

Customizing Building Envelopes: Retrospect and Prospect of Customization in Building Industry
(MCPC-060-2007)

Presenter:* Piroozfar, Amir (United Kingdom)

Abstract: Despite the relatively long history of using mass-customization in building industry inadvertently, very scattered systematic attempts have been made so far to apply it on the field knowingly and in its genuine meaning, almost none of them have successfully avoided the predicament of its pure manufacture interpretation dominance or have been able to obliterate the failure of its predecessor, mass-production, in building industry. Having the two above aims, this paper will try to set a particular scene for customization in building envelopes. In this way it will try first to give some existing examples through which it seeks to establish the notion for the building industry. Then it will have a look on similar attempts within the field trying to build up the knowledge based on them and find about what is missing with regard to special needs and requirements of the sector. Then it will investigate the factors and entities which can be customized within a set of building envelope and the degree to which this customization can be meaningful and achievable. It will finally present some general suggestions for taking advantage of the benefits of mass-customization yet avoiding the downfalls associated with it in the building industry.

A Mass Custom Design Tool for User Participatory Approaches to Housing (MCPC-005-2007)

Presenter:* Noguchi, Masa (United Kingdom)

Abstract: Mass customization of housing may hardly be achieved without homebuyers' involvement in the design decision-making process. In fact, user participation in the design of housing has been examined for several decades. This emerged as a result of a worldwide increase in the number of inadequate housing forms for all sections of society. More efforts are needed to involve future users in the design decision-making process. The use of information and communication technologies may facilitate the user participation and thus, it should be explored. As well, the emergent notion of mass customization may have great potential to tackle issues arising in the delivery of affordable, sustainable homes, so that it should be incorporated into the participatory approaches to housing for people and society. Accordingly, this paper initially discusses the meaning of user participation for housing design and provision and identifies the significance of participatory approaches. Secondly, it examines an interactive mass custom design

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communication tool with a view to enhancing conventional user participation processes. The authors found that the design quality of housing that should reflect the buyers' wants and needs for housing to be purchased can be improved through the user participation, in which the digitalized design communication tool is brought in play.

Flexible Solution Space - Architecture by means of industrialized structural building systems
(MCPC-081-2007)

Presenter: * Vibæk, Kasper (Denmark)

Abstract: This article is based on empirically founded research in progress examining industrialized structural building systems used for multi-storey housing complexes. The main question in the article is; what are the implications of applying mass customization when it comes to the architectural quality and the physical potentials these systems. Two hypotheses are examined: a) Mass customization in construction is often based on a rather superficial adaptation of the building e.g. its aesthetic appearance (ceilings, kitchens, flooring, bathrooms etc). Customizable façade systems are under development but even more relevant concerning the architectural result would be a widely customizable and flexible building structure. b) Mass customization is normally perceived as an 'instrument' to establish a direct link between customer and producer. Contrary to customization of an industrial design product the architectural project requires due to its complexity to be customized using expert knowledge of great variety which cannot alone be written or transformed into IT-based configurators or mathematical algorithms. Conclusion: Mass customization developed into flexible solution space at a structural level seems within both an economical and an architectural logic to be a sustainable alternative to the rather fixed, standardized systems used for most multi-storey residential housing in Denmark today.

Error frequencies along the value chain of mass-customization products - An empirical investigation by the example of building elements (MCPC-020-2007)

Presenter: * Mekwinski, Sven (Germany)

Abstract: Regarding the rising meaning of individualized products, mass customization manufacturers face the challenge of orientating and optimizing continuously their process cycles. Due to the necessity for reorganization of old well-known process cycles, the danger of error increases along the value chain at the same time. In the context of his graduation at the University of Hanover as well as his activity within a building element enterprise, the author conducted an empirical research on the mass-customization value chain exemplified by windows, marquees, winter gardens and fronts. Basing on 800 investigated contracts, error sources were designated concretely. Particularly, the four process steps consultation, configuration, production and distribution / assembly were examined. As central determinants of the study the product complexity / type of product and the individualizing degree were identified.

7.2   Mass Customization in the Footwear Industry

7.2.1   Strategies for Customized Footwear: State of the Art

Special Panel: Footwear Customization: State of the Art (MCPC-9xx-2007)

Presenter: * Dulio, Sergio (Chair) (Italy)

Abstract: This panel will introduce the state of the art of mass customization in the footwear industry. Feature presentations will be delivered by **Sergio Dulio**, **Claudia Kieserling** from Selve (customized ladies shoes), and further experts from the industry.

Customized but Blisters: Strategies in Providing the Best Fitting Shoe (MCPC-063-2007)

Presenter: * Rutschmann, Dirk (Germany)

Abstract: The great appeal in individualizing shoes for the customer is a product which reflects the design flavor and form necessity of its user. While this opens up a new playground for the customer, the supplier of this product and service bundle faces a bunch of different questions compared to the mass production approach: How many more design and shape variants of the product are needed to fulfill the expectations in style and fit, how should they look like, how can these variants be matched to the individual customer and how can they be permanently optimized? In both areas a lot of research and development work was done in the past. But while for the design aspects we now have nice and appropriate configurators, fancy design and visualization tools the improvements regarding the better fit

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expectation of customized shoes lags a lot behind. We will show the state of the art of the different aspects and strategies of these fitting approaches. Based on our experiences from different research projects and customer implementations will discuss these approaches and present some further developments in improved fitting strategies and less need for shape variants of mass customized shoes.

7.2.2 Case Studies and Technologies for Mass Customization in the Footwear Industry

Soft Customization within the Shoe Industry - The Case of the WEXLA-Shoe (MCPC-100-2007)

Presenter: Walcher, Dominik (Austria)

Abstract: So far nearly all mass customization offers in the shoe industry are based on hard customization. Famous online-configuration examples like NikeID and Puma's Mongolian Shoe BBQ as well as offline-configuration examples like miAdidas or Selve allow customers to co-design their shoes within a customer-interaction-process. The production of the shoes however is done solely by the company normally with the help of modularization systems quite often thousands of miles away from the customer. In contrast to these hard customization examples there are only some soft customization examples within the shoe branch, where the customers are enabled to self customize their products. In this paper the status of an ongoing project, which is executed by Austrian shoe manufacturer IQ-Shoe and the Salzburg University of Applied Sciences, is presented. Main issue of this project is the development of a marketing concept as well as the execution of customer integration activities for a new shoe system, which is based on soft customization.

Customization of Consumer Goods: First Steps to a Fully Customizable Fashionable Ladies' Shoe (MCPC-165-2007)

Presenter: van der Zande, Marc (Netherlands)

Abstract: The production of fashionable footwear has basically been the same for almost a century. It consists of combining elements of various materials together around a physical shape – the last – and thereby making a product around the foot – the shoe. This process requires different stages in production, transport of semi-finished products, intermediate components etc. In the project "CEC-made-shoe*" one of the tasks has been defined as to develop a product concept based on radically transforming this process, avoiding transport, complex logistics, long lead times, components like lasts, stiffeners etc. and with the possibility to personalize the shoe. This task is fulfilled in a research project in which the production of footwear is approached from the Rapid Manufacturing (RM) point of view. Such a new approach to footwear requires a lot of back-ground knowledge of footwear requirements, production process, material properties and design opportunities.

