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The Adaptive Fitting Room

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Abstract In order to remain attractive and economically viable whilst supplementing online presence, physical stores need to play to their strengths and engage customers in novel ways. Stores have the possibility to act as experimental arenas, where customers can browse apparel through interactive installations and try on products in semi-realistic situations. For fashion retailers, however, the average fitting room experience is rarely representative of actual use. The product range is often diverse and varies with seasons, which makes it difficult to create a one-experience-fits-all fitting room. In this paper, we present a concept for a new customer experience. By exploiting automatic single item identification using RFID, we propose a fitting room that adapts to the products that enter the fitting room, using video projection mapping, magic mirrors and screens, lighting and sound. This allows different types of customer engagement prior to the point of purchase, opening up new possibilities for integrating product information, recommendations, clienteling and social media. Some expected benefits are illustrated through a set of user scenarios.

Introduction

Today's fashion retailers face multiple challenges, most of which are related to the expansion into and balancing of omni-channel retailing. Customers are more informed than before, and the transaction cost of comparing and switching between both online and brick and mortar retailers is decreasing (Nunes and Cespedes 2003; Stone et al. 2002). Physical stores have traditionally played the advantage of enabling product 'touch and feel', correct fit and sizing, zero delivery lead time, and advice and up-sales from sales representatives (Bhatnagar et al. 2000; Liao and Cheung 2001; Levin et al. 2003). However, the lines between online and offline retail are fading (Enders and Jelassi 2000). Online channels increasingly offer free returns, next or same day shipping and improved choice navigation aiding the customers. At the same time, online retail benefits from advantages such as consolidated inventory, economies of scale in purchasing and lower labor and facilities costs.

In order to remain attractive and economically viable whilst supplementing online presence, physical stores need to play to their strengths and engage customers in novel ways (Baker et al. 2002). In this respect, physical stores have a possibility

to act as experimental arenas, where customers can browse apparel through interactive installations and try on products in semi-realistic situations. The latter is perhaps more predominant within sporting goods and recreational equipment. For example, American REI offer customers in their Seattle flagship store the opportunity to test climbing equipment in a 20 meter instore climbing wall (REI 2016). For fashion retailers however, the average fitting room experience is rarely representative of actual use. The product range is often diverse and varies with seasons, which makes it difficult to create a one-experience-fits-all fitting room; for instance, a cocktail dress is obviously used in other environments than a heavy winter coat, but they are still often found in the same store within a season. Further, they are usually tried on under the same ambience in shared fitting rooms.

In this paper, we present a concept for a new customer experience – *the adaptive fitting room*. By exploiting automatic single item identification using RFID, we propose a fitting room that adapts to the products that enter the fitting room, using video projection mapping, magic mirrors and screens, lighting and sound. This allows different types of customer engagement prior to the point of purchase, opening up new possibilities for integrating product information, recommendations, clienteling and social media. This will possibly attract customers to physical stores and augment the stores' online presence. Further, we present a discussion in which we motivate such a concept through showing how such an investment makes sense and affects upstream actors of the retail value chain, too.

Several authors (e.g. Loebbecke et al. 2008; Uhrich et al. 2008; Choi et al. 2015; Melià-Seguí et al. 2013; Serra et al. 2011) describe the use of RFID to provide recommendations and information about garments inside the fitting room. However, to the best of our knowledge the use of such technology to trigger an alteration of the fitting room's ambience has not previously been proposed. Some expected benefits of the adaptive fitting room are illustrated through a set of user scenarios. In the process of developing these scenarios, interviews with the retail manager, the head designer and a shop floor manager of a Norwegian fashion retail chain have been carried out.

The remainder of the paper is structured as follows. First, the adaptive fitting room is described. Here, a brief summary of previous research on fitting rooms and interactive installations is provided, before outlining the envisioned functionality of the concept. A set of user scenarios is provided to illustrate its use and further motivate following discussion. Thereafter, identified challenges and future prospects for research are discussed.

