Identification of potentials for the personalization of products

Manfred Dangelmaier[1,2,*], Lesley-Ann Mathis[1], Daniel Ziegler[2], Anette Weisbecker[1,2]

[1] University of Stuttgart, Institute of Human Factors and Technology Management (IAT), Nobelstr. 12, 70569 Stuttgart, Germany
{manfred.dangelmaier, lesley-ann.mathis, anette.weisbecker}@iat.uni-stuttgart.de
[2] Fraunhofer IAO, Fraunhofer Institute for Industrial Engineering IAO, Nobelstr. 12, 70569 Stuttgart, Germany
{manfred.dangelmaier, daniel.ziegler, anette.weisbecker}@iao.fraunhofer.de

Abstract. Individualization is considered a megatrend in postmodern societies. The markets react with the individualization of products. However, many approaches fail after considerable sums have already been invested. Therefore, this paper presents a benefit-oriented method to identify potentials for the personalization of products. It first accompanies the product through its life cycle (product journey) in order to identify various users and then these users on their user journey in order to observe the product experience. From these observations, a set of ideas for personalization is derived, which together with the associated benefits represent the personalization potential. The method has successfully been tested by individuals and teams in face-to-face workshops and online events using scenarios from the mobility, construction and service sectors. The learning effort is low. The personnel input per analysis amounts to approx. 150 hours. The method is to be further evaluated using concrete use cases in industrial practice.

Keywords: Mass Personalization · Product Development · Innovation Potentials · Product Journey · User Journey

1 Problem and Objective

Individualization is considered a stable megatrend and a determining factor for postmodern societies [1]. Markets are responding to this with the individualization of products. The classic approach to product personalization through mass customization focusses on the idea of differentiation as a market strategy [2]. Mass customization adapts the product to customer needs at the time of the purchase decision. Changes of users' needs during the product life cycle are typically not anticipated. In contrast, we use the term "mass personalization" to emphasize the further development of mass customization under the changed boundary conditions of today's product creation. It focuses on radical user-centricity and the benefits for all users over the entire life cycle of a product instance [3, 4] exploiting the cost advantages of mass production and automated end-to-end processes.

However, many personalized products do not meet the expectations placed in them and serve only a niche market or, in the worst case, fail after considerable sums have

already been invested in their development and production. Therefore, a method or tool for strategic product management is being sought that can be used to identify the potential for personalizing products with little effort.

2   State of the Art

Most existing methods for personalization in product creation follow a process-oriented sequential approach. Requirements are elicited first and in the second step, products are adapted accordingly (e. g. [5, 6]). However, the meaningfulness of the product adjustments from the user perspective as well as the cost-benefit ratio are not in the focus of these methods. They start rather late in the development process, are too time-consuming, and are tailored to conventional mass customization.

In innovation management, identifying the potential of new technologies in early phases plays a crucial role in meeting the needs of the market and users [7]. Foresight methods like the scenario technique are used to show development possibilities through extrapolation and to derive new fields of action by identifying influencing factors [8]. However, if the direction of the innovation is already determined - towards personalization in our case - this method is not suitable. In addition, those methods are targeted at technologies rather than users.

More recent approaches in innovation management, on the other hand, focus on interaction and customer centricity in the product development process. Examples include methods such as Design Thinking or Empathy Maps, which actively involve the user in the adaptation process and are thus intended to ensure the success of new developments [9]. Hence, recent approaches show a shift from analytical to participatory methods, with a focus on the user perspective.

This user perspective is mostly represented in the area of usability and customer experience engineering. For example, customer journeys are an established tool for modelling the customer experience. Their roots lie primarily in service engineering [10] but it is also widely used in marketing [11–13]. A customer journey deals with the touchpoints customers have with a company's offering over a period of time, while the considered time period can vary widely [14]. Customer journey maps can be used to analyze the surveyed or presumed current state of an existing offering as well as to shape the target state of a product or service to be adapted or created [14]. Typically, customers and users are assumed to be the same person and not changing over the time period under consideration. Hence, people who may encounter the service in roles other than as a customer are often not considered. The occasionally used term "user journey" is predominantly understood as a synonym [14], but might in practice indicate that other groups of users and their experience of use (user experience) are also considered.