Custom Kicks: Using Metaphor Elicitation to Understand Consumers' Thoughts and Feelings Regarding Online Shoe Customization (MCPC-091-2007)

Presenter: Giebelhausen, Michael (United States)

Abstract: This paper presents preliminary results from an ongoing study involving in-depth interviews designed to uncover consumers' thoughts and feelings regarding online shoe customization. The interview process used in this study is inspired by the steps outlined in the Zaltman Metaphor Elicitation Technique (ZMET). This technique requires that participants collect a series of images representing their core thoughts and feelings about their experiences purchasing customized shoes online. During the interview, a variety of strategies are used to delve into the meaning behind the metaphors created by the participants' image choices. Analysis of interview transcripts indicates four key themes in the shoe customization process: "extensive customization," "uniqueness," "status," and "self expression." In summary, participants indicated a desire for extensive customizability that would enable them to create unique, one-of-a-kind shoes. This uniqueness allowed them to achieve two inter-related yet distinct goals of expressing their inner creativity and achieving a feeling of status. These findings highlight the need to reconsider a common assumption in the fashion industry: that utilitarian issues, such as garment fit, are driving consumers' increasing interest in customization.

Manufacturing Upon Knowledge. A New Approach to Engineering Wearable Products (MCPC-172-2007)

Presenter: Cremaschi, Armido (Italy)

Abstract: The available instruments for the measure of body parts are either very expensive and difficult to use or not suitable for measuring moving parts. The paper describes the goal achieved by the researcher's team developing a full range of instrument for the measurement of body parts, with the aim of determining possible shape and/or function

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differences. The results are available to the medical sector, but may also be utilized by companies that are interested in manufacturing better fitting garments for their customers. Furthermore the items specifically made for a single person may be engineered and manufactured in an easy and consistent process. Our approach will bring to the market a family of cheap, reliable instruments to measure body parts of individuals, in order to be able to characterize them following a clustering model that is a emerging from the first measure campaign. The typical part of each cluster will have its one mode of deformation under load, which will be determined by a structural analysis. The first results are encouraging and we are in the process of confirming that all the parts belonging to the same cluster show a similar behavior, which is of course major advantages in mass customization.

7.3   Mass Customization in Fashion & Textile Industries

7.3.1   Mass Customization of Apparel: Strategies & Technologies

u-Fashion : Creating New Business Model for MCP in Fashion Industry (MCPC-011-2007)

Presenter:* Chung, Jae Hyun (South Korea)

Abstract: U-Fashion is a new solution of mass customization and personalization infra structure in the fashion industry developed by SK C&C; a leading IT company in South Korea. It provides services with an advanced IT technology implemented with 3D motion graphics and the body scanning technology where it can digest customer's needs. The system gives customers chances to create self-like avatar with 3D body scanner. After building an avatar that has exact body shape, it allows customers to pre-fit and pre-coordinate with any colors and styles of their favorite garments virtually. The avatar and the virtual garments shall be also accessible in mobile applications and current online and offline shopping environments. U-fashion is to connect customer's exact pursuit with their purchase by providing chances to pre-try on the exact body scale for the most satisfaction with its ubiquitous environment. It will provide merchandisers with the most accurate statistical analysis. This is beneficial to the merchandiser's to figure out the individuals' trends and styles to meet customer's needs.

Developing Considerate Design: Meeting individual fashion and clothing needs within a framework of sustainability (MCPC-088-2007)

Presenter:* Delamore, Philip (United Kingdom)

Abstract: This paper addresses The Fashion Paradox – the economic importance of the fashion industry set against its inherent obsolescence and waste through constant change. A new methodology is being developed for designers to approach these complex problems, and to evaluate the impact of design decisions through the development of personalized fashion products. A new 'Considerate Design' process model is being created through analysis of practical design processes by transferring tools and methods from engineering design within a framework of sustainability. This project responds to the rapidly changing context of fashion and positions the user at the centre of the design process. It will produce personalized fashion products using 3D body scanning and rapid prototyping techniques integrated with different production processes: the direct 3D manufacturing of seam free knitwear; the making of bespoke hand-crafted bags, and the direct digital creation of body conformable seamless textile structures. The sub-projects each represent different levels of the industry, to test economic viability of products which are individually tailored to requirements, contributing to the development of mass customization. Considerate Design will reduce environmental impact of fashion products and consider both the end user and the entire product life cycle.

Towards Mass-Customizable Next-to-Skin Apparel (MCPC-126-2007)

Presenter:* Kinnicutt, Patrick (United States)

Abstract: In the sports apparel industry, a trend towards developing and marketing next-to-skin (NTS) apparel for the professional and amateur athlete exists. Many of these NTS garments are designed with heterogeneous fabrics in an effort to increase the user's comfort by providing better moisture and thermal management. In sporting apparel stores, NTS garments of varying sizes can be found to fit a consumer; however, these apparel items assume that the heat and moisture dissipation of the average consumers are all spatially identical. Studies have shown that, in fact, this is not the case; humans emit heat and moisture differently from one another, based on physiological factors other than size alone. This paper focuses on currently active research exploring spatial models of heat dissipation among a sample of over 300 human subjects. In this study, a 3D thermal database of the human torso is being created of subjects, males and females aged 16 and up, with varying lifestyles and somatotypes, in an effort to determine if several categories of thermal profiles can be defined. This could lead to cost-efficient mass-customization of NTS apparel that optimizes thermal and moisture management based on the consumer's thermal category.

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7.3.2 Mass Customization of Apparel: Case Studies

Mass Customization of Custom Designed Embroidered Fabrics - The Case of Hatti Design Inc.
(MCPC-062-2007)

*Presenter:** Srinath, Rajiv (United States)

Abstract: This case study describes how Hatti Design Inc., a manufacturer of custom designed embroidered fabrics, has applied the principles of mass customization and personalization to derive competitive advantage in the area of highly complex, custom engineered, embroidered textiles products. The Presentation will be made by MNI Partners Inc., a company specialized in breakthrough improvement and promoters of number breakthrough ventures including Hatti Design Inc. The Presentation will highlight the mass customization vision, mass customization offerings, the kind of challenges placed in the implementation of mass customization, and how these challenges have been overcome with the help of knowledge based strategies. The key result to be shared is the company's ability to accept and economically execute orders as short as 50 yards without any premium, and the entire sales cycle for a customer in USA, including collection of specifications, samples preparation, samples approval, orders, and production in India to delivery of products in USA is accomplished within a timeframe of 4 to 6 weeks. This presentation by MNI Partners Inc. will share the excitement of Hatti's story of mass customization and several insights developed in this process.

