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## In Pursuit of Personalization Design

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### Abstract

In response to diversified needs in the market, the manufacturing industry is required to provide more user-oriented products and services than ever. In order to satisfy such needs, much attention has been paid to personalization, which, in this paper, refers to the process of designing, manufacturing, and providing different products and services for each individual user. There are key enablers to foster personalization because of technological advancement. Since personalization is considered an approach to prolonging the value lifetime of a product and minimizing resource input, it should be further discussed in the field of lifecycle engineering. To realize personalization, a methodology to design such products is essential. We call such design as "Personalization design." The goal of this research is to develop a theory for personalized design. In this paper, we propose the concept of personalization in the context of product and service design including a life cycle perspective. We firstly show examples of personalization and their characteristics as context, target phase and participation. This is followed by a presentation of the concept of personalization. Then, we show how the actual personalized design system was designed through a case study on designing equipment for rehabilitation hospital. In this case, participation of multi-stakeholder has a great influence on a design solution. Finally, we discuss the future direction of design research for personalization.

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### 1. Introduction

In response to diversified needs in the market, the manufacturing industry is required to provide more user-oriented products and services than ever. For example, due to aging population around the world, larger number of elderly people need nursing-care equipment that is tailored to their body shapes and behaviors. In order to satisfy such needs, much attention has been paid to personalization, which, in this paper, refers to the process of designing, manufacturing, and providing products and services specialized for each individual user [1]. In reality, there are key enablers to foster personalization because of technological advancement, particularly in the area of information technology and 3D printing technology. Indeed, personalization businesses are becoming popular using personal devices, sensors, and digital production [2].

Since personalization is considered an approach to prolonging the value lifetime of a product and minimizing resource input, it should be further discussed in the domain of life cycle engineering. To realize personalization, a

methodology to design such products is essential. We call such design as "Personalization design." If we implement personalization design, potential propagating effects may include strengthening the market competitiveness of companies. Relevant fields include lifecycle design [3], service design [4], product-service system (PSS) design [5], participatory design [6], and human-centric design [7]. However, it has not yet systematized how to support personalization design.

The goal of this research is to develop a theory for personalization design. In this paper, we propose the concept of personalization in the context of product and service design including a life cycle perspective. We firstly characterize and categorize examples of personalization. Then, we show a case study of designing equipment for rehabilitation hospital to analyze how a personalized system was designed. Finally, we discuss the future direction of design research for personalization.

## 2. Characteristics and categories of personalization

### 2.1. Examples

Table 1. describes some typical examples of personalization. There are a lot of studies and practices of personalization in broader fields [8]. This is because the definition of personalization focuses not on the specific area but on the individuality as an abstract aspect of user, products and services.

### 2.2. Characteristics

As depicted in Table 1, we here analyze four characteristics of personalization; including context, target, phase and participation.

#### 2.2.1. Context

Though there are various kinds of personalization, we can find some contexts in each case. The context shows the primary objective. As shown in Table 1, we found four contexts; marketing, hospitality, user action, and life cycle.

The first and major context is a marketing. A lot of companies do personalization to make their products attractive and expand their own market. Its background is the transition of customer behavior. Before they only selected from lists of available options, but now they are actively involved in the design of the products they want to buy [8]. It requires higher variety and smaller volumes per product variant. To realize this production scheme with minimizing cost, personalization is the solution for companies.

The second context is hospitality. This is related to services rather than products. Hospitality means the strong willing to satisfy customers. Sometimes it results in try to respond to the special problems that go beyond regular work.

Third context is the user action. Many owners have desires about their possessions. Sometime it is a matter of the ease of

use, and at times it is a matter of taste. Some of them will try to solve their problem on their own, which is called “Do It Yourself”. Various tools and places are provided for such people in the market. Sometimes they make community to share their knowledge.

Fourth context is life cycle. Situations change for each product over time. Some gets failure and need repair, others change their owner. When and what happens are quite different depending on the product, so that their needs individual treatment.

#### 2.2.2. Target

Target of personalization includes products and services. The difficulty of personalization depends on the target.

Products with simple and modular architecture are relatively easy to be personalized by replacing parts. To make it more efficient, some products have a platform which is common to a wide range of products like car production. Platform design focuses on how to find the common architecture and how to add and replace the modules [9].

Personalization advances in the information industry, because it is easy to replace components. A number of services that have Identification number (ID) are provided. For example, Amazon introduces products “inspired by your shopping trends” using records associated with the ID. Personalization of information technology can separate into two parts. One is to select a predefined action associate with a visitor segment. The other is to find implicit relationships between information, which sometimes provide unexpected experience for a customer.

Services are also relatively easy to be personalized. The special difficulty of personalized services is to guarantee the quality of service. Existing personalized services are provided with implicit knowledge and its quality depends on the skills of each service provider. This heterogeneity becomes a serious problem for some large company with lots of stores.

Table 1. Examples of personalization.

No	Content	Context	Target	Phase	Participation
1	Measuring customer's body and providing fitted garment	Marketing	Product	Production	Yes
2	Printing photos or letters on cups	Marketing	Product	Production	Yes
3	Choosing colour or additional accessories of cars	Marketing	Product	Production	Yes
4	Showing advertisement tailored to individual users on website	Marketing	Product (Information)	Use	No
5	Providing prosthesis fitting to user body	Hospitality	Product	Production	Yes
6	Remembering the name and preference of the guest in hotel	Hospitality	Service	Use	No
7	Making original bookshelf by yourself	User action	Product	Production	Yes
8	Writing the name of owner on the textbook	User action	Product	Use	Yes
9	Renovating the house to accommodate changes in residents' lifestyles	Life cycle	Product	Production	Yes
10	Internet searching that getting closer to an individual's interests spontaneously	Life cycle	Product	Use	Yes

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