Towards a Personalized Virtual Customer Experience

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Abstract In an experience economy, customers are no longer satisfied with products and services themselves. Products and services are required to create memorable events, perfectly suited to individual needs and expectations of each customer. Such personalization that can potentially lead to an increased customer experience is currently recognized as the most important strategic goal for retailers. To reach this goal, the substantial use and contribution of new technologies seems to be of paramount importance. In this paper, a conceptual model of a virtual retail store for a personalized customer shopping experience is proposed. The model employs process mining, recommender systems, and big data analysis to create both personalized offers and personalized virtual shopping spaces which customers can immerse themselves in when making purchase decisions.

Keywords Personalization · Virtual retailing · Virtual reality · Customer experience

1 Introduction

At the end of 2014, Forbes predicted [1] that personalization would not be a trend; it would be a marketing tsunami that will entirely transform all thinking about marketing, shifting from globalization and generalization to localization and individualization. This tsunami has been very evident in retailing activities in 2015 and 2016.

An experience economy, a concept introduced in 1999 by Joseph Pine and James Gilmore, is becoming a must in today's business. The concept assumes that

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products and service themselves do not satisfy customers any longer. They need to create memorable events—"the experience"—and that is what customers are willing to pay for. According to one survey [2], 86% of customers are ready to pay more for a better customer experience.

Unfortunately the "ordinary" experience is not enough to attract customers. It has to be a personalized experience, perfectly suited to each individual customer that they can fully immerse in and recognize as created especially for them.

In this paper, a conceptual model for personalized virtual customer experience is proposed. The model employs process mining and recommender systems to create both personalized offers and personalized virtual shopping spaces which customers can immerse themselves in while making purchase decisions.

The reminder of this paper is organized as follows. Section 2 provides an overview of related work in personalization and shopping customer experience. In Sect. 3 the proposed conceptual model of personalized virtual customer experience is presented. Finally, Sect. 4 concludes the paper and outlines the future work.

2 Related Work

It is widely accepted in the literature that virtual technology can enhance the customer experience [3–5]. The "customer experience" could be defined as a set of interactions between a customer and a product, brand, service, company or part of its organization which provoke a reaction as a result of an ordinary or extraordinary experience [6]. This experience implies the customer's involvement at different levels, such as the emotional, affective, spiritual, physical, sensorial, behavioral (e.g. lifestyle), intellectual, cognitive, rational (functional and utilitarian), as well as relational or social. For many researchers this enhancement of customer experience in virtual reality can be done by so called telepresence, a high level of interactivity and multisensory feedback [5, 7–9]. Great emphasis is put on telepresence that is conceptualized as the sensation experienced in virtual technology [10], or in other words this is the ability of virtual technology to induce a sense "of being there" [11, 12]. It is suggested that telepresence is partly related to the consumer's state of mind and partly to the virtual technology itself [5]. To make consumers even more involved in virtual reality or to increase their sense "of being there" the virtual technology should be immersive, which means that it should be capable of creating an immersive virtual environment [5]. With the development of technology, including faster processor speed and higher-resolution graphics, virtuality has becoming more and more deeply engaging.

On the other hand, it is not only technology that can induce a sense "of being there". Very promising possibilities lay within the concept of personalization. Based on the definition of personalization, it can be concluded that this term means the adjustment of a company's offering to the individual needs of each customer [13] or is a form of product differentiation which enables meeting the individual needs of customers [14]. Personalization can also be understood as a process of

delivering to each customer the right product, in the right place and at the right time [15]. Information technology has fundamentally changed the possibilities in the area of personalization. The breakthrough concerns the way enormous volumes of data concerning customers can be gathered and analyzed. Information technology also allows for the personalization of offers without customer involvement. In such cases, customers do not have to define their needs or communicate them to the offer provider. The only activity that is required, for example, is to do shopping at e-stores. Each such activity is a source of data for creating customer profiles [16].

In retailing, personalization is regarded as the highest priority and at the same time the biggest challenge for management [17]. The major prerequisites for personalization are the following [13]:

- Customer expectations;
- Direct access to data relating to the purchasing behavior of customers;
- Advanced technological possibilities for collecting and processing information, leading to the creation of customer profiles.

The essence of a personalized offer is matching the characteristics of a product to the individual needs of customers. However, it must be pointed out that personalization is implemented in a different way within the retail sector than in the manufacturing sector. Retailers individualize their offer not by changing the physical form of individual goods, but by providing consumers with ready-made purchasing combinations. This means that the customer does not need to browse all the products from the offered range, but can be presented only with a selection that corresponds to their current and/or potential needs [13]. Although it has not been widely investigated, it can be hypothesized that a personalized virtual environment can enhance telepresence and, as a consequence, customer experience. Even though personalization is a broad concept, recent studies have focused only on avatar-like sales assistants as way to personalize the virtual environment. In fact, these assistants provide tailored recommendations based on data mining techniques [18]. It is not surprising that such assistants are not the only possibility for virtual reality personalization. Within a virtual reality environment the possibilities and areas of personalization seem to be much higher, not only when compared with bricks-and-mortar retailers but also with e-commerce or m-commerce.