A Case Study in Personalized Digitally Printed Jeans (MCPC-157-2007)

*Presenter:** Delamore, Philip (United Kingdom)

Abstract: This project focuses on the digitization of the product development process incorporating 3D body scanning, automatic pattern generation, visualization, digital printing and embroidery. The aim of the project was to introduce custom print and embroidery to the existing Bodymetrics Digital Couture offer in a London retail store. This is the first in-process report of an ongoing digital fashion product development research programme. There were several stages employed to realize this research project. One male and one female model were scanned and automatic 2D pattern generation and uploaded to a CAD system in preparation for the engineering of the two selected print designs. The designs were evaluated on a 3D dynamic visualization system before the color profile of which was reviewed on a color management system prior to being tested on a Mimaki TX2 and lay plans produced for final printing. On completion, prints were steamed and washed, and the fabric of the women's jeans was embroidered. The garments were cut and assembled using traditional methods. The project was successfully realized using a range of digital tools, which facilitated each individual stage, but failed to provide a continuous integrated workflow. The issues highlighted are currently being addressed through a continuing research program.

Quest for the Next Model of Apparel Business: A Japanese Case Study (MCPC-061-2007)

*Presenter:** Cho, Yasuyuki (Japan)

Abstract: There can be several ways to manage Risks. The history of the development of Business Models may in fact be a journey involving the management of various risks. For most consumer-related businesses, market uncertainties or demand fluctuations is one of the major challenges. In this paper I introduce some cases of Japanese apparel projects that are similar in working to pave the way for a new customer centric model for the twenty first century. The approach involves reducing risks by inviting the participation of end users (consumers) of our products when making final decisions on design and numbers. We have gained agility through the participation of voluntary and trusted consumers both online and offline in our overall business process. Context sharing may not happen in the business traditional model, but in co-creation it is common. I would like to give you some insights from our test case, using comparisons to other projects in Japan. I believe these insights may help the development of efficient future practices. I will introduce our test project, providing some background from various areas. They are Information Technology, Supply Chain Management, Customer Relationship Management and User Centric Design.

7.3.3 Making the Clothes Fit: Body Measurement, Scanning, and Virtual Models

Discard one size fits all labels! New Size and Body Shapes labels are coming! Way to achieve Mass Customization in the apparel industry (MCPC-075-2007)

*Presenter:** Carrier, Serge (Canada)

Abstract: This paper focuses on choice, complexity and simplicity, and attempts to answer questions such as: What is the meaning of customization in the apparel industry?. Is individual size and fit customization too much?, How can size

labeling be put to use?, Do people want more choice regarding size labels?, How can a new size labeling system better support order givers, manufacturers, retailers and consumers? It also discusses the application and configuration system and rules sets, i.e.: How to substitute the one size fits all label without going into a pure customization (i.e. cut and sew to fit one individual) by building an integrated sales system with tools such as the new size labeling system for efficient mass-customization in the apparel industry.

Mass Customized Target Market Sizing: Extending the Sizing Paradigm for Improved Apparel Fit
(MCPC-079-2007)

*Presenter:** Ashdown, Susan (United States)

Abstract: We present an extended paradigm for sizing and fit, mass customized target market sizing; that is, sizing systems based on and derived from measurement data exclusively from the people who represent an apparel firm's target market. Mass customized target market sizing is proposed as an alternative to proportional sizing systems used by the apparel industry for ready-to-wear. Advancing technologies, especially the body scanner, are the tools that make target market sizing possible through rapid, accurate measurement of populations and development of continuously updated measurement data bases that can be sorted by multiple demographic factors to provide the foundation for mass customized production. Our central argument is that companies that focus on a well defined target market, that create well designed clothing and sizing systems for this market, that accommodate the full range of body proportions of this market, and that communicate effectively with the market can succeed as a mass customized business. Target market sizing is examined for its potential to improve fit for both mass customized and ready-to-wear apparel based on the variables proposed within a sizing and fit conceptual framework. Implications of mass customized target market sizing and recommendations for industry, consumers, and educators are discussed.

Perception of Size Risk and Purchase Behavior by Apparel Item in Internet Shopping Malls According to Perception of Body Type (MCPC-036-2007)

*Presenter:** Lee, Hyun Hwa (South Korea)

Abstract: Dissatisfaction with sizes can be considered that it is caused by consumers' enormous interest in their body types. Research shows that female consumers are less likely to think that their body types are recognized as they are and their ideal body types are not consistent with their real body types. Through the recognition process of their body types, many consumers tend to buy clothes that are not fit to their bodies. In order to solve this problem, even though it is necessary to establish easy sizing systems, it is difficult to simplify a sizing system. Considering the rapidly expanding online shopping malls, huge interest in body types, and desire expression through apparel, perception of body type should be reflected on studies on perception of risk and purchase intention of sizes in case of online buys. In this study, how consumers recognize their body types are investigated the group is segmented by the recognition of their body types, and whether each group has a difference in the degree of perception of size risk for online shopping malls are investigated. We also analyzed whether perception of size risk has an impact on purchase intention and it causes difference between apparel items.

Development of Women's Upper Body Grading Rule and Distortion Rule for Uniform Easy-order system (MCPC-030-2007)

*Presenter:** Choi, Youn Lim (South Korea)

Abstract: There is a rapid increase of professional uniform sites recently. Since uniform is manufactured as mass production, individual body shapes cannot be reflected. Also, the body shapes should be classified in order to improve a cover rate. However, the Easy Order system can reflect consumers' size through its unique production system similar to individual customization. In particular, the Easy Order system should make clothes appropriate for each size although the tacking-up process of a customized cloth is omitted. Thus, an effective size positioning system is required to reflect consumers' various body shapes for high productivity. Therefore, the study suggests a size positioning system that can improve the appropriateness of clothing by covering various body shapes with main factors. Also, the study proposes a grading rule and a distortion rule as methods to change patterns by size sections. The grading rule is in general used for size diversification, while the grading rule of the study adopts a concept of a shape-transformation rule that applied to some patterns rather than the whole of a cloth in order to reflect specific body shapes.

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7.3.4 Design, Virtual Garments, and Virtual Models

Customized Garment Generation with Computer-Aided Design Technology (MCPC-152-2007)

Presenter: Tien, Jia-Xin (Taiwan)

Abstract: The authors present an application of computer-aided-design for customized garment generation. A structured mannequin is firstly constructed based on body scan of a subject. Various styles with modifiable surface are virtually created and dressed on the mannequin. Instead of traditional pattern design on planar CAD tool, we apply three-dimensional trimmed NURBS to provide an intuitive tool for garment generation by surface fitting method. In terms of trimmed NURBS, several reshape techniques are applied to the work on basic styling. Moreover, an innovative styling method is also proposed.