The Adaptive Fitting Room

Theoretical background

The shop environment's effect on customer behavior has received substantial attention by researchers and practitioners (see e.g. Bäckström and Johansson 2006). Some suggest that only a limited number of consumer choices are based on conscious information processing strategies; the rest is said to be caused by unconscious effects of all kinds of cues in the environment (Dijksterhuis et al. 2005). While many atmospheric variables can affect the shopping experience, lighting has been the focus of many studies, as it can easily be altered to create different moods (Baumstarck and Park 2010). However, as people perceive the world through all their senses simultaneously, other sensory stimuli such as touch, sound and smell can also influence environments and improve the shopping experience and behavior (Soars 2009). In the same way that atmospherics in the main store can affect the shopping experience either positively or negatively, the dressing room atmosphere can be crucial to making a purchase (Baumstarck and Park 2010). Therefore, we argue that an alteration of the fitting room ambience is highly relevant in physical stores' quest for better customer experiences.

When looking beyond 'traditional' fitting room qualities, such as spaciousness and lighting (Baumstarck and Park 2010), most of the recent research on fitting rooms can be divided into three main streams: (1) interactive installations, (2) virtual try-on and, (3) RFID in fitting rooms. The first stream, *interactive installations*, covers aspects such as conceptualizations of, and challenges with, multimedia mirror systems for physical stores (Begole et al. 2009; Zhang et al. 2010); more overall concerns regarding risks and benefits of interactive installations (Campos et al. 2011; Akpan et al. 2013); and, other fitting room concepts such as *the socially-interactive dressing room,* which integrates social media in the fitting room (Liew et al. 2011). The second stream, *virtual try-on*, looks beyond the physical garment and tries to develop virtual fitting room solutions for use either in-store or online. This stream has a strong technological focus, with many authors focusing on image processing and augmented reality technologies (Chang et al. 2013; Kjærside et al. 2005; Traumann et al. 2015). The third stream, *RFID in fitting rooms*, takes into consideration the progression of item-level RFID and looks at how this opens for detailed monitoring of visual merchandising efficiency, correction of individually misplaced items and instore product flow (Loebbecke et al. 2008; Choi et al. 2015) and enables interaction with e.g. smart dressing rooms, displays and mirrors to improve the shopping experience (Loebbecke et al. 2008; Uhrich et al. 2008; Choi et al. 2015; Melià-Seguí et al. 2013; Serra et al. 2011).

The fitting room concept

The main idea behind the adaptive fitting room is to use the RFID tag of each garment to identify which garments the customer is bringing into the fitting room. Based on identification of the product, the customer gets a matching experience by automatically altering the fitting room's ambience. The fitting room should mimic environments in which the products are typically used, but could also be altered in response to user inputs. This is illustrated in Fig. 1-3 below.

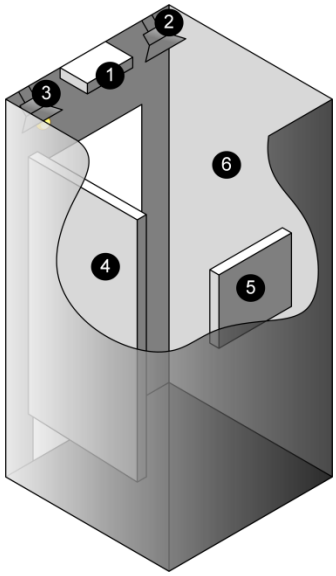

Fig. 1. The adaptive fitting room when it is not in use. Foreseen functionality includes **(1)** RFID antenna; **(2)** speaker; **(3)** lighting; **(4)** intelligent (magic) mirror; **(5)** information/omni channel panel; **(6)** (projection) screen.

