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Education

Since 09/2009

RWTH Aachen University, Aachen, Germany
Ph.D. in Innovation Management

- Research Interests: Strategic Management / Mass Customization / Solution Space Development / Sustainable Development / Business Model Innovation
- Stipendiary at the DFG Graduate Researcher Program on Ramp-Up Management
- Thesis Title: Strategic Capabilities for the Realization of Mass Customization Business Models (Working Title)

10/2003 – 08/2009

RWTH Aachen University, Aachen, Germany
Diploma degree in Business Administration & Mechanical Engineering

- Major Fields of Study: Automotive Engineering / Technology and Innovation Management
- Diploma Thesis: User Acceptance of Embedded Toolkits in Passenger Cars (1,0)
- Final Grade: very good (1,5)

09/2006 – 08/2007

Portland State University, Portland, OR, USA
Master of Science degree in Engineering Management

- Capstone Project: Intangible Design Factors in New Product Development
- Final Grade: GPA 4.0 (A)

08/1993 – 06/2002

Werner-von-Siemens Gymnasium, Gronau (Westf.)
Abitur

- Final Grade: 1,0

08/1999 – 01/2000

Mitchell Christian Highschool, Mitchell, SD, USA

Working Experience

Since 09/2009

Technology and Innovation Management Group, RWTH Aachen University, Aachen, Germany
Research Associate

09/2008 – 08/2009	Technology and Innovation Management Group, RWTH Aachen University, Aachen, Germany Research Assistant
09/2008 – 11/2008	think consult Management Consulting, Munich, Germany Intern in Research Consulting
09/2007 – 08/2008	Technology and Innovation Management Group, RWTH Aachen University, Aachen, Germany Student Research Assistant and Tutor
08/2007 – 10/2007	Fahrzeugwerk Bernard Krone GmbH, Werlte, Germany Intern in Product Management
08/2005 – 10/2005	RWE-Westfalen-Weser-Ems, Dortmund, Germany Student Worker
03/2005 – 04/2005	RWE-Westfalen-Weser-Ems, Dortmund, Germany Student Worker
06/2003 – 07/2003	Salzgewinnungsgesellschaft Westfalen, Gronau (Westf.), Germany Student Worker
05/2003 – 06/2003	May-Lachnit GmbH & Co. KG, Heek-Nienborg, Germany Intern in Metal Construction
07/2002 – 04/2003	St. Marien-Krankenhaus, Ahaus, Germany Community Service
05/2002 – 06/2002	Salzgewinnungsgesellschaft Westfalen, Gronau (Westf.), Germany Student Worker

Scholarships

03/2008 – 08/2009	Stipendiary at Robert Bosch GmbH
08/2006 – 08/2009	Stipendiary at Friedrich Naumann Foundation for Freedom

Skills and Interests

Language Skills	German: native speaker English: fluent French: basic knowledge
Computing Skills	Applications: MS Excel, MS PowerPoint, MS Word Programming Languages: HTML, Java Statistical Software: SPSS, Amos, SmartPLS
Drivers Licenses	Categories A, B, BE, C, CE
Interests	Sports (Sailing, Soccer, Tennis, Jogging), Board Games, Geocaching



Aachen, November 25, 2013

Detailed Synopsis of Ph.D. thesis

Strategic Capabilities for the Realization of Mass Customization Business Models (Working Title)

The development of suitable product offerings for today's markets is strongly affected by the level of uncertainty within the particular product domain (Song and Montoya-Weiss, 2001; Calantone et al., 2003; MacCormack and Verganti, 2003; Bstieler, 2005). Uncertainty in the new product development process can result from two major sources: technological turbulences (Song and Montoya-Weiss, 2001) or market uncertainties (MacCormack and Verganti, 2003). In this context, market uncertainty oftentimes is the result of changing customer demands in regard to specific product requirements (MacCormack and Verganti, 2003). Furthermore, today's markets are characterized by an increasing heterogeneity in customer needs (Franke et al., 2009). In consequence, product offerings with a high number of product variants have become rather common for manufacturing companies. This trend can be observed in particular in industrial goods markets, as customers in such business-to-business (B2B) settings usually demand products that meet clearly defined specifications (Ellis, 2010, p.17). Such a "lock-in" on strictly defined product specifications typically results in low levels of customer flexibility and an increasing demand for product variety (Lancaster, 1990; Zhang and Tseng, 2009).