Customer journey mapping can also be applied in an adapted form to industrial product-service systems [15]. The considered procurement decisions and processes in the business-to-business environment are characterized by the involvement of stakeholders with different roles. The authors therefore stress the necessity to identify all relevant participants prior to the actual mapping process [15]. However, the focus on the procurement process means that end users were not considered in the case studies described.

To sum up, there are relevant approaches and methodical components related to the defined problem, but no integrated method and no tool, which fulfil the needs for a user-centric and lifecycle-aware personalization.

3 Methodological Approach

The basic idea behind differentiation through mass customization [2] is the willingness of customers to pay for the benefits of personalization. Benefits are usually understood as a measure of products' ability to satisfy needs [16]. We follow this view and focus on finding personalization options for a product which satisfy needs of customers or users better than the current state without personalization. The notion of need is not limited to certain types of requirements and includes functional, economic, as well as procedural utility needs as well as emotional and social ones.

By potential we understand a set of development possibilities for a product. They are represented by the set of development options that better fulfil user needs and thus deliver added value. Therefore, personalization potentials consist of a set of personalization options together with needs, which can be fulfilled in addition for the customer or user.

In the user-centered lifecycle approach both users and their needs may change. Needs can be person-dependent, time-dependent and/or situation-dependent. Users may include "end users" of the product as well as production workers, maintenance personnel or recyclers. They can be natural persons such as John Doe or corporate bodies such as a company operating the product.

The fulfilment of needs happens through interaction between user and product at their touchpoints (Fig. 1). Interactions may also occur in pre- and post-usage stages like marketing experience, purchase process, and product disposal.
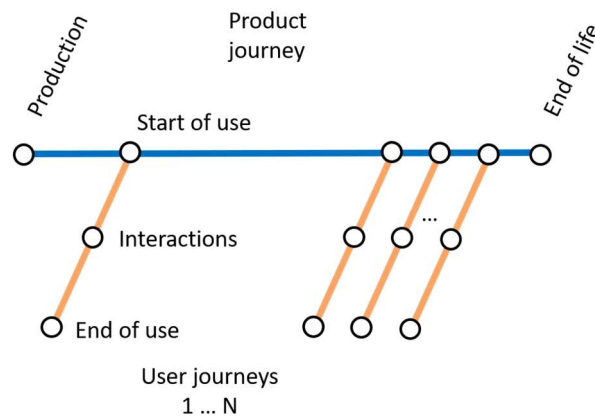

Fig. 1. Product and user journeys

According to this model, personalization options can be found when considering interactions between users and the product over the lifetime of a product. Ideally, all

possible users in all possible states and all possible interactions are considered in order to develop personalization ideas for them and evaluate them regarding their benefits.

In real life, we must limit our efforts and work with user samples and representative interactions to identity potentials. It is well known from user-centered product design [17] that in usability engineering working with small user samples is sufficient to identify optimization potentials. Observation (field studies), user surveys (interviews), or the use of prior knowledge of individuals or groups (workshops) are appropriate for the examination of interaction. The latter is particularly suitable for interdisciplinary groups in companies for orienting work on their product portfolios and product strategies. Costs, personnel capacity and implementation time are comparatively low for this case. The procedures to be applied will not require any special expertise and will be familiar at least to some of the players involved. Techniques from usability engineering and market research are particularly helpful here, since they start with the customers and their needs. We take up the principle of the customer or user journey mentioned above and apply it twofold (Fig. 1). First, we accompany a product on its way from the cradle to the grave in order to identify the users with whom it comes into contact.

We call this lifecycle consideration the product journey, borrowing from the notion of product journey mapping, which has been also applied in the context of sustainability studies [18]. We then follow users on their journey from initial contact with the product to the end of use, where we look at interactions with the product to find ideas for personalization. We call those user journeys, in agreement with the terminology used in marketing and usability or user experience engineering.