3 Personalized Virtual Customer Experience

In the conceptual model for a Personalized Virtual Customer Experience, personalization is defined as a process of tailoring customers' experiences in three dimensions:

- Assortment;
- Space;
- Ambient conditions.

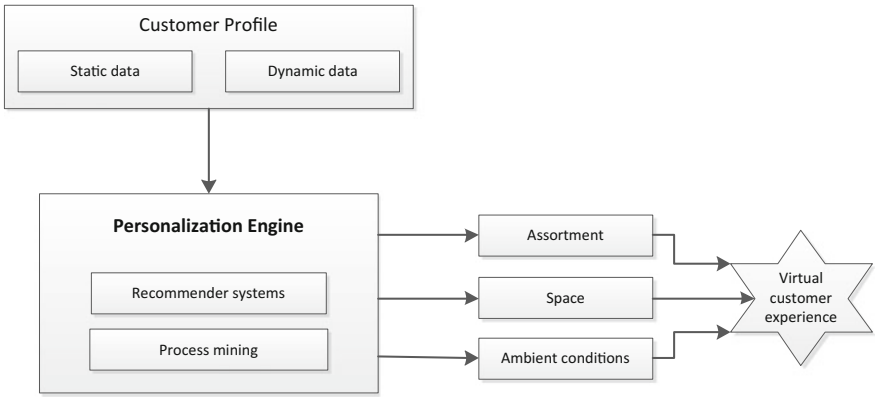

Fig. 1 Conceptual model for the personalized virtual customer experience

The model is presented in Fig. 1. It consists of the following main components:

- Customer Profile;
- Personalization Engine;
- Three dimensions of personalization: Assortment, Space, and Ambient conditions;
- Virtual customer experience.

The Customer Profile includes two main types of data:

- Static data: this describes the characteristics of a customer that are constant during a specific period of time; e.g. marital status;
- Dynamic data: this relates to activities performed by a customer; e.g. purchase history.

The data included in the Customer Profile is as follows:

- Behavioral data: purchase history (products or services purchased by the customer); products viewed but not purchased; products added to the cart but eventually abandoned; products being searched for;
- Demographic data: age, gender, residential area (address), education, occupation;
- Social profile: interests (movies, music, books, hobbies), friends;
- Social media profile: activities on social media (e.g. Facebook likes and dislikes, Twitter followings, etc.);
- Lifestyle data: type of property owned, pets;
- Family details: marital status, children;
- Device-related data: e.g. smartphone brand;
- Psychographics: religious and political views;
- Personal wishes: expectations and interests expressed directly by the customer;
- Contextual data: e.g. customer's location-related data such as current weather or social events being held.

The data stored in the Customer Profile is used by the Personalization Engine to generate the various aspects within the three dimensions of the Virtual Customer Experience.

The Personalization Engine employs two main technologies:

- Recommender systems;
- Process mining.

Recommender systems use data filtering algorithms to adapt the content—assortment and virtual space—to the needs and requirements of each individual customer. Because these systems are entirely autonomous, they therefore require no human supervision; which makes it possible to create personalized offers to all customers regardless of their number and the number of products and services. There are two fundamental algorithms used in creating recommendations [19]:

- Collaborative filtering—filtering based on the similarity of behavior;
- Content-based filtering—filtering based on the similarity of content.

Modern recommender systems typically take a hybrid approach; i.e. they use a combination of both types of filtering. They are often also supported by additional technologies like domain ontologies and inference engines.

Collaborative filtering assumes that customers with similar behavioral profiles have similar tastes. This is based on the following rule: "we enjoy the same experiences that are enjoyed by people like us". The approach is based on building customer profiles; including data on activities, preferences, opinions, and beliefs. This data is then used to predict that assortment and its arrangement in virtual space which will bring a positive experience to the customer based on an analysis of positive ratings on similar assortments and their arrangements by customers with similar profiles. Ratings are collected through both explicit and implicit means:

- Explicit means: a customer is directly asked to provide a rating on a particular item (the product, its arrangement in a virtual space, etc.);
- Implicit means: a rating is inferred from customer's activities; e.g. the length and frequency of viewing a specific product.

The main advantage of collaborative filtering is that it is not necessary to analyze the structure of customer experiences—therefore it is possible to express fine recommendations regarding multi-faceted items without the need to "understand" their internal structure and content.

