

Touching the void: exploring consumer perspectives on touch-enabling technologies in online retailing

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## **Touching the void:**

### **Exploring consumer perspectives on touch-enabling technologies in online retailing**

#### **Structured abstract**

**Purpose.** A major factor hampering the continuing and explosive rise of e-commerce, particularly for experience goods, is the lack of tactile information that could help to reduce uncertainty in consumer purchase decision making online. The paper aims to identify the specific touch-related properties worthwhile to enable in online retailing and the type of customer value that can be provided, as well as the drivers and barriers for consumer acceptance towards touch-enabling technologies for online shopping.

**Methodology.** By means of consumer focus groups we address the research questions regarding touch-related properties, their value to consumers and the drivers and barriers for consumer acceptance by taking into consideration two specific touch enabling technologies.

**Findings.** The study reveals that touch-enabling technologies can provide utilitarian and hedonic value to consumers, mainly at the pre-purchase stages in the path-to-purchase. Valuable applications conceived by consumers primarily pertain to offering information on material and geometric product properties. A hurdle for consumer adoption seems to be the necessity of a dedicated output device, such as a glove.

**Research limitations/implications.** Due to the early development stage of the new technologies under investigation, this study is exploratory in nature. The findings should be validated in the future, once these technologies actually get introduced for online marketing purposes.

**Practical implications.** This study aims to raise awareness among online retailers of marketing opportunities comprised in touch-enabling technology.

**Originality.** We provide a first outlook with regards to future consumer acceptance of touch-enabling technologies in online shopping and how and when such technologies can provide consumer value.

**Keywords:** Sensory-enabling technology, the sense of touch, haptic information, online retailing, consumer research, focus groups

**Article Classification:** exploratory research

## 1. Introduction

Online retailing can be defined as "adopting digital technology and the Internet to enable the buying and selling process and transactions" (Okonkwo, 2010, p.20). Since the beginning of the 1990s, many retailers have incorporated the Internet into their multichannel strategy. Researchers believe that online retailing will continue to disrupt how we shop and will completely change the paradigm of retailing (Shankar et al., 2010). It no longer seems to be a question of *whether* one should be online or not, the current issue many retailers face is *how* they can optimally market their offerings online (Overmars and Poels, 2015a). Today, a major perceived barrier for shopping online is still the lack of physical inspection possibilities for products offered online. This issue particularly matters for product categories characterized by experience attributes (Weathers et al., 2007). The dearth of sensory input when shopping online, makes consumers end up with less complete mental product images (Rosa and Malter, 2003) and as such substantial perceived risks associated with the purchase. This risk may induce shoppers on the one hand to abandon their online shopping trip all together, causing a direct loss in retail turnover. On the other hand, thanks (or due) to common free shipping and return policies, shoppers take the risk, order products online but if their expectations are not met, after physical inspection once delivered, the products are often being returned (Foscht et al., 2013). These tremendous amounts of returned packages cause substantial operational and financial distress for the retailer.

Beyond the use of the *Internet* for doing business, this study focuses on how *digital technology* in a broader perspective can provide online retailers with the means to further optimize the value proposition towards their customers. In accordance to Citrin et al. (2003, p.902), we strongly believe that:

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*"Technology may provide the means to bridge the gap that it created in reaching out and virtually touching the consumer, thereby promoting successful retailing to consumers via the Internet."*

In this study, the focus is particularly on *sensory-enabling technologies*, defined by Kim and Forsythe (2008, p.1102) as "technologies providing sensory input in the online shopping environment as a proxy for sensory experiences encountered in direct product examination, and including both product visualization technologies (visual support) and haptic interfaces (tactile support)". At present, the marketing of products via the Internet does not fully capitalize on human sensory processing, targeting consumers as primarily verbal/visual information processors. Yet, touch is one of the most prominent human senses.

Prior research has proposed compensatory measures such as price promotions (Yazdanparast and Spears, 2013) and enhanced mental imagery processing or image interactivity to simulate stroking gestures for indirect product experiences (Overmars and Poels, 2015a, 2015b), as well as substitutes such as virtual try-on (Kim and Forsythe, 2009) as means to *compensate* for the lack of touch online. However, academic research has thus far not yet examined solutions that provide a *real* experience, like the use of touch-enabling technologies. Moreover, the vast majority of research on the lack of touch in online shopping (cf. the aforementioned studies) focuses solely on the category of apparel.

