Personalized Design Process for Persuasive Technologies

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Abstract. In this position paper we discuss the application of personalization in persuasive technology design in light of the Personalized Design Process model (PDP-model). The PDP-model defines personalization as aligning a persuasive product to the end-user by stakeholder involvement (i.e. designers, end-users, domain experts and family/relatives) across the Problem Definition-, the Product Design- and/or the Tailoring design phases. It is expected that personalization in a PDP enhances the motivation of end-users to interact longer and more frequently with a product, increasing the likelihood that the product will reach its aimed-for effect. Although personalization in a PDP is a common method in persuasive product design, its added value has not been sufficiently validated by scientific research. We propose several reasons for the frequent use of personalization in a PDP, despite the lack of evidence for its added value. Furthermore, we discuss how personalization could be validated according to the PDP-model.

Keywords: Personalized; Design; Process; Tailoring; Persuasive technology

1 Designing personalized persuasive technologies

Persuasive technologies, such as mobile applications, aim to enhance user-engagement with a product by means of design [1-3] in order to optimize chances for an aimed-for behavioral change [4-6]. According to Oinas-Kukkonen et al. persuasive technologies can influence the end-user in different ways, i.e. by changing the attitude, compliance and/or behavior. They propose a behavioral change support system that can be applied as a key construct when designing and testing persuasive technologies [7]. In enhancing the aimed-for effect of these technologies, designers often try to design a product in the best possible way. For example, by involving end-users, domain-experts and others in the design process, also referred to as co-design or co-creation, aiming to personalize a product so end-users are motivated and engaged to interact with it [8, 9]. Besides, a product can also be personalized by tailoring or customization [10, 11] to enhance experiences of end-users even more [1].

2   Expected benefits of personalization in persuasive technologies

Personalization is applied in persuasive technologies for different functions and in varying contexts, e.g., substance use [12], medication adherence [13] or health and wellness [14, 15]. One example is "1-2-3Smokefree", an intervention for smoking cessation that provides personalized strategies and materials for smoking cessation based on the end-users' gender, age and ethnicity [16]. It is expected that tailoring or customizing a product, e.g., using the personal name of an end-user in a product, can serve as a personal trigger that can spark the end-user's motivation to use the product and execute specific behavior that the product is aiming at [6, 7]. Besides, involving stakeholders in a design process, e.g., via co-design or co-creation, could enhance the chance that a products meets the needs and enhances the satisfaction and interaction of the end-user [17]. However, despite the manifold usage of these personalization methods in persuasive technologies, its additional effect of how and when stakeholders are involved largely remains unknown. Both a recent meta-analysis by DeSmet et al. (2016) and a systematic review by our own research group showed many inconclusive findings about the benefits of stakeholder involvement when designing games in a health context [18, 19]. Besides, existing validation studies generally examined products that only applied tailoring or customization to personalize or did not study the intended effects on attitudes, compliance or behavior but focused on user experiences [20, 21]. Since the scientific validation of the possible incremental effect of personalization in persuasive technologies is lacking, we suspect that there might be other reasons as well why personalization is applied in this context (see Table 1).

Table 1: Suggestions of expected motives and reasons for personalization in personalized persuasive technology design

End-user	Designers/science
Empowerment	Focus on the scarce positive studies
Engagement	Expected facilitated implementation
Expected or desired feature	Trending
Increased usage	Expected better sell

3   How is personalization applied in persuasive technologies?

The concept of personalization is currently applied in different ways and with different definitions. Personalizing a product is most often done by tailoring or customizing a product. For example, tailoring products by using relevant characteristics of the end-users, like demographic information, preferences and sensitivity to specific elements [22], or relevant characteristics of groups of end-users, like examining the influence of gender on the persuasiveness of persuasive technologies [20] or aligning game-elements to player archetypes [23, 24] or personality traits [25]. In addition, a product can be personalized to the end-users' needs and preferences, by involving them in the design process, also referred to as co-creation or co-design [8, 9, 26].