Content-based filtering is based upon an assumption that customers generate positive responses to experiences that are similar to those appraised positively in the past. This is based on the rule: "we have a definite taste therefore we like experiences of a similar kind". The approach compares prospective experiences to those that the customer liked in the past (purchased, positively rated, they belong to a liked category, etc.) and recommends similar ones. The key issue in this approach is the necessity to recognize customer preferences regarding activities within one type of content and apply these preferences to another type. The task is straightforward

but the results are less valuable if the recommendations apply to experiences in the same category; e.g. recommending yet another detective movie based on information that in the last week the customer watched five movies of this genre. Much more valuable is to recommend a movie or music based upon previously read and positively rated press releases.

Process mining is an approach to analyzing logs, including data describing time-based events, and turning them into process models. An event is defined as anything that happened that was of some importance, and thus data on it was stored in an information system. Examples of such events are as follows: a customer placing an order, a user liking a picture on a social media website, a user writing a comment on a blog post, a customer looking at a product description on an e-commerce site, and a customer withdrawing a specific amount of money from an ATM.

There are three classes of process mining techniques [20]:

- Discovery
- Conformance checking
- Enhancement

Discovery techniques refer to creating process models based on event log data only; i.e. there is no a priori information about what the process model should look like.

Conformance checking techniques refer to comparing event log data to existing process models and analyzing the discrepancies.

Enhancement techniques refer to enriching an existing process model by including additional information in the event log and describing the contextual aspects of performing the process in a specific environment. An example is enriching a process model with performance data.

3.1 Ambient Conditions

Ambient elements create so called atmospherics [21]. Kotler [22] defined this term as "the effort to design buying environments to produce specific emotional effects in the buyer that enhance purchase probability". Atmospherics or ambient elements have an impact on consumers in a way that they are not fully aware of. The reason for this being it is at a more subconscious level of influence. That is why atmospherics is recognized as background stimuli [21]. Various ambient elements (atmospherics dimension) can be distinguished; they are presented in Table 1 [21].

Technological limitations pose certain obstacles to using all the ambient elements within virtual reality (olfactory and taste, for instance). On the other hand the same reality permits the designing of some ambient elements more easily. One of them is the visual dimension. VR allows one to choose from an almost unlimited range of colors and lighting levels; as well as something that especially creates new

Table 1 Five atmospheric dimensions

Dimension	Description
Visual	Color, lighting level, appearance of objects (size and shape)
Aural	Volume, pitch, tempo and style of sounds
Olfactory	Nature and intensity of sound
Tactile	Temperature, texture and contact
Taste	Nature and intensity of taste sensations

possibilities, the size and shape of store fixtures. Another dimension is the aural. The appropriate music can be played not through speakers as it is in bricks-and-mortar stores but through earphones. The latest technology developments seem to be very promising in the area of including the tactile dimension in VR. More and more sophisticated virtual gloves are available on the market that make it possible for instance to feel the texture or weight of a given product.

All the ambient elements can influence shoppers within a range that is limited by two elements: stimulus awareness and stimulus overload. If the intensity of an ambient element (lighting level, music volume, etc.) is too low (lower than the level of stimulus awareness) shoppers will not be affected by them. On the other hand, however, if the intensity is higher than the stimulus overload point shoppers will experience perceptual overloading. Ambient elements have a positive impact on consumers between stimulus awareness and stimulus overload. It is not surprising that for each customer the level of acceptable intensity, as well as the level of stimulus awareness and overload, can be different. For this reason in an impersonalized store environment, it is recommended to consider a zone of maximum effectiveness that will be large enough to meet the requirements of the highest possible number of customers (Fig. 2).

VR makes it possible to personalize each of the above mentioned ambient elements. The possible ways to personalize the ambient elements are presented in Table 2.

One has to stress that VR, apart from allowing the creation of personalized ambient elements, can overcame obstacles that retailers have to face when creating perfect ambient condition inside bricks-and-mortar stores.

To summarize, one can conclude that within VR each consumer can enjoy the purchasing process in a different environment, tailored to his/her needs. Therefore the zone of maximum effectiveness presented in Fig. 2 can be considered redundant; being be replaced by a point of maximum effectiveness. Each point can represent the personalized atmospheric that meets the needs of each customer.