Being confronted with such business environments, manufacturers of industrial goods need to establish new business models that are capable of dealing with high levels of customer demand heterogeneity. For this purpose it appears to be necessary to offer broad product variety that meets the diverse needs of the target customers while developing technical capabilities to maintain near-mass production efficiency at the same time (Tseng and Jiao, 2001). In order to be able to exploit such a business environment, companies must not regard heterogeneous customer requirements as a threat, but should consider them as a potential business opportunity (Piller and Steiner, 2013). PILLER and TSENG (2010, p.7) term this approach "mass customization thinking". However, adapting a respective business model for high-variety production cannot be accomplished over night, but demands profound organizational change (Duray, 2002; Piller, 2004; Rungtusanatham and Salvador, 2008). Existing research suggests that companies have to develop certain strategic capabilities in order to be able to successfully implement such business strategies. For example, a broad body of literature highlights the need for flexible but also efficient manufacturing processes for the realization of large numbers of product variants (cf. Åhlström and Westbrook, 1999; Swaminathan, 2001; Tu et al., 2001; Tu et al., 2004). However, the discussion about strategic capabilities for high-variety product offerings is not limited exclusively to manufacturing issues, but also includes other aspects such as the necessary interaction between firms and their customers during the specification of the individual product (Huffman and Kahn, 1998; Wind and Rangaswamy, 2001; Broekhuizen and Alsem, 2002; Dellaert and Stremersch, 2005; Schreier, 2006). SALVADOR ET AL. (2009), for example, suggest three dimensions of strategic capabilities for the successful implementation of a mass customization business model, namely "solution space development", "robust process design" and "choice navigation". These capabilities are briefly introduced in the following:

As mass customization aims at serving a broad group of customers individually, mass customizing companies oftentimes have to offer a high number of product variants. However, offering limitless choice is economically unfeasible, thus companies have to make a choice, clearly defining what they are going to offer and which variants will be excluded from the available assortment (Salvador et al., 2009). In this context, solution space development describes the firm's capability to understand the individual needs of its customers and to target this heterogeneous market with a suitable selection of product offerings that can be manufactured without causing exuberant costs (Piller, 2004).

At the same time, the increase of product variants confronts the customers with a more complex purchase decision, as there are more available options. If the customers are exposed to too many choices, the cognitive cost of the purchase decision could outweigh the increased utility that results from having more choices (Huffman and Kahn, 1998; Piller, 2004). Therefore, the company needs to apply activities of choice navigation in order to support customers in identifying suitable solutions, while minimizing complexity and burden of choice (Salvador et al., 2009).

Whereas, the capabilities of choice navigation and solution space development are mostly concerned with communication and information processes that aim at identifying customer needs and guiding customers throughout the configuration and purchasing processes (Salvador et al., 2009), robust process design focuses on the stability of the manufacturing processes and the supply chain. Offering a

wide range of options might impact the robustness of the production processes negatively in several ways. In order to reach the level of manufacturing efficiency that is required for a mass customization business model, it is crucial to ensure that the increased number of product variants does not significantly impair the firm's operations and supply chain (Pine, 1993). Therefore, robust process design can manifest itself in several different methods that help to mitigate the above mentioned negative effects of a higher level of product customization by increasing the flexibility of manufacturing processes (Salvador et al., 2009).

In order to gain a more detailed understanding of these strategic capabilities for the realization of a mass customization business model, this dissertation project will analyze the respective approaches in a B2B context in the course of three separate scientific papers. These papers will be outlined in the following.