4   Method and Tool for the Analysis of Potentials

Based on this approach, a tool for the analysis of potentials using product and user journeys was developed for small and medium-sized teams. It can be used synchronously or asynchronously both in face-to-face workshops and in digital collaboration. An interdisciplinary team with people from e.g. marketing/sales, portfolio and product management and production as well as representative users is recommended for the implementation of the method in order to be able to cover all relevant aspects.

For identifying users in the product journey, we use the concept of personas, which describes users and their goals [19]. Since creating validated personas is very time-consuming, we chose proto-personas which are quickly to implement [20]. Proto-personas are created in brainstorming sessions [20] and in our case, are described in a minimalistic way by a combination of first and last name. The last name represents a character trait or activity of the user (e.g., Colin Commute). The first name is used for naming and to perceive the persona as a person. The proto-personas are plotted as users along the horizontal axis in a product journey schema (see Fig. 2). The lifecycle of the product is followed to identify relevant personas as far as possible.
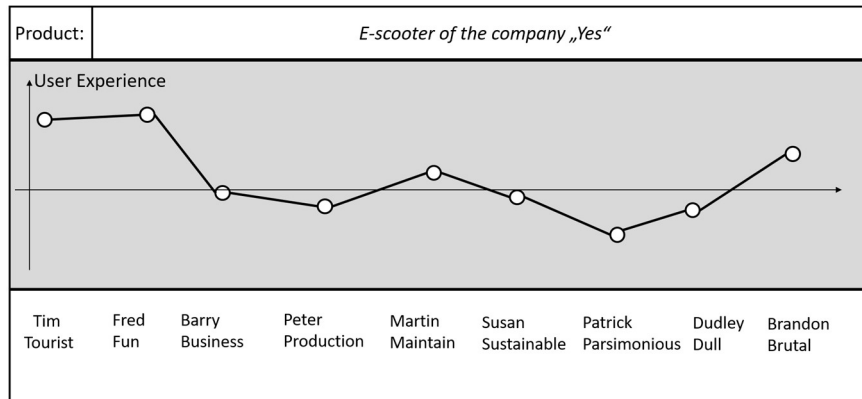
Fig. 2. Product journey schema with example for an e-scooter (translated from German)

Subsequently, the proto-personas are prioritized regarding their representativeness for the relevant target groups. The value development per user is analyzed and the experienced benefit or the quality of the user experience is represented by positioning the persona on the vertical axis. Depending on the product, the graph can also show the course of value creation or value development (e.g., for real estate).
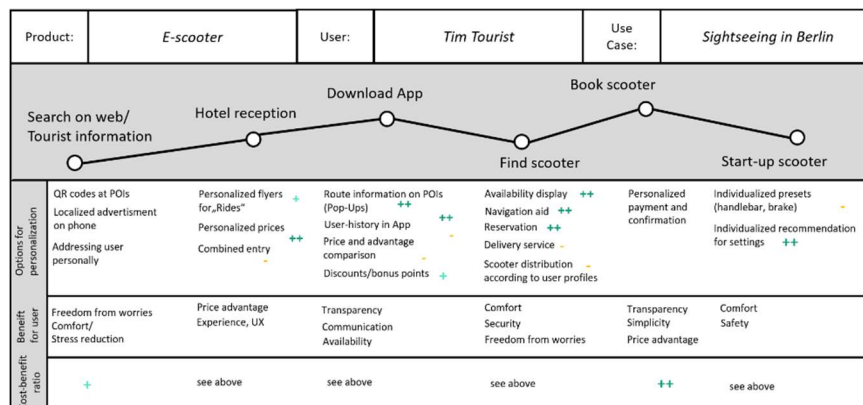

Fig. 3. User journey schema with example for the proto-persona "Tim Tourist"
(translated from German)

Then we perform a user journey for the selected proto-personas by analyzing their interactions with the product for their typical use case. Each user journey is documented using a schema as shown in **Fehler! Verweisquelle konnte nicht gefunden werden.**. The stations of the user journey are named and plotted along the horizontal axis over time, while the vertical axis quantifies the user experience. Based on the interactions at the touchpoints, suggestions for improving the user experience are identified and options for personalization are specified. Not all ideas for improving the user experience might be related to personalization, but they represent further development potential. For each personalization option, the benefit for the customer (added value or fulfilled

need from the user's perspective) is explicitly specified. Then the cost-benefit ratio is estimated from the company's point of view and qualitatively evaluated with plus or minus in a simple case. The set of personalization options with a positively assessed cost-benefit ratio together with their customer benefits represent the personalization potential, which is the final result.