3.2 Assortment

VR seems to be the perfect environment for assortment personalization for two reasons: unlimited selling space and unlimited possibilities in the assortment

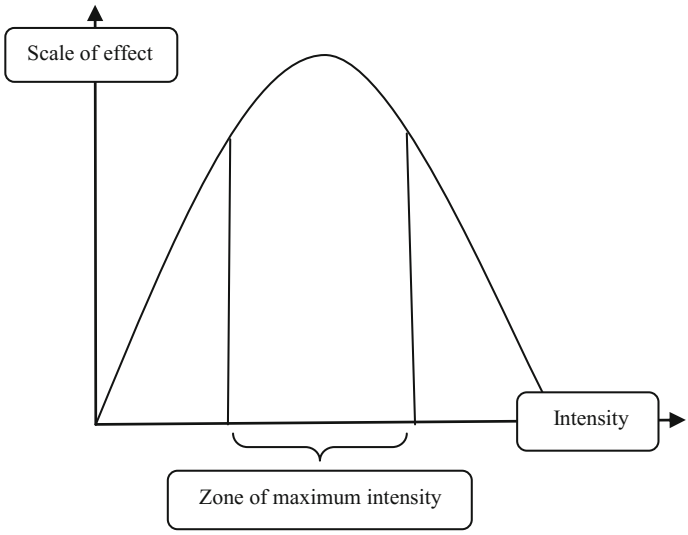

Fig. 2 Zone of maximum effectiveness [21]

Table 2 Examples of personalization for selected ambient elements

Ambient elements	Examples of personalization
Visual	Color of the floor, walls, ceiling and fixtures tailored to each consumer's aesthetic needs
	Color and intensity of the light tailored to each consumer's needs
Aural	Type and volume of the music tailored to each consumer's needs
Tactile	Texture of the floor, walls, ceiling and fixtures tailored to each consumer's needs

combinations offered to each consumer. Bricks-and-mortar retailers have to struggle with a finite amount of selling space. Obviously this limits the number of products retailers can offer to their customers. VR overcomes these obstacles as the selling area is not limited and can be extended and arranged according to the needs of consumers. As a consequence the number of products carried by a virtual store can be very high. This gives retailers the possibility to have more products with a greater diversity of products to choose from when providing the consumer with ready-made purchasing combinations.

This issue is closely related to the possibility of unlimited assortment combinations. Combinations can be made by adjusting the depth and width of the assortment in order to meet each consumer's needs. Assortment width is defined as the number of different product types offered by a retailer, while assortment depth is considered to be the number of product varieties offered [21]. According to each shopper's preferences a specific number of different products, as well as a specific number of product varieties, can be provided.

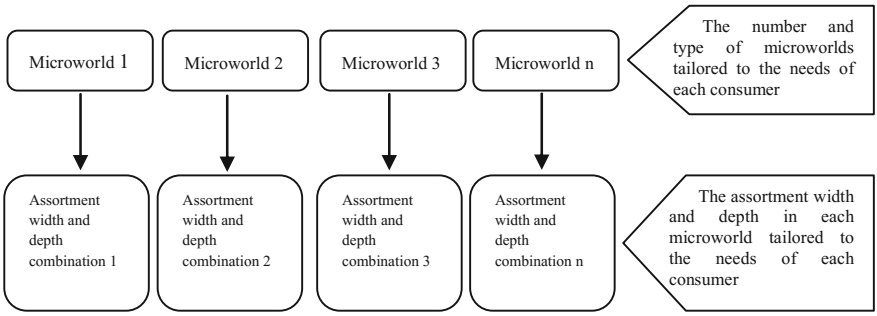

Fig. 3 Assortment personalization in VR stores

3.3 Space

In the endeavor to personalize space the concept of microworlds can be employed. Microworlds can serve as a first step in the process of personalization. In this scenario the type and number of microworlds would first be determined. Then in each microworld the width and the depth of the assortment can be tailored to each consumer (Fig. 3).

VR also allows for so called dynamic personalization. This means that the assortment offered can be different (in terms of its width and depth) every single time a given consumer 'enters' the VR store. In this scenario not only would the assortment provided to each shopper be unique, but also every visit by each consumer in the VR store would result in unrepeated assortment combinations. In other words, this way of assortment personalization can lead to unrepeatable customer experiences.

4 Conclusions and Future Work

In this paper, a conceptual model for Personalized Virtual Customer Experiences has been proposed. The model defines customer experience as a personalized combination of three aspects: assortment, space, and ambient conditions. The personalization is performed by the Personalization Engine based on data collected in the Customer Profile. The data is of two kinds: static and dynamic. Static data refers to customer characteristics that are constant during a specific period of time; dynamic data refers to activities performed by customers; e.g. products purchased, products added to the cart but eventually abandoned. To handle these two types of data, the Personalization Engine uses two main technologies: recommender systems and process mining.

Future work includes the operationalization of the model. The internal structure of the Personalization Engine needs to be elaborated, both at the technological and

business level. Specific algorithms within recommender systems and process mining should be developed and implemented. Also, the concept of the customer experience as a combination of assortment, space, and ambient conditions should be investigated and elaborated in detail.

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