Paper 1: Defining the solution space for high-variety product environments in heterogeneous markets – an explorative study of the trade-off between initial and adaptive solution space development

Out of the three above-mentioned capabilities, the aspect of solution space development seems to be considered the least in existing management literature. This is rather surprising as the delineation of a suitable solution space appears to be a fundamental task for any manufacturer that is facing heterogeneous markets. PILLER (2004, p.316), for example, states that “[s]etting the solution space becomes one of the foremost competitive challenges of a mass customization company”. Nevertheless, this issue has not been discussed in detail; to the best of our knowledge there is no study available that exclusively explores mechanisms for the development of a solution space for high variety offerings.

For this reason, the first paper of the dissertation project will provide an exploratory research study in order to develop research questions and propositions to stimulate future research on solution space development. Thus, this paper aims at identifying managerial procedures that are currently used for solution space development in successful mass customization businesses by means of an in-depth single case study of a successful mass customizer in a business-to-business market. In this context, the study is supposed to show what kind of managerial routines or processes have been established in companies, which are experienced in implementing a mass customization approach. Furthermore, the paper tries to identify management techniques that companies apply within the different phases of solution space development. Based on this explorative study, managerial implications will be derived from the observations made during the course of the case study.

The approach of a single case study methodology has been chosen, because case study research is particularly suitable in situations, where specific, complex phenomena are not fully understood yet and where a detailed understanding of the issue at hand still has to be developed (Yin, 1994, p.3). Moreover, the case-study method is appropriate in situations “where respondents cannot verbalize the underlying causes of behavior reliably or where a phenomenon, because of its complexity or breadth, cannot be operationalized meaningfully in quantitative terms” (Bonoma, 1985, p.202).

Target Journal: IEEE Transactions on Engineering Management

Paper 2: Measuring firms' capabilities to manage high-variety production environments: Construction of a formative measurement index

Considering the availability of an ample amount of literature that discusses success factors or strategic capabilities for the implementation of a mass customization business model, the adoption rate of such business approaches is still surprisingly low (Piller, 2004). We assume that the reason for this development can be found in a lack of sufficient detail in the understanding of the necessary capabilities. Even though there is a broad body of literature available, it may remain unclear for managers how the different strategic capabilities are interrelated and how they complement each other. Furthermore, most studies lack a sufficient level of detail in the discussion of the capabilities and fail to provide necessary managerial implications for companies that would like to increase the variety of their product offerings.

In this context, the second research paper of the PhD-project aims at the development of a formative measurement index for the three mass customization capabilities, structured according to the strategic dimensions proposed by SALVADOR ET AL. (2009). This way, an index of various managerial activities that strengthen a company's ability to provide a high-variety product offering will be established. Thereby, several contributions to research on mass customization or high-variety production environments in

general can be made: 1) The paper extends and refines the definitions of strategic capabilities for mass customization business models. 2) Based on literature reviews and expert workshops the paper provides an extensive list of managerial activities that strengthen a company's ability to provide a high-variety product offering. 3) Finally, the paper develops a formative measurement index for mass customization based on the above-mentioned strategic capabilities. This formative measurement index could emerge as a valuable contribution to research on mass customization, as to the best of our knowledge, all existing measurement approaches are designed to be reflective. The formative approach that was chosen for this paper, however, does not only allow to measure the mass customization capabilities of a business, but also points out management activities that practitioners could apply in order to improve the high-variety product offering of their company at the same time.

The construction of the formative measurement index in this research endeavor follows the guidelines suggested by DIAMANTOPOULOS and WINKLHOFFER (2001). The formative approach was chosen over a reflective measurement scale, because the formative measurement models take a behavioral perspective of the research object, whereas a reflective approach rather uses a cultural perspective (Coltman et al., 2008).