Realistic 3D Simulation of Garments (MCPC-160-2007)

Presenter: Gagalowicz, André (France)

Abstract: Our target is to produce realistic 3D simulations; garments that correspond exactly to the style that a future client will have chosen and the rendering of textile material. In our presentation, we will first focus on the mechanical properties of warp/weft materials and describe results on the characterization of such textile. We will then describe the overall technique used to produce a 3D mannequin wearing a specific garment constructed from a set of 2D patterns of the type of the 2D patterns employed to create the real garments. We will describe the mass/spring model used to model realistically the mechanical behavior of textile and how it is mapped on each 2D pattern. We will also discuss a technique allowing the automatic pre-positioning of the 2D patterns around the body and how these 2D patterns are sewed We will finally present the procedure used to animate the global mass/spring system in order to produce the garment evolution around the body. The results of the validation of our choice of non linear mass spring system will be shown. Videos showing various garment simulations on a numerical mannequin of a real person (obtained by a 3D scanner) will close the presentation.

Virtual Fit of Apparel on the Internet: Current Technology and Future Needs (MCPC-114-2007)

Presenter: Ashdown, Susan (United States)

Abstract: To make the online shopping experience easier and more fun for the consumer, some retailers are incorporating visualization technology such as that offered by My Virtual Model®. The user can input measurements and create a avatar to visualize clothing on a body similar to their own, and to find size selection information about specific clothing styles. To explore what the website has to offer, 21 female subjects aged 20-24 and within the size range 0-12, used the website to generate and test a size selection for a specific style of jeans from H&M. They were then scanned to create a 3-D image to compare to their website avatar. While many preferred the image My Virtual Model® provided, the subjects felt the website needed refining based on their specific body proportions. Most participants felt the garment in the suggested size had a problem in at least one area with regard to fit. This technology is significant to the industry because it can boost sales by increasing online orders, as well serving as a means of increasing consumer confidence in purchasing. If proven reliable and of interest to shoppers, My Virtual Model may positively influence customer behavior.

Automatic MTM Pattern-making of Diving Suits by Programming and Parameterizing Body Features with the Use of an Intelligent CAD Program (MCPC-014-2007)

Presenter: Jang, Sngok (South Korea)

Abstract: Facing the growth of the leisure industry, we implemented an automatic made-to-measure pattern-making process for diving suits, a part of the growing leisure industry. For this, we used Grafis, an intelligent CAD program. First, we programmed the patterns by script language and extracted some parameters of body features and design elements for a better fit and for customer's preference. Then, the extracted parameters were inputted into the program, constructing a variety of diving suit patterns reflecting different and complex consumers' body shapes and meeting consumer's wants. Our process could be a possible solution for mass customization in the apparel industry as well as the diving suit industry. But programming the pattern is so tedious and complex that it itself could possibly be an obstacle to putting this possible solution to practical use. The programming process needs to be shortened and simplified, and further studies should be made.

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7.4   Automotive Customization

7.4.1   Searching for a New Model of Mass Customization of Automobiles

Customization and Automotive Industry: In Search for New Modalities (MCPC-029-2007)

Presenter:* Pasek, Zbigniew (Canada)

Abstract: In today's economies, customer-driven markets experience high demand fluctuations, turbulence of which is often amplified by arrival of new products and new technologies. To stay competitive under these conditions automotive original equipment manufacturers (OEM) companies need smart technical solutions for product development and quick adjustment of production capacities and functionalities. For most of the past century automotive industry has followed a single paradigm – mass production – established by Henry Ford on the foundations of scientific management principles developed by Frederick Taylor. The mass production paradigm, even with productivity improvements cannot competitively sustain the auto industry. A glaring example is the American auto industry, where manufacturing processes have become super-efficient (e.g., low labor hours per vehicle), while other parts of value-creation are neglected. As a result, customers have been alienated by being forced to make compromised choices from a limited number of products which do not satisfy their specific needs. This paper argues for the importance of the customization approach for the future of auto industry. It reviews current mismatch/discontinuity in the automotive business model by pointing out the inefficiencies and inflexibilities of the current value chain.

eHomeostastis Methodology in the Automotive Industry: Integration of Emotion-Based Customer Feedback into Product Lifecycle Management (MCPC-047-2007)

Presenter:* Krahtov, Konstantin (Germany)

Abstract: The market's progressive dynamic and the thereby resulting and ever-changing conditions of success require that all of a company's performance potential is used for competitive strength. Against this background, particularly the treatment of increasing product individualization, together with a subjective and emotionally defined perception of the customer towards technical products, plays an important role. The basic purpose of this paper is the introduction of an innovative methodology, eHomeostastis. It allows a transformation of the traditional manufacturing-centered procedure for planning and design of products and services (product push strategies) to a novel paradigm where the focus lies on the intensive involvement of customers in the entire product lifecycle processes (consumer pull management). Due to continuous analysis of customer emotions that are captured by service personnel before and after each customer contact, information in the form of customer expectations and recommendations are extracted. Furthermore, support for the daily engineer's work is presented. This methodology is used in test cases for investing in customer feedback using real-world data derived from the automotive industry.

Automobile Interior Personalization – Trends and Analysis (MCPC-143-2007)

Presenter:* Barhak, Jacob (United States)

Abstract: How do you want the interior of your dream car will look like? Do you want it to be an extension of your personality and fit your needs? At the future, the interior of each passenger car will be different, although containing similar modules, at the same way that kitchen interiors look different from each other. Your personal car interior will be designed by you and made just for you, still at the affordable cost of mass produced cars. The rationale of this emerging personalized production paradigm is explained. The results of a survey about customer desires of their dream cars are presented.

7.4.2   Panel: Mass Customization in the Automotive Industry

Mass Customization in the Automotive Industry (MCPC-9xx-2007)

Chair:* MacCarthy, Bart (United Kingdom)

Abstract: The automotive sector is important in all economies – advanced, emerging and developing. In one sense Mass Customization (MC) has been the 'holy grail' for the sector – giving customers their precise desired vehicle specifications without comprising on waiting times or quality and without incurring significant additional producer costs. However, this has proved difficult, particularly in the volume markets where it is a distant goal (in the pure sense of MC at least). On the other hand, customer choice and levels of variety in vehicles continue to increase. As with other

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sectors, the variety explosion shows no sign of abating. Mass Customization raises fundamental issues for the automotive sector - on its definition and meaning, its desirability in the marketplace and its feasibility for real automotive operations. The customer base is very heterogeneous with additional differences in different market segments and geographical markets. Mass Customization has implications for the way vehicles are sold, the underlying business model and the customer interface. Customization may add to the 'burden of choice' for customers. In moving from forecast-driven 'stock push' to 'customer pull', many operational issues arise in the supply chain, in planning and control, in assembly and in order management and distribution. The environmental debate may be a positive factor in encouraging more user-specified vehicles. Panelists will present views on issues related to Mass Customization in the sector and the debate will then be open to attendees to the session.