The purpose of this paper is to explore the potential of touch-enabling technologies in an online retail environment from a consumer perspective by identifying the touch-related properties that are worthwhile to enable in online retailing, and examining how and for which product categories this can create value to consumers. In addition, the paper also explores the drivers and barriers for consumer acceptance of touch technologies and in which stages of the path-to-purchase they are most likely to be valuable. In this article, first, we provide a theoretical

backdrop regarding the literature on the role that the sense of touch plays in retailing. Next, we describe the potential value of touch-enabling technology in online retailing. Then, the research questions are formulated and the particular methodological approach for addressing them by means of consumer focus groups is outlined. Finally, the results of this exploratory consumer research are described along with conclusions, some indicative managerial implications and suggestions for further research.

## **2. Theoretical background**

### *2.1 Addressing the forgotten sense of touch in online retailing*

While vision and audition can be relatively well-addressed in online shopping settings, this is much less the case for touch. Nevertheless, this 'forgotten' senses has been proven to affect consumers in physical retail stores (Krishna, 2012). The human sense of touch is "the first sense to develop in the womb and the last sense one loses with age" (Krishna, 2012, p.335). As such, the ability of receiving and processing tactile information is the most extended during a consumer's lifetime. Therefore, it is interesting for marketers to particularly study how to optimally target consumers via touch.

Two types of touch-related properties with regards to products can be distinguished (McCabe & Nowlis, 2003). First, touch can offer diagnostic input with regards to the shape or the size of a product, also termed '*geometric properties*'. This type of touch-related properties can still be communicated reasonably well in words (e.g., diameter of a watch and breadth of the wrist band). Second, '*material properties*' can also offer relevant input upon evaluating certain categories of products. Such material properties comprise for example texture, weight,

temperature, softness and smoothness. This type of touch-related properties tends to require physical inspection through our sense of touch in order to allow for a thorough examination of the product in that regard (e.g., type of material of the wrist band and weight of the watch) (Grohmann, Spangenberg, and Sprott 2007, Degeratu, Rangaswamy, and Wu 2000, Klatzky, 1993). While almost all products can be inspected in terms of both geometric and material properties, for most product categories, one of the two touch-related characteristics prevails in terms of diagnostic value in consumers' evaluation of the product. While for a piece of home decoration like a vase, geometric properties need to be inspected in order to imagine whether the vase would fit one's interior and not be proportionally overly tall for example, upon choosing a new couch, the smoothness of the fabric and filling is likely to be more informative upon making a purchase decision. As the above mentioned examples illustrate, the sense of touch is inherently of more importance for material products than for geometric products (McCabe and Nowlis 2003), although geometric properties can also be examined through touch.

Besides serving as a means for the transfer of product properties, touch can also be used to make consumers feel at ease (Spence et al., 2014), and induce interaction with in-store merchandise. Experimental research has illustrated the positive impact of being able to touch a product on consumers' perceived ownership and the valuation of that product in online consumer behaviour, especially for products that vary substantially on touch-related properties (e.g. clothing and mobile phones; Peck and Shu, 2009). Perceived ownership has been found to induce a sort of endowment effect (i.e., positive valuation by consumers of items they perceive to own) and a higher reluctance of consumers to give up the product (Brasel and Gips, 2014). So, in addition to examining specific instrumental product information through touch, the experience of merely touching a pleasantly valenced object

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can influence persuasion, even if the touch element provides no information regarding the product (Peck and Wiggins, 2006).

## *2.2 Compensating for a lack of sensory input in online retailing*

A variety of compensatory measures has been developed and tested to make up for the absence of sensory information in online retailing. Studies have demonstrated that in the absence of touch, inducing a positive mood, granting price promotions and targeting customer segments with sufficient product expertise are all *marketing measures* that positively impact purchase intentions and particularly increase evaluation confidence (Yazdanparast and Spears, 2012, 2013).