5   Exemplary Testing

The method for potential analysis with product and user journey was tested based on three products: hotel accommodation, real estate and electric scooter. Since the testing was mostly conducted after the COVID-19 outbreak, the methodology is also designed for digital formats. Testing took place within the project team as face-to-face workshops and online events and was conducted several times online with external participants. The use of the developed schemas enables collaborative processing of the respective journey as well as rapid visualization in virtual workshops. In the following, the example "e-scooter" is described, which was carried out iteratively with different users to demonstrate the applicability of the method.

The e-scooter was used as a product example in external testing because it is readily accessible to participants and has been a feature of the urban landscape recently. The company in this example is a fictional scooter operator named "Yes" which provides e-scooters in a sharing mode. These can be rented by the user with the help of an app by paying for the time and distance of the ride. In the product journey, proto-personas for the lifecycle of the e-scooters were identified together with the external participants (see Fig. 2). The course of the graph describes the user experience.

The proto-persona Tim Tourist was selected as one of the prioritized target groups for the e-scooter. An exemplary user journey for the use case sightseeing in Berlin starts with the initial contact with the product and ends with the start-up (see **Fehler! Verweisquelle konnte nicht gefunden werden.**). Personalization options with a positively evaluated cost-benefit ratio include, for example, personalized prices and a personalized payment process, which lead to a price advantage and greater transparency for the user.

In terms of effort, our examples show that a product journey as well as a user journey, should be estimated at 1.5 hours. For a simple potential analysis, one can assume 5 personas [21]. This results in a time expenditure of 6 sessions of 1.5 hours each in addition to the effort for the preparation by the organizer and the moderator. In total, this means 9 hours per participant and with 5 participants, amounts to 45 hours of personnel input for the participants. If the organizer or moderator is familiar with the method and content, 2 weeks of working time for preparation, implementation and follow-up are to be estimated. Realistically, an analysis can be carried out within one month, with a personnel input of 150 hours. This applies if the participants are readily available. It assumes digital implementation in the case of distributed participants.

6 Discussion and Future Work

The need for the presented method is based on the insight that personalization in itself does not deliver any added value customers are willing to pay for. It therefore aims to identify potentials that establish customer value. It combines radical user-centeredness, lifecycle orientation, and the search for benefits for the customer or user of the product, without ignoring the cost-benefit ratio for the manufacturer or operator. It is thus suitable for identifying personalization potentials in early phases of product innovation and development.

The method was tested using examples from the mobility, construction and service sectors and its applicability to physical products and services was demonstrated. The application to the e-scooter example, which was fictitious for the participants, shows that the method can also be applied to new developments if there is at least a basic product idea to sketch a product journey. When used for the enhancement of existing products, on the other hand, extensive experience or existing market research results can be used as input to improve the quality of the outcome. The trials with external participants confirm the method is applicable in workshops with an appropriate learning effort. This should especially be rated against the fact that the tests were carried out both in face-to-face workshops and in online formats with limited interaction possibilities.

In order to adapt the method to different starting situations, there are various scaling options. In an iterative-incremental approach, it can make sense to start with a coarse product journey and only a few user journeys in order to first structure the existing assumptions. In further iterations, insights previously gained in evaluations can be used to further detail these or to consider additional relevant user groups. In this way, the effort per iteration can be kept low. Conversely, individual methodological components such as the proto-personas can easily be replaced by more detailed approaches, or up-stream empirical user research can be supplemented. The method therefore offers the necessary flexibility to be adapted to specific requirements from the company's point of view and to make further use of any findings already available.