7.5   Service Customization: The Next Big Issue in Mass Customization

7.5.1   Strategies for Service Customization

Unraveling the Service Innovation Dilemma: Network-Based Mechanisms for Enhancing Competitive Advantage (MCPC-154-2007)

Presenter: Chen, Manli (United States)

Abstract: Service innovation, unlike product innovation, is not easily scalable in the production process. In general, as firms attempt to grow, one potential direction for growth is through their ability in applying the same processes and resources used for a single unit of production to larger volumes, thus saving costs through economies of scale. Whereas product-oriented companies can easily achieve cost reduction through scientifically tested and validated operational processes for product innovation, the peculiar nature of service offerings do not permit such formal processes to be applied to expansion of service offerings. In this study, we investigate the "service innovation dilemma"— the problem of diseconomies of scale in a world of increasing demand for services. We adapt a network-based theoretical framework to examine how firms are able to achieve "economies of repetition" proposed by Davies and Brady, which is a reasonable proxy for economies of scale in the service innovation context. We derive several propositions, which suggest that firms can develop sustainable competitive advantage in services through "real" and "virtual" embedded inter-firm and customer co-creation (market) mechanisms. The study also postulates some useful implications for theory and practice in services and related sectoral innovations.

Tangiblize the Intangible – Service Mass Customization By Means of Personas (MCPC-086-2007)

Presenter: Haas, Michael (Germany)

Abstract: Whereas efficient and effective practical implementation of mass customization in goods industries is a well-researched topic, a deeper understanding of service mass customization is still missing. Particularly service specific implementation challenges arising from the integration of customers into service delivery and the intangibility of services have been hitherto unaddressed. These characteristics affect the requirements towards the configurator design as well as the appropriate education of service employees. Consequently, one key challenge for service mass customization is to translate information about consumer preferences gained through market research into a format that can be easily used for service modularization decisions and training of the customer contact personnel. As solution to this 'translation problem' we propose to use 'personas' as a tool for tangiblizing complex market research data into easy to grasp and vivid narrative descriptions of archetype customers that represent different customer segments. Such archetypes convey customization needs in a way that makes it easy for decision makers and employees to understand and to empathize with. Along with the concept we introduce a structured approach for developing and using personas in service mass customization projects and provide managerial implications as well as an outlook for further research.

The Life Event Cycle - A Conceptual Approach for Service Customization (MCPC-123-2007)

Presenter: Siems, Florian (Austria)

Abstract: In this paper it is argued that Service Stores most often offer standardized services, which may not hit the customers' demands. As a conceptual base to customize service offerings the life event cycle is introduced, which builds on traditional lifecycle concepts but refines them by a stronger individual perspective.

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7.5.2 Approaches and Tools for the Design of Service Customization

Mass Customization in Wireless Communication Services: Individual Service Bundles and Tariffs (MCPC-094-2007)

Presenter: Pau, Louis-Francois (Netherlands)

Abstract: This paper presents results on mass customization of wireless communications services and tariffs. It advocates for a user-centric view of wireless service configuration and pricing as opposed to present-day service catalog options. The focus is on design methodology and tools for such individual services and tariffs, using altogether information compression, negotiation algorithms, and risk portfolio analysis. We first analyze the user and supplier needs and aspirations. We then introduce the systematic design-oriented approach which can be applied. The implications of this approach for users and suppliers are discussed based on an end-user survey and on model-based calculations. It is shown that users can achieve desired service bundle cost reduction, while suppliers can improve significantly their risk-profit equilibrium points, reduce churn and simplify provisioning.

One Size Fits All, Made-to-Measure, and Bespoke Tailoring: Challenges in Building an Attractive Service Portfolio (MCPC-044-2007)

Presenter: Björkman, Hans (Sweden)

Abstract: Customer relationship management (CRM) can be described as aiming at creating shared interests as a means for building loyalty between organizations and their customers. An important issue is hence whether mass customization strengthens or weakens such relations. On one hand, the element of customer co-design in mass customization tends to strengthen the relations. On the other hand, mass customization builds upon a fixed or restricted design space and limited personal interaction and may thus result in weaker relations than individually customized services. Sif, a major white-collar trade union in Sweden, provides a broad and attractive service portfolio consisting of standardized, mass customized, and individually customized services. Each individual member creates an individual service portfolio through: (i) Personal choice of information, activities and services. (ii) Mass-customized/customized services. Linkages between standardized, mass customized, and individually customized services will be discussed and the issue of building relations with members/customers will also be treated. The presentation concludes with a description of the results of the chosen strategy and a discussion concerning the possibilities to generalize from the experiences gained.

Mass Customization's implication on After-Sales Services (MCPC-150-2007)

Presenter: Oddsson, Gudmundur (Denmark)

Abstract: In many years' service operations management literature has been focusing on advocating for customized service products for customers. The problem is that every customized product should be supported by a unique service operation. To increase the problem these services are often characterized by lack of structure and manual processes that run them. All this leads to lack of operational efficiency and lesser quality than can be achieved. Although mass customization techniques suggest solution for the trade off between customization and efficiency for the manufacturing industry, no widely known concept has been introduced when it comes to after sales services. As mass customization also generates customized products, the implications on after sale services like installation, training, routine maintenance, emergency repair, parts supply and software services are comparable to customized service products. This research points out that service operations management should consider a new approach to services. It is suggested to include embedded configuration systems in product design and to modularize the service product assortment. The article points out that the solution basically incorporates finding the relevant decision variables, operationalization of these same and their internal mapping. At the end of the article two case studies are supplied to support the argumentation.

7.5.3 Case Studies in Service Customization

Personalization of Services: EMOCIONA Study (MCPC-102-2007)

Presenter: Lahuerta, Rubén (Spain)

Abstract: The EMOCIONA initiative has demonstrated that the application of Emotional Design Techniques can serve to improve the design of surrounding settings used in the point of sale of habitat-related products, and to measure to

which extent a retail store's background has influence in the willingness to purchase a product. Around eighty people had participated of this experience through a pilot emotions measurement laboratory in which the emotional profile of the users was determined and its purchase attitude was registered, in order to extract concepts associated not only with the piece being evaluated, but also to establish the influence that different scenarios had in their perception of it. The results showed an increase of the purchase intention of a piece of furniture when it was settled in users favorite environment, and also the emotional component the "desired environment" concept responds to in terms of style, global preferences, et cetera. Furthermore, the results had permitted the corroboration of the possibilities that the utilization of Emotional Engineering techniques, as part of User Oriented Development methodologies, have in the area of personalization of a retail store environment; allowing its adaptation for a determined population and the effective communication of a brand image.