There are thus different definitions and practices of personalization, which can be confusing. This is limited by our Personalized Design Process model (PDP-model) [19], where designers, domain experts, end-users, and/or family and relatives (in this model referred to as "stakeholders") are involved in all phases of a design process in games for healthcare. The PDP-model consists of three phases: 1) the Problem Definition phase, where the problem and focus is identified and established, 2) the Product Design phase, where the product is designed in Ideation and further improved through iteration in Embodiment, and 3) the Tailoring phase, where a product is adapted by the end-user or others in User Controlled Customization or a product adapts itself to the end-user in Use-Dependent Adaptation (see Figure 1, previously published in [19]). The PDP-model differs from other models by also involving Tailoring, which ensures alignment to individual end-users within a group. We expect that designing persuasive technologies for healthcare via a PDP will improve the design process, alignment of the product to the daily practice, and more strongly result in the aimed-for effects.
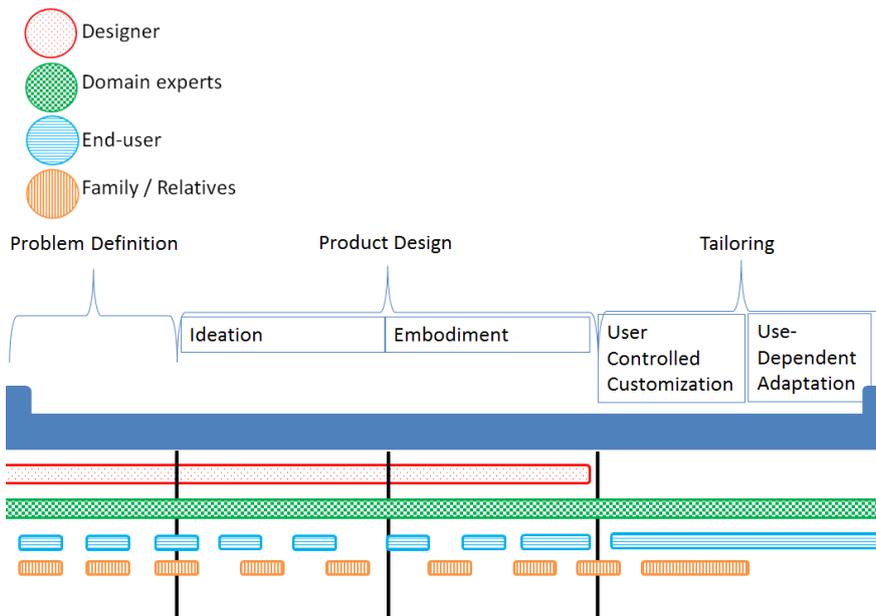

Fig. 1. The three phases of the Personalized Design Process, where stakeholders can consist of designers, domain experts, end-users and/or family and relatives [19].

4   **Can we know if personalization works?**

In our literature review, we found that stakeholders were mainly involved in the Product Design phase or Tailoring phase, and less in the Problem Definition phase. Moreover, hardly any studies examined the involvement of stakeholders in all PDP-phases [19].

Results of our review cannot provide strong conclusions about the effect of personalization. However, we question if it is even possible to validate the added value of stakeholder involvement across the different phases of the design process.

The Problem Definition phase is the fundamental phase for the whole design process. If stakeholders are not involved in this phase, the design may unintendedly be aimed at tackling non-existing problems or problems that are irrelevant to the field [19]. Moreover, validation of stakeholder involvement during the Problem Definition phase may be a complicated endeavor, since validation research is usually aimed at comparing a product with and a product without an independent variable (i.e. stakeholder involvement). In this case, the in- or exclusion of stakeholder involvement may lead to two different products that are targeted at incomparable problems and outcomes.

In the Product Design phase, stakeholder involvement can be validated only if the study focusses on specific, comparable aspects of products. During the Tailoring phase, the product is adapted to individual end-users, either by the end-users themselves, by the product or by others. Most existing validation studies have only examined the additional effect of personalization during the Tailoring phase, because it is practically more feasible to study the additional effect of stakeholder involvement in one characteristic of a product [19] compared to the other two phases [27].

Concluding, more research with strong methodological designs are needed to confirm if and when personalization (in this paper referred to as stakeholder involvement in a PDP) significantly improves the aimed-for effects of persuasive technologies. Well-validated studies only seem to have focused on personalization in the Tailoring phase, but not on personalization in the other or all phases of a PDP.

5 Is it relevant to know if personalization works?

The aim of validation research is to prove the added value of personalization of persuasive technologies. To this end, two persuasive products should somehow be comparable and at least target the same problem. If this is not the case, and products are incomparable or focus on different outcomes, it is impossible to determine whether the effect is due to stakeholder involvement or to other aspects. With current validation methods it is possible to study the effect of stakeholder involvement in the Tailoring phase, because the tailored aspect of a product can be studied as an independent variable. However, it is harder to study the effect of stakeholder involvement in the Product Design phase and it may even be impossible in the Problem Definition phase. Within the workshop, we would like to discuss ideas about alternative validation techniques for personalization. We would also like to discuss the relevance of validation research on personalization in persuasive technologies. Designers currently apply personalization without scientific evidence of its added value. However, no insight is gained into the long-term and aimed-for effects of the products that are designed with stakeholder involvement in all PDP-phases. In our opinion, this type of information is warranted to further develop the design process.

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