References

1. Hornik, A., Klose, G., Stehnken, T., Spalthoff, F., Glockner, H., Grünwald, C., Bonin, D. and Sachs, J.: Zukunft von Wertvorstellungen der Menschen in unserem Land, https://www.vorausschau.de/files/BMBF_Foresight_Wertestudie_Langfassung.pdf
2. Piller, F.T.: Mass customization. Ein wettbewerbsstrategisches Konzept im Informationszeitalter. Dt. Univ.-Verl., Wiesbaden (2006)
3. Hämmerl, R., Dangelmaier, M.: Mass Personalization und die Erfolgsfaktoren nach dem Stuttgarter Modell. ZWF 113, 730–733 (2018)

4. Held, M., Wehner, D., Hämmerl, R., Dangelmaier, M., Briem, A.-K., Reiff, C. and Wulle, F.: Personalization in the automotive and building sector – research program of the High-Performance Center »Mass Personalization« in Stuttgart. Novi Sad, Serbia. 8th International Conference on Mass Customization and Personalization – Community of Europe (MCP - CE 2018) (2018)

5. Kaneko, K., Kishita, Y., Umeda, Y.: Toward Developing a Design Method of Personalization: Proposal of a Personalization Procedure. Procedia CIRP 69, 740–745 (2018)

6. Baumberger, G.C.: Methoden zur kundenspezifischen Produktdefinition bei individualisierten Produkten. Verl. Dr. Hut, München (2007)

7. Ardilio, A., Laib, S.: Technologiepotenzialanalyse. Vorgehensweise zur Identifikation von Entwicklungspotenzialen neuer Technologien. In: Bullinger, H.-J. (ed.) Fokus Technologie. Chancen erkennen - Leistungen entwickeln, pp. 175–217. Hanser, München (2008)

8. Schimpf, S., Lang-Koetz, C.: Technologiemonitoring. Technologien identifizieren, beobachten und bewerten. Fraunhofer IAO, Stuttgart (2010)

9. Schoblik, J., Kölmel, B., Bulander, R., Richter, A., Waidelich, L.: Methoden des kundenzentrierten Innovationsmanagements als Basis der personalisierten Produkt-/Servicegestaltung. In: Dialogmarketing Perspektiven 2019/2020, 17, pp. 1–19. Springer Fachmedien Wiesbaden, Wiesbaden (2020)

10. Stickdorn, M., Schneider, J.: This is service design thinking. Basics, tools, cases. Wiley, Hoboken, N.J. (2011)

11. Janson, A.: Der Kunde im Fokus: Das Konzept der Customer Journey. GRIN Verlag, München (2012)

12. Keller, B., Ott, C.S. (eds.): Touchpoint Management. Entlang der Customer Journey erfolgreich agieren. Haufe Group, Freiburg, München, Stuttgart (2019)

13. Theobald, E., Jentschke, M.: Kundenzentriertes Markenmanagement. Effektive Markenführung entlang der Customer Experience Journey. Springer Fachmedien Wiesbaden; Imprint: Springer Gabler, Wiesbaden (2020)

14. Følstad, A., Kvale, K.: Customer journeys: a systematic literature review. JSTP 28, 196–227 (2018)

15. West, S., Stoll, O., Østerlund, M., Csernetzky, P.M., Keiderling, F., Kowalkowski, C.: Adjusting customer journey mapping for application in industrial product-service systems. IJBE 11, 275–297 (2020)

16. Kirchgeorg, M.: Gabler Wirtschaftslexikon, https://wirtschaftslexikon.gabler.de/definition/kundennutzen-39021/version-262440

17. Nielsen, J., Landauer, T.K.: A mathematical model of the finding of usability problems. In: Arnold, B., van der Veer, G., White, T. (eds.) Proceedings of the SIGCHI conference on Human factors in computing systems - CHI '93, pp. 206–213. ACM Press, New York, New York, USA (1993)

18. Ellen MacArthur Foundation: Product Journey Mapping, https://www.circulardesignguide.com/post/product-lifecycle-mapping

19. Cooper, A.: The inmates are running the asylum. SAMS, Indianapolis, Ind. (1999)

20. Gotthelf, J.: Using Proto-Personas for Executive Alignment, https://uxmag.com/articles/using-proto-personas-for-executive-alignment

21. Nielsen, J.: Why You Only Need to Test with 5 Users, https://www.nngroup.com/articles/why-you-only-need-to-test-with-5-users/