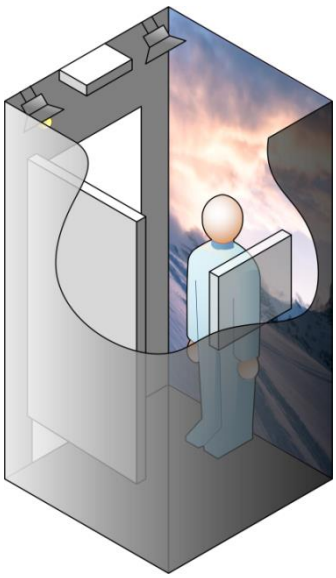

Fig. 2. The adaptive fitting room when in use, showcasing the change of ambience given when a customer brings a certain garment into the fitting room.

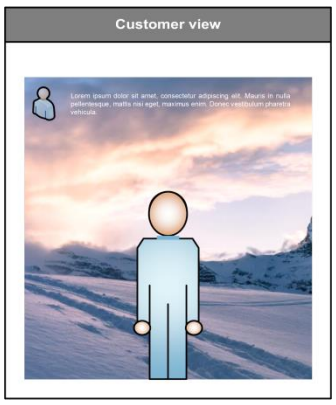

Fig. 3. The customer sees itself as standing in a landscape when trying on clothes for skiing. Product information can be provided through the magic mirror.

User Scenarios

In this section, we describe possibilities that an adaptive fitting room might represent for four key roles in the retail supply chain; the Customer, the Shop floor assistant, the Retail manager, and the (product) Designer.

Customer

The modern customer is making a conscious choice to go to a brick-and-mortar store over other retail channels. While the reasons vary, the store of the future will certainly play to its strengths by attracting customers based on the advantages of brick-and-mortar and high-fidelity customer engagement limited to the physical realm.

The customer browses the store and selects a few items that he brings to the adaptive fitting room. The fitting room immediately detects the items the customer has brought into the room through RFID. The customer is looking to purchase a winter coat, but has not made a final decision. The fitting room recognizes the product category and adapts both the lighting and scenery to place the customer in a bright and wintery landscape – both in order to augment the shopping experience, but also to place the product in a scenario that is realistic to the actual end-use of the product.

Undecided as he is the customer uses the in-room system for choice navigation – looking at the alternatives sizes, colors and products the store can offer. The shop floor assistant is on hand and supplying the alternative size. The in-room system also offers recommendations based on customer club membership and previous purchases the customer has made.

After finding a product, through the aid of the in-room navigation and shop floor assistant, with a desired fit and color, the customer opts for home delivery rather than carrying the bulky winter coat home himself. This order is actually filled from a different store that has a larger inventory and better facilities for home delivery, but this is invisible for the user who receives it at home at the agreed upon timeslot.

Shop floor assistant

The shop floor assistant may monitor real-time flow of products in the store based on the RFID-equipment fitted in the store. This allows for both an up-to-date inventory as well as the ability to see which products are tried in the various fitting rooms. For customers who have chosen to allow self-identification, it is also possible to for the assistant to see what the customer already owns from the brand (regardless of which channel it was obtained through).

Upon seeing that a customer has entered the adaptive fitting room with a winter coat, the assistant may choose to use the electronic recommendation engine to calculate potential items that he can recommend to the customer as well as alternate fits if he believes the customer might want to try on a different size. This reduces the "lead time" for the assistant in offering alternative or additional sizes or products to the customer. Additionally, the electronic aid helps the shop floor assistant in classifying how to approach the customer for a best possible interaction, as well as prioritizing between different customers based on more data.

Retail manager

RFID already allows the retail manager to monitor the inventory stock levels and gauge the efficacy of the visual merchandising and layout of the store. The detailed flow of products also better track to which extent products cannibalize each other – allowing the manager to differentiate between products "swapped on the rack" or if they make it to the fitting room (and later if it converts to a sale).

The adaptive fitting room not only gives an indication of fitting-room vs non-fitting room conversion rates, but also allows the manager to go "beyond" Point-of-Sale for conversion rates and distinguish between "which products are tried, but never sold" and "which products never make it off the shelf". The aggregation of this customer behavior allows for more detailed customer profiles and constant profiling and adapting the content of the fitting rooms to create the illusion of "a spit wash for every customer" based on detailed profiles.