Beside marketing actions, technology can also be used to compensate for the lack of multi-sensory input. Recent research points out that visual characteristics of the product representation in online retail interfaces (e.g., static product pictures vs. a dynamic mix-and-match webshop) have the power to activate mental imagery on touch-related properties of the depicted clothing in the webshop (Overmars and Poels, 2015a). Furthermore, being able to exert control with a computer mouse to simulate stroking gestures (e.g., on the fabric of a scarf one is examining for purchase) was found to positively affect product understanding (Overmars and Poels, 2015b). While continuous progress is made in optimizing such visual interfaces, these vision-oriented technology measures will never allow for simulating a perfectly 'real feel' of the depicted products.

## *2.3 Enabling sensory input in online retailing via touch technologies*

From a technological point-of-view, user interfaces that address senses other than vision have so far rarely been considered regarding their potential to improve online shopping. Many of these multi-sensory and particularly touch-enabling interfaces are promising (Brewster et al., 2007; Wastiels et al., 2013), but until today they remain underexploited, as they often still find themselves at the concept/prototype stage and advancements in their development are rather driven by a search for applications in other contexts than for online shopping purposes (e.g., optimizing gaming interfaces or medical application; cf. section 2.4).

Upon inspecting the IT literature on touch-enabling interfaces, two distinct interfaces can be discerned allowing for providing touch-input in an online context: (1) actuators (e.g. a haptic glove), and (2) mid-air tactile sensations (e.g. AirWave; Gupta et al., 2013). First, actuator technology uses electric forces and converts them into motion to apply a force to, for instance, the person's hand. This force stimulates our nervous and muscular system so that the user can feel 'touch' elements such as weight, texture or shape. A main advantage of this on-skin technology is that there is an association with human touch interactions which adds expressiveness (Weigel and Campus, 2014). Second, some touch-enabling technologies, though less numerous, can be classified as mid-air tactile sensations, making use of air or airborne ultrasound to generate touch. The main advantage hereof is that users do not need to hold a device or have a device attached, which however challenges the design to provide touch-related feedback at the right location (Wilson et al., 2014).

In terms of the specific applications described in the original Human-Computer Interaction studies reporting on these touch-enabling technologies, some are positioned as mainly facilitating touch-related input to make virtual objects feel more concrete. Examples of technologies that enable feeling textures or 3D shapes are haptic glove technology, and haptic tablets which use on-skin actuators and ultrasonic waves respectively in order to transmit touch



information. Other examples include Feel Through Window (similar to the haptic tablet; Saga et al., 2012) and Airwave which provides free-air sensations that can be projected onto the skin to generate sensations such as rain or texture (Gupta et al., 2013). Other touch-enabling technologies are mainly described as facilitators of remote human interaction (e.g., Kissenger and Remote Handshaking; Samani et al., 2012; Nakanishi, 2014; Hamam et al., 2014). A technology such as the Kissenger allows for the remote transferral of kisses via an interface, and was designed for couples in long-distance relationships. Such technologies regarding interpersonal interaction could be considered rather far-fetched. Other applications reported in the HCI field include personalization of haptic information by allowing the user to create layers of textures and superimposing them to images (e.g. Haptic Editor; Kamuro et al., 2012).

#### *2.4 The value of touch-enabling technologies in online retailing*

Touch interfaces have been found to have a number of successful applications in the fields of surgery, prototyping and assistance for persons with visual impairment (Nam et al., 2014). While touch-enabling technologies have, so far, not yet found their way to the context of online commerce, previous studies on interactive technologies (among which touch technologies can be classified) have demonstrated a range of opportunities for creating consumer value in terms of entertainment and this along the various stages of the path to purchase (Pantano and Naccarato, 2010).

With regards to touch interaction, both utilitarian (task-oriented) and hedonic (recreation-oriented) shopping motives can be addressed (Peck and Childers, 2003). Whether the shopper has a utilitarian or hedonic motivation affects the kind of shopping environment he/she seeks. The key for retailers is to *maximize the motive–environment fit* by providing

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environmental conditions that support the shopper's quest to fulfill his/her needs. Thus, the store environment must fit with customers' shopping motivations (Kaltcheva and Weitz, 2006). Correspondingly, the role of touch in the online shopping environment should match shoppers' Need For Touch, which can either be *instrumental* (i.e., for functional purposes, cf. Section 2.4.1) or *autotelic* (i.e., for fun, cf. Section 2.4.2) (Peck and Childers, 2003).