Target Journal: Journal of Product Innovation Management

Paper 3: Solution Space Development for B2B product offerings in high-variety production environments

Following the results of paper 1 and paper 2 of the dissertation project paper 3 aims at validating the earlier research results concerning the capability of solution space development in a survey of a large-scale firm-sample of B2B-companies in Austria, Germany and Switzerland. The study should provide insights with regard to the following research questions: 1) Does the application of the individual solution space development activities positively affect the customers' perception of the quality of the existing product offering? 2) Does the implementation of such activities impact performance measures such as customer satisfaction or market share / market growth? 3) Is there a moderating influence of environmental factors such as market uncertainty or technological turbulence?

As a methodological approach for this research paper a quantitative online study was chosen. By means of an online questionnaire B2B-companies from Austria, Germany and Switzerland, which are confronted with high levels of product variety, will be contacted.

Target Journal: Production and Operations Management

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- Piller, F. T. and F. Steiner (2013). Mass Customization as an Enabler of Network Resilience. Intelligent Non-hierarchical Manufacturing Networks. R. Poler, L. M. Carneiro, T. Jasinski, M. Zolghadri and P. Pedrazzoli. Hoboken, John Wiley & Sons, Inc.: 3-22.
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Publications / Conference Papers

Peer-reviewed Journal Articles

Steiner, F. / Ihl, C. / Piller, F.T. / Tarman, R.T. (2011): Learning from the Customer: Identifying Changing User Needs during Product Usage through Embedded Toolkits for User Innovation, in: Engineering Management Journal, Volume 23, Issue 4.

Kleer, R. / Steiner, F. (2013): Mass Customization: Bridging Customer Integration and Sustainability?, in: Journal of Industrial Ecology (**under review**).

Steiner, F. / Hergenröther, I. (2013): Modular product architectures as an enabler of the simultaneous application of a mass customization strategy and efficient ramp-up management, in: International Journal of Product Development (**accepted for publication**).

Book Chapters

Piller, F.T. / Lindgens, E. / Steiner, F. (2013): Strategic Capabilities to Implement Mass Customization of Athletic Footwear: The Example of MiAdidas, in: Goonetilleke, R.S.: The Science of Footwear, CRC Press, Boca Raton.

Piller, F.T. / Steiner, F. (2012): Mass Customization as an Enabler of Network Resilience, in: Poler, R. / Carneiro, L.M. / Jasinski, T. / Zolghadri, M. / Pedrazzoli, F.P.: Intelligent Non-hierarchical Manufacturing Networks, Wiley-ISTE, Hoboken.

Steiner, F. (2011): Mass customization: recognizing the heterogeneity of customer needs as a business opportunity, in: Ipser, C.: Fabvolution: Developments in Digital Fabrication, Ajuntament de Barcelona. Institut de Cultura – Disseny Hub Barcelona, Barcelona.

Conference Papers

Steiner, F. (2011): Mass Customization and Sustainability – An Introduction, in: Proceedings of the World Conference on Mass Customization, Personalization, and Co-Creation 2011, 15.-19.11.2011, San Francisco.

Canetta, L. / Steiner, F. / Piller, F.T. / Boër, C. (2011): Fostering Mass Customization Adoption through a Suitable Specialized Open Innovation Platform, in: Proceedings of the World Conference on Mass Customization, Personalization, and Co-Creation 2011, 15.-19.11.2011, San Francisco.

Steiner, F. (2010): Mass Customization and Sustainability, in: Proceedings of the Research Workshop "Innovation & Value Creation" 2010, 25.-27.11.2010, Beilngries.

Piller, F.T. / Ihl, C. / Steiner, F. (2010): Embedded Toolkits for User Co-Design: A Technology Acceptance Study of Product Adaptability in the Usage Stage, in: Proceedings of the 43rd Hawaii International Conference on System Sciences 2010, 05.-08.11.2010, Kauai.