The low cost of changing the fitting room experience when deployed also allows to continually re-create the initial wow-factor and deliver customer experiences that attracts potential customers in to the store.

Designer

In general, the designer is less 'in-the-loop' than the other roles described, often working a season or two ahead of the products that are currently in store. Feedback for designers often comes through multiple sources such as peer- and expert reviews, as well as turnover statistics of which products have sold well.

Based on fitting room statistics, such as combinations and products tried, but not bought – the adaptive fitting room may open up for pinpointed surveys of customers trying on specific products or combinations of – for direct customer engagement.

Discussion and Prospects for Future Research

The adaptive fitting room is an ambitious concept which is founded on numerous assumptions. First, it assumes that customers are interested in trying on garments in an environment that simulates situations in which the garment would typically be worn if purchased. Second, it assumes that an alteration of the fitting room is considered to be a positive experience for the customers. Third, it assumes that a fitting room provides sufficient space for numerous sensory stimuli. Fourth, it assumes that RFID can be used to trigger the adaption of the fitting room. Fifth, it assumes that the adaptive fitting room pays off. The list goes on. These assumptions need to be taken into consideration when adopting the concept.

Some of the assumptions relate to customers' willingness to adopt the concept. After all, more and more retailers use advanced techniques in order to create compelling in-store experiences to their customers, while the same customers regard traditional values such as the sales personnel's behavior, satisfactory product ranges and a good store layout as determinants of their in-store experience (Bäckström and Johansson 2006). We believe that the adaptive fitting room is not for everyone. It is aimed at companies that (should) try something 'crazy' once in a while, which have customers that crave technology and innovation rather than what is familiar. If a retailer that does not fit this profile adopts the adaptive fitting room, we fear that it may become just another 'irritating aspect of the shopping environment' (see d'Astous 2000).

Other assumptions relate to technical and physical feasibility of the concept. In our research, RFID antennae have been installed in real-life fitting rooms of a retailer. We see that detecting garments in one room at the time, with customers blocking the tags from the antennae when trying on garments, is a real challenge. This is important to overcome, as altering the fitting room to a real-life simulation requires a steady read over some time to ensure that the customer is in fact inside the fitting room. Other challenges are how to contain sound and light within fitting rooms that need may need to be open at the top and bottom due to theft protection and safety, and how to create a realistic environment, either with screens or video projection, within the very limited space of a typical fitting room.

Finally, it is a question of payback. While some (e.g. Soars 2009) argue that enhanced shopping experiences can have a significant impact on decision-making, store choice and spend, it is hard to foresee the effects of the adaptive fitting room with respect to actual conversion and increased sales. Even when in place, the effects of the concept may be hard to quantify, as it may for example bring customers to the store that purchase something without trying it on.

As is evident, there are numerous prospects for future research related to the adaptive fitting room. The multitude of assumptions needs to be addressed in order to further develop the concept.

Conclusion

In this paper we have presented a concept for a new customer experience – *the adaptive fitting room*. The idea behind this concept is to exploit automatic single item identification using RFID to adapt the fitting room of a retail store to the products that enter it, using video projection mapping, magic mirrors and screens, lighting and sound. In addition to opening up new possibilities for integrating product information, recommendations, clienteling and social media in the fitting room, we believe that it will possibly attract customers to physical stores and augment the stores' online presence. This is important in a time where physical stores need to play to their strengths and engage customers in novel ways in order to remain attractive and economically viable.

The adaptive fitting room concept acknowledges the potential of multiple sensory stimuli to influence shoppers' behavior. Further, it assumes that people are engaged by interactive installations, and that virtual simulations cannot fully replace physical touch and feel when it comes to trying on garments. Finally, it is strongly based on single-item RFID being in place. As such, it augments two of the three identified research streams on fitting rooms.

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