#### 2.4.1 The utilitarian value of touch-enabling technologies in online retailing

Utilitarian touch can be considered a goal-driven search for haptic information in order to achieve certainty in one's judgment of a product. For example, a consumer may want to pick up a notebook computer to assess its weight and portability. According to *Attribution Theory*, intrinsic cues, such as shape or texture, often matter even more than extrinsic cues, such as price and brand name (Szybillo and Jacoby, 1974). In their *Integrated Information Response Model*, Smith and Swinyard (1982) argue that direct hands-on experiences are more powerful in conveying a message and strengthening product attribute beliefs, than indirect, highly mediated product experiences (e.g., via advertising). In addition, (perceived) tangibility has a strong positive impact on perceived diagnosticity and in turn on purchase intentions (Verhagen et al., 2016). This finding particularly holds true for the communication of experience attributes (e.g., fit, texture, taste) of a product, and only to a lesser extent for search attributes (e.g., price) (Wright and Lynch, 1995; Overmars and Poels, 2015a).

#### 2.4.2 The hedonic value of touch-enabling technologies in online retailing

Marketing research has demonstrated that consumers have an innate need for tactile input (i.e., 'Need For Touch'; Citrin et al., 2003). 'Need for touch' refers to the "preference for the extraction and utilization of information obtained through the haptic system" (Peck

and Childers, 2003, p.431). Plenty of research in the services- and consumer research literature has found evidence on the fact that touch can also offer 'fun' beyond 'function', or the role that touch can play (cf. e.g. Spence and Gallace, 2011; Eroglu et al., 2001; Crusco and Wetzel, 1984). Particularly for hedonic oriented shoppers, touch can be an end in itself, beyond its diagnostic role in providing product information. Peck and Childers (2003) as such describe *autotelic* touch as sensory aspects of product touch that pertain to spontaneous investigations in exploratory variety seeking via touch, merely for enjoyment. Consequently, touch-enabling interfaces in online retailing can be expected to offer hedonic customer value via sensory gratification.

#### 2.4.3. *The role of touch-enabling technology along the path-to-purchase*

Technology can serve as a means to affect shoppers along different steps in their decision-making process (Willems et al., 2017). A complete path-to-purchase is commonly agreed upon as consisting of five more or less consecutive steps, in all of which technology can assist retailers in targeting the shopper more effectively (Willems et al., 2017), namely (1) need recognition (e.g., technology for informing consumers about new arrivals or new products), (2) information search (e.g., achieving fast and detailed information about products and comparing them indirectly), (3) evaluating alternatives (e.g., directly comparing alternatives), (4) purchase (e.g., helping with the actual purchase) and (5) post-purchase (e.g., sharing product reviews). For touch-enabling technologies, it can also be expected that they offer value to shoppers in various stages of the path-to-purchase. When it comes to providing touch-related information of products (e.g., texture of a wrist band of a watch), the value is for example offered mainly in the stage of information search and/or evaluating alternatives.

## 2.5. Consumer acceptance of touch-enabling technology

Research regarding new technologies often considers the extent to which consumers are prepared to open themselves up to a particular technology. Consumer adoption intentions have been examined with respect to various technological innovations in past research, such as for example acceptance intentions of virtual try-on (Kim and Forsythe, 2008) or augmented reality (Rese et al., 2014), by applying the Technology Acceptance Model (TAM; Davis, 1989). The TAM has been described as "the most influential and commonly employed theory of information systems (Lee et al., 2003, p. 752) but has also been adapted to suit retail-related technology acceptance (Pantano, 2014), and has been extended to newer versions such as the Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003).

Factors examined in a quantitative TAM approach pertain to the perceived usefulness and perceive ease-of-use of a consumer technology and how these elements drive adoption. In UTAUT, perceived enjoyment or hedonic value of the technology is additionally incorporated to predict and explain consumers' attitudes toward using and the actual use of the technology. Overall, the TAM/UTAUT model provides a framework that can serve as a topic guideline to examine the acceptance and barriers towards using touch technologies.

## 3. Research objectives

"it is not the technology per se but *how* it is used to create value for customers that will determine success" (Burke, 2002, p. 427).