Steiner, F. (2010): Lösungsräume für variantenreiche Produktprogramme, in: 2. Aachener Innovationsplattform 2010, 22.01.2010, Aachen.

Steiner, F. (2009): Forschungsagenda zu Mass Customization, in: Proceedings of the Research Workshop "Innovation & Value Creation" 2009, 13.-14.11.2009, Hamburg.

Steiner, F. / Ihl, C. / Piller, F.T. (2009): Embedded Toolkits: A User Acceptance Study in the Automotive Sector, in: Proceedings of the World Conference on Mass Customization, Personalization, and Co-Creation 2009, 04.-08.10.2009, Helsinki.

Steiner, F. / Harmon, R. (2009): The Impact of Intangible Value on the Design and Marketing of New Products and Services: An Exploratory Approach, in: Proceedings of PICMET '09: Portland International Center for Management of Engineering and Technology 2009, 02.-06.08.2009, Portland.

Steiner, F. / Tarman, R.T. / Ihl, C. / Piller, F.T. (2009): Learning from the Customer: Identifying Changing User Needs during Product Usage through Embedded Open Toolkits for Open Innovation, in: Proceedings of PICMET '09: Portland International Center for Management of Engineering and Technology 2009, 02.-06.08.2009, Portland.

Steiner, F. (2009) User Acceptance of Embedded Toolkits in Passenger Cars, in: Proceedings of the User and Open Innovation Workshop 2009, 03.-05.06.2009, Hamburg.

Harmon, Robert R.; Steiner, Frank et al. (2007) Marketing Opportunity Analysis for Daimler Chrysler's Sprinter Van Plug-in Hybrid Electric Vehicle, in: Proceedings of PICMET '07: Portland International Center for Management of Engineering and Technology 2007, 05.-09.08.2007, Portland.

Teaching / Presentation Experience

Undergraduate & Graduate Teaching at RWTH Aachen

Since 09/2009

Co-Advisor for more than 30 bachelor / master / diploma theses

Winter terms
2011/2012,
2012/2013

Course "Strategic Technology & Innovation Management"

- Graduate level students of business administration and industrial engineering / engineering management.
- 5 ECTS credits
- Case Study courses and Tutorials

Winter terms
2009/2010,
2010/2011,
2011/2012

Course "Introduction to Business Administration"

- Undergraduate level students of business administration and industrial engineering / engineering management.
- 5 ECTS credits
- Lectures and Tutorials

Winter term
2010/2011

Course "Sustainable Innovation"

- Graduate level students of business administration and industrial engineering / engineering management.
- 4 ECTS credits
- Case Study courses

Winter term
2009/2010,

Course "Interactive Value Creation"

- Graduate level students of business administration and industrial engineering / engineering management.
- 5 ECTS credits
- Case Study courses and Tutorials

Executive Teaching

09/2013

Course "Strategies for Managing Long Tail Markets"

- Module for the Executive Master Program 2013 in Supply Chain Management at Vlerick Business School, Leuven, Belgium. 5 ECTS credits
- Executive Master Level
- Case-based Lecture

09/2012
and
09/2011

Course "Product Program Planning and Complexity Management"

- Program module for the Certificate Program in Complexity Management 2011 and 2012 at RWTH Aachen University.
- Executive Master Level
- Case-based Lecture

05/2011

Course "Open Innovation by 3D Collaboration"

- Lecture for a virtual executive training at Heilbronn University, Heilbronn, Germany.
- Executive Master Level
- Online Lecture via Second Life

Corporate Workshops

Preparation and execution of more than 15 customized executive workshops for companies (such as FORD, Lindt & Sprüngli GmbH or KARL OTTO BRAUN GmbH & Co. KG), research consortia (such as the NRW-Researchcluster "Patient Customized Engineering for Cardiovascular Therapy") or industrial working groups (such as the "Working Group Virtual Commercial Vehicle" of the Commercial Vehicle Cluster) on topics such as mass customization, business model innovation and customer -centric value creation.