Extending Mass Customization from Products to Services (MCPC-023-2007)

*Presenter:** Astiazarán, Juan Carlos (Spain)

Abstract: The aim of this paper is to present and discuss how a company can extend the competitive advantage of mass customization, and more specifically from Product to Service. The Technological Centre Ikerlan undertook an applied research project in a cutting tool manufacturer, Zubiola, Nowadays, it serves customized tools as well as catalogue tools under the paradigm of Mass Customization. Zubiola shifted from a market demanding tangible product to a market looking for service, and now it combines successfully Mass Customization in Products and in Services. This paper describes the case study of Zubiola and conceptualizes the guidelines of its strategy in extending Mass Customization in the world of tangible products and from product to Services. Finally, the paper discusses how the achieved results can be extended to other business and companies.

Applying the Configuration Paradigm to Mass-Customize Contract Based Services (MCPC-134-2007)

*Presenter:** Tiihonen, Juha (Finland)

Abstract: Satisfying needs of individual customers by mass-customizing services has been proposed. Although configuration, i.e. specifying a product individual as a combination of predefined components, is an important way of achieving mass-customization to industrial goods producers, there is relatively little literature on the applicability of the configuration paradigm to services. In this paper we take a step towards understanding if services could be managed as configurable products, and discuss the applicability of configuration modeling and configurator technology for managing services. The ideas presented in this paper originate both from existing literature and from our co-operation with four companies that participated our 3-year research project on configurable services and IT support for service configuration. We show that at least in some contract-based service industries configurable services exist and are used for doing business, and we characterize the services and related processes. We provide empirical evidence that basic configuration modeling mechanisms and configurators can indeed support management of configurable services, and discuss special requirements of services on configuration modeling and configurators.

Mass Customization and Personalization in Business-to-Business Environment: Innovations in Integrated Marketing Management (MCPC-072-2007)

*Presenter:** Winiarz, Marek (United States)

Abstract: The field of global Marketing Management presents unique challenges for multi-brand global corporations. Mass Customization and Personalization (MCP) allows solutions that meet two seemingly conflicting requirements: to be locally relevant and to deliver comparable outputs across geographies and categories. Local marketing is category and market dependent, subject to environmental factors, specific competitive activities and local regulations. This paper shows that MCP can be successfully applied in a Business-to-Business (B2B) environment to meet the requirements of local conditions and of global accountability using "common currency" indicators. The paper discusses the importance of systems thinking in designing and implementing an MCP application. It shows how personalization is applied in a B2B environment using the example of MCA for Business™ - a marketing management software solution. We show the customized components and techniques: adaptation to Clients' processes and embedded software "Wizards". We also describe the processes-in-common that deliver marketing accountability, including an example contrasting two competitors' results. The paper concludes with the discussion of advantages of the MCP approach, comments on the Product-Service duality of MCP, and the mechanisms of Innovation, Adoption, and Diffusion.

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8 Pre-Conference Workshops

> **The fee to join one of the workshops is US$ 100, lunch and conference materials included. Pre-registration is required**. Please use the conference registration system to reserve your seat in one of the workshops. *In case you already have registered for the conference*, *you can change your registration also in the online system and add a workshop to your conference package.*

8.1 Pre-Workshop I: An Introduction into Mass Customization Strategies and Implementation

Facilitators: **Frank Piller**, RWTH Aachen; **Rajan Suri**, University of Wisconsin-Madison, and **Mitchell Tseng**, HKUST

Several companies, such as Dell, Adidas, BMW, Nike, Volvo Trucks, etc. are already successfully operating after this new business model. However, a number of well-financed mass customization operations failed (e.g. by Levi Strauss, Procter&Gamble), reminding us of the challenges of mass customization. Using several case studies, this workshop will discuss the success factors of implementing mass customization. The idea is to give conference participants with little mass customization experience a compact introduction into the field.

9:15-9:30: Overiew and introduction

9:30-10:30 **Mass Customization Seen From the Customers' Perspective** (Frank Piller)

This part of the workshop will share some of the main factors of setting up successful mass customization systems and will discuss recent trends in from the perspective of the customer.

Frank Piller is a chair professor in innovation management at RWTH Aachen University, Germany. He also is a co-director of the MIT Smart Customization Group at the Massachusetts Institute of Technology, USA. His research focuses on value co-creation between businesses and customers/users. Frequently quoted in The New York Times, The Economist, and Business Week, amongst others, Frank is regarded as one of the world's leading experts on mass customization, personalization, and open innovation. His blog, mass-customization.blogs.com, is the premier source of information on mass customization and customer driven value creation. As a founding partner of Think Consult, a management consultancy, he helps his clients to serve their customers better by using truly customer-centric strategies.

10:45-12:00 **Connecting Customers Preferences and Supply Chain to Support Mass Customization: Product Family and Configurators** (Mitchell Tseng)
Mass Customization aims at producing goods and services to best meet individual customer's need with near mass production efficiency. In order to accomplish this, product offerings need to be structured logically so that customers' preferences not only can be captured effectively but also be fulfilled with supply chain within the customer's expected lead time and with scale of economy. In this presentation, the speaker will discuss approaches to design product family and its structure, or Product Family Architecture (PFA), so that product offerings can be presented intuitively to avoid customers' confusion. Simultaneously, product family also serves as launching pad for fulfillment to synchronize with suppliers and factory. Discussion will also be included to incorporate contemporary

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techniques of customer co-design and supply chain management chain management to meet the seemingly contradicting goal of mass customization.

Prof **Mitchell Tseng** joined the ong Kong University of Science and Technology in 1993 as the founding department head of Industrial Engineering and Engineering Management after working in industry for almost two decades. He started his career in industry as a Manufacturing Engineer and progressed through several management and executive positions. He is an elected fellow of the International Academy of Production Engineers (CIRP) and published more than one hundred technical papers and two books, Customer Centric Enterprise (with Frank Piller, Springer, 2003), Transformation through Global Value Chain (with Behnam Tabrizi, Stanford University Press, 2007). He was a faculty member in University of Illinois – Champaign Urbana and Massachusetts Institute of Technology. Professor Tseng's interest in Mass Customization started when he managed the computer configuration program for Digital Equipment Corporation in mid 80's. He is widely recognized for his work in Mass Customization and has been serving as co-chair of the MCPC conferences. Sponsors of his research include AT & T, Astec-Emerson, Esquel, Honeywell, HK Research Grant Council, Lucent Technologies, Natural Science Research Foundation (China), Rockwell International, Liz Clairborn, Motorola, Nokia, GAP, Ford Motor, Yusan Products, Hong Kong Air Cargo Container Limited, and Sterling Products.

12:45-3:15: **QRM and POLCA: Manufacturing and Material Control Strategies to Support Mass Customization** (Rajan Suri)

A critical factor for success of Mass Customization (MC) strategy is responsiveness, specifically, the ability to customize a product but at the same time deliver it to the customer with an acceptable lead time. This ability depends on the manufacturing and material control strategies adopted by the enterprise. Although the Pull (Kanban) strategy associated with Lean Manufacturing can be powerful in certain situations, for companies making customized products, Lean and Kanban have several drawbacks. Quick Response Manufacturing (QRM) can be a more effective competitive strategy for companies adopting MC. We provide an overview of QRM strategy which focuses on lead time reduction throughout the enterprise. We explain why Lean strategies of Flow, Takt time and Pull don't work well for customized products because of the variabilities introduced into the system. On the other hand, QRM restructures the enterprise, in order to effectively cope with such variabilities, and thus QRM is more applicable for MC. We describe POLCA, a material control system to be used as part of QRM. We show why a Kanban system cannot be applied for customized products. Instead, POLCA allows for customized routings, individual product variations, and load variability, and thus provides an effective method to support MC. The combination of QRM and POLCA provides companies with competitive advantage through their ability to deliver customized products with short lead times.

Rajan Suri is Professor of Industrial Engineering at the University of Wisconsin-Madison. He received his Bachelors degree from Cambridge University (England) and his M.S. and Ph.D. from Harvard University. He is internationally regarded as an expert on the analysis of manufacturing systems, and is author of the book Quick Response Manufacturing: A Companywide Approach to Reducing Lead Times (Productivity Press). Dr. Suri serves as Director of the Center for Quick Response Manufacturing (QRM), a consortium of over 50 companies working with the University on understanding and implementing QRM strategies. Dr. Suri has consulted for leading firms including Alcoa, Danfoss, Hitachi, IBM, John Deere, Pratt & Whitney, Rockwell Automation, Siemens and TREK Bicycle. In 2006 Dr. Suri received the Albert M. Sargent Progress Award the Society of Manufacturing Engineers (SME), for the creation and implementation of the Quick Response Manufacturing philosophy.

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8.2 Pre-Workshop II: Mass Customization Design: An Interactive Workshop at the MIT Media and MIT Design Labs

Facilitators: **William Mitchell, Ryan Chin** and the **MIT Smart Cities Group**

9:30 – 3:00   Your chance to become part of the MIT Design Lab for a day. Interact with Media Lab members and the MIT Design Lab team to co-create innovative solutions and latest designs for mass customization and personalization applications. You will work on an actual project and learn about MCP design and prototyping during the day. An highly interactive experience in a creative environment.

William J. Mitchell, Professor of Architecture and Media Arts and Sciences at MIT, holds the Alexander W. Dreyfoos, Jr. (1954) Professorship and directs the Media Lab's Smart Cities research group. He was formerly Dean of the School of Architecture and Planning and Head of the Program in Media Arts and Sciences, both at MIT. He teaches courses and conducts research in design theory, computer applications in architecture and urban design, and imaging and image synthesis. A Fellow of the Royal Australian Institute of Architects, Mitchell taught previously at Harvard's Graduate School of Design and at UCLA. His most recent book, Placing Words: Symbols, Space, and the City was published by MIT Press. His earlier books include: ME++: The Cyborg Self and the Networked City; E-Topia: Urban Life, Jim—But Not As We Know It; the edited volume High Technology and Low-Income Communities (with Donald A. Schon and Bish Sanyal); City of Bits: Space, Place, and the Infobahn; Digital Design Media (with Malcolm McCullough, two editions); The Reconfigured Eye: Visual Truth in the Post-Photographic Era; and The Logic of Architecture: Design, Computation, and Cognition.

Ryan Chin is a fourth-year PhD student at the MIT Media laboratory in the Smart Cities research group. He is building the car of the future – a stackable, sharable, electric, two-passenger city vehicle that rethinks urban mobility. This work, in collaboration with General Motors, takes into account problems of parking, congestion, energy efficiency, pollution, communication, and considers the best and most efficient uses of available resources in urban environments. The project also serves as a platform for investigating mass-customization, personalization in product-development processes, and MIT Media Lab technological innovation. In 2007 Chin along with Professors William J. Mitchell, Frank T. Piller, and Marvin Minsky help found the Smart Customization group at the MIT Design Lab. This MIT-Industry collaboration focuses on improving the ability of companies to efficiently customize products and services. Chin at MIT earned a master of science in media arts and sciences and a master of architecture; and bachelor's degrees in civil engineering and architecture from the Catholic University of America.

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9 MCP Business Seminar at HEC Montreal (Oct 11, 2007)

The focus of the **business seminar of the MCPC 2007** is the **application of mass customization and personalization in retail, enabling a total redefinition of the way goods and services are sold and customers and vendors interact**. Social commerce, profiling services or virtual reality applications are changing the way we shop and make selections. These technologies also lower the barrier for new entrants in mature markets. In addition, shopping and entertainment are converging. These developments ask for a revision of today's dominant retail model – an extreme makeover of retail.

Personalized advertising is transforming marketing, advertising and the media business. Virtual identity, product placement in games and movies, televisions and ads, social shopping and communities are driving and transforming forces in the market. How will merchants, brands and retailers address this new wave of interaction? The business seminar features the new breed of entrepreneurs: investors, advertisers and researchers in e-commerce, gaming industry leaders, TV and movie special effect providers, fashion managers, and new media innovators.

MCPC Business Seminar Keynote Presentations (HEC Montreal, Oct 11, 2007)

Don Tapscott, Chief Executive of New Paradigm, and Adjunct Professor of Management at the University of Toronto

Don is an internationally renowned authority on the strategic value and impact of information technology. He has authored or co-authored eleven widely read books on technology and business, including his most recent **Wikinomics: How Mass Collaboration Changes Everything,** which will form the basis of his presentation. He is also the author of The Naked Corporation, Digital Capital and Growing Up Digital.

Mike Gray, Supply Chain Evangelist – Dell, Inc.

With Dell for over 15 years, Mike is considered an expert on Dell's unique approach to supply chain management. He has been a lead architect for many of the business processes that allow Dell to achieve its unprecedented levels of inventory while maintaining industry-leading customer service. Mike Gray is a lifetime Certified Purchasing Manager (C.P.M.) with the Institute for Supply Management (ISM) and is also certified in Integrated Resource Management (CIRM) by APICS, the Association for Operations Management.

Go here for the full program and speakers of the Montreal MCPC 2007 Business Seminar: http://www.mvm.com/MCPC/indexEN.htm

NOTE: Montreal is an easy 4-5 hour drive away from Boston; and the trip though the New England Indian Summer should be a great experience at this time. There are also plenty of flights or bus connections between Boston and Montreal. Please make your own travel arrangements, there is no central group travel organized by the conference.

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10 MCPC 2007 Program Committee and Area Coordinators

MIT Research Conference

Conference Chair:
William J. Mitchell, MIT Media Lab, Massachusetts Institute of Technology

Conference Program Co-Chairs:
Frank Piller, RWTH Aachen University & MIT Smart Customization Group
Mitchell Tseng, Advanced Manufacturing Institute, Hong Kong University of Science & Technology

Conference Coordinators:
Ryan Chin, MIT Media Lab, Massachusetts Institute of Technology
Betty Lou McClanahan, MIT Media Lab, Massachusetts Institute of Technology

HEC Montreal Business Seminar

Conference Co-Chairs:
Louise Guay, My Virtual Model, Inc.
Jacques Nantel, HEC (Haute Études Commerciales) Business School, Montreal (Canada)

Honorary MCPC 2007 Chair:
B. Joseph Pine II, Strategic Horizons

MCPC 2007 Subject Areas & Program Committee

*The **program committee** advises the conference chairs on the conference matters and provides input for the conference planning and paper submission process. Each **subject area** has one **coordinator (underlined)**.*

1 Management

1.1   MCP Business Models: Rebecca Duray, University of Colorado; Klaus Moser, The Boston Consulting Group; Ralf Reichwald, TUM Business School

1.2   Marketing & Consumer Behavior in MCP: Nikolas Beutin, Prof. Homburg GmbH & Co. KG; Frédéric F. Brunel, Boston University; Benedict G.C. Dellaert, Erasmus School of Management; Christoph Ihl, TUM Business School; Arvind Rangaswamy, Penn State University; Martin Schreier, Wirtschaftsuniversität Wien

1.3   User Innovation & Personal Manufacturing: Karim R. Lakhani, Harvard Business School; Christopher Lettl, Aarhus School of Business; Ian McCarthy, Simon Fraser University; Eric von Hippel, MIT Sloan School of Management

1.4   MCP Effectiveness: John Bessant, Imperial College; Ashok Kumar, Grand Valley State University

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1.5 Change Management for MCP Tobias Fredberg, Chalmers University of Technology; <u>Linnea Peltonen</u>, University of Tampere

1.6 Modeling MCP (OR&MS): <u>Aydin Alptekinoglu</u>, University of Florida; Ali Parlakturk, University of North Carolina, Kenan-Flagler Business School; Paul H. Zipkin, Duke Univeristy, Fuqua School of Business

2 Engineering & Design

2.1 Product Design, Modularity, and Product Platforms for MCP: Olivier L. de Weck, Massachusetts Institute of Technology; Qi Guoning, Zhejiang University; <u>Timothy W. Simpson</u>, Penn State University

2.2 Industrial Design & Customization: Ryan Chin, MIT Media Lab; <u>Dominik Walcher</u>, University of Applied Sciences Salzburg

2.3 Comfort & Usability by and for MCP: Vincent Duffy, Purdue University, School of Industrial Engineering; <u>Martin Helander</u>, Nanyang Technological University; Halimahtun M. Khalid, Damai Sciences Sdn Bhd; Richard H.Y. So, Hong Kong University of Science and Technology

3 MCP Information Systems & Configuration

3.1 Configuration Systems & Toolkits for Co-Design: Thorsten Blecker, Hamburg University of Technology; Nikolaus Franke & Reinhard Prügl, Vienna University of Economics and BA; Louise Guay, My Virtual Model Inc.; <u>Lars Hvam</u>, Technical University of Denmark

3.2 IT Systems & Integration for MCP: Marko Mäkipää, University of Tampere; Peter Mertens, Friedrich Alexander Universität Erlangen-Nürnberg; Kathrin M. Moeslein, Friedrich Alexander Universität Erlangen-Nürnberg; Mikko Ruohonen, University of Tampere; <u>Detlef Schoder</u>, Universität zu Köln

4 Manufacturing & SCM

4.1 MCP Production Planning & Scheduling: <u>Roger Jianxin Jiao</u>, Nanyang Technological University; Roberto F. Lu, The Boeing Company; Kathryn E. Stecke, University of Texas at Dallas; Rajan Suri, University of Wisconsin-Madison; Amy J.C. Trappey, National Tsing Hua University

4.2 MC Manufacturing Systems <u>Fazleena Badurdeen</u>, University of Kentucky Center of Manufascturing; Claudio R. Boër, ICIMSI-SUPSI Institute of Computer Integrated Manufacturing of Southern Switzerland; Fumihiko Kimura, The University of Tokyo; Bart L MacCarthy, Nottingham University Business School

4.3 Supply Chain Management for MCP: Cipriano Forza, University of Padova; Johnny Rungtusanatham, University of Minnesota, School of Management; <u>Fabrizio Salvador</u>, Instituto de Empresa; Jayashankar M. Swaminathan, University of North Carolina, The Kenan-Flagler Business School

4.4 Rapid Manufacturing (Digital Manufacturing): Phill Dickens, Loughborough University, Wolfson School of Mechanical and Manufacturing Engineering; <u>Richard Hague</u>, Loughborough University; Christopher Tuck, Loughbourough University

5 Special Areas & Case Studies

5.1 Architecture & Construction Industries: Martin Bechthold, Harvard Graduate School of Design; <u>Kent Larson</u>, MIT Media Lab; Jarmo I. Suominen, University of Art and Design; Mikkel A. Thomassen, Foundation Realdania

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5.2 Apparel & Footwear: <u>Sergio Dulio</u>, Dulio Consutants; Suzanne Loker, Cornell University, Department of Textiles and Apparel (TXA); Nadia Magnenat-Thalmann, University of Geneva, MIRALab; <u>Chang Kyu Park</u>, Konkuk University, Department of Textile Engineering

5.3 Automotive Customization: <u>Betty Lou McClanahan</u>, MIT Media Laboratory

5.4 Customization of Services: <u>Gregory R. Heim</u>, Boston College, Carroll School of Management; Melanie Mueller, TUM Business School

5.5 MCP in Food, Health, and Pharmaceuticals: <u>Jose C. Lacal</u>, Motorola, Inc., iDEN Mobile Devices Group; Frank T. Piller, RWTH Aachen University

5.6 Sustainability and MCP: Martin Charter, The Centre for Sustainable Design; Klaus Fichter, Universitaet Oldenburg; <u>Arnold Tukker</u>, TNO-STB

5.7 Extreme Customization: Marvin Minsky, MIT Computer Science and Artificial Intelligence Laboratory; <u>William J. Mitchell</u>, MIT Media Laboratory; Frank Piller, RWTH Aachen University

5.8 MCP Teaching Case Studies: Jean-François Ouellet, HEC Montréal, Dept. of Marketing; <u>Sylvain Sénécal</u>, HEC Montréal, Dept. of Marketing

6 Practitioner Track: MCP Cases & Experiences

D. Helferich, Masterfoods USA; Lin Mingwei, Industrial Technology Research Institute; B. Joseph Pine II, Strategic Horizons LLP; Patricia B. Seybold, The Patricia Seybold Group; <u>Mitchell Tseng</u>, Hong Kong University of Science and Technology

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