As Burke (2002) underscores, technologies can only provide value to consumers when their use is relevant and answers to consumers' needs. Therefore, the focus of this research

pertains to the consumer in particular. The objective of this research is twofold. The first objective is to identify which specific touch-related properties (i.e., geometric and material properties) would be worthwhile to enable in online retailing, and – at a broader level – what type of customer value can be created via touch-enabling technology (e.g., are both functional and hedonic applications conceivable?). A second objective is trying to get a better understanding of drivers and barriers for consumers' acceptance towards touch-enabling technologies in online shopping (cf. Technology Acceptance Model) and when the use of this kind of technology is most likely to be valuable and adopted by consumers. In particular, we address the following four research questions:

- RQ1a: Which touch-related properties would be worthwhile to enable in online retailing?
- RQ1b: How (i.e., in terms of specific applications) could touch-enabling technology add value for consumers in online shopping?
- RQ2a: What is the outlook with regards to future consumer acceptance of touch-enabling technology in online shopping?
- RQ2b: When (i.e., in which stage of the shopper's path-to-purchase) are consumers most likely to value touch-enabling technologies upon online shopping?

## **4. Research method**

### *4.1. Focus group research*

In order to investigate the potential of using touch technologies for retail purposes from a consumer perspective, a qualitative research method – focus groups – is used. Focus

groups are informal discussions between participants on an a priori determined topic (Beck et al., 1986) that allow for exploring subjective experiences, attitudes and opinions (Carlsen and Glenton, 2011). Focus groups differ from group interviews due to the emphasis on the interaction between the participants (Morgan, 1997). As such, a focus group allows researchers to learn more from the participants, who are in turn stimulated by a snowball effect to express their views (Kent, 2007). As the focus of this study is on gaining knowledge on consumers' perceptions of touch-enabling technologies in online shopping, as well as their ideas on the possible applications of these technologies, focus groups are deemed a suitable research method (Geuens et al., 2003).

#### 4.2. Sample

In social sciences, focus group research most commonly relies on a total of 3-4 focus groups (Stewart et al, 2007; Kent, 2007). The recommended group size per focus group varies between 6 and 12 participants (Stewart et al., 2007; Vaugh et al., 1996). In this study, four focus groups are run, consisting of 9 or 10 respondents each. The respondents were recruited from the student body enrolled in a 'strategic marketing' course, which is part of a MSc Management evening program at a Belgian University, thus providing the respondents with basic knowledge on marketing and retailing. Note that in this evening program, most enrolled students are employed with a number of years of working experience. As the course is provided both in Dutch and English, two focus groups took place with Dutch-speaking Belgian students, and two focus groups pertained to international students (originating from Spain, Columbia, Palestine, Ukraine, Greece, Turkey, Tanzania, Croatia, Slovakia, Portugal and Ireland).

The participants' ages range between 23 and 42 years old, and a total of 17 male and 20 female respondents participated in the focus groups. With regards to online shopping behavior, all respondents have previously purchased goods online, with over half of them doing so more frequently than once a month. Participants were eligible to receive a bonus point for their strategic marketing course as an incentive for taking part in the focus groups. Full details on respondent demographics can be retrieved in Table 1.

	Number of participants (%)
<b>Age</b>	
21 – 25 years old	12 (32.4)
26 – 30 years old	13 (35.1)
31 – 35 years old	8 (21.6)
36 – 40 years old	3 (8.1)
41 – 45 years old	1 (2.7)
<b>Gender</b>	
Male	17 (45.9)
Female	20 (54.1)
<b>Respondent occupation</b>	
Student	13 (35.1)
Employed	24 (64.9)
<b>Origin (Nationality)</b>	
Belgian	21 (56.8)
Non-Belgian (international)	16 (43.2)
<b>Respondents' online shopping frequency</b>	
< once a year	2 (5.4)
Several times a year	13 (35.1)
Monthly	14 (37.8)
Weekly	8 (21.6)

**Table 1.** Sample profile

#### 4.3. Procedure

The four focus groups were all hosted at the university campus in a meeting room that was booked dedicated to the focus group meetings. They all took place on a weekday evening in March 2017 (i.e., 8, 9, 14 and 15 March). On average, the focus group duration was around 1.5 hour long. Sandwiches and beverages were provided. All focus group discussions were

moreover film- and audio recorded, for which the participants had declared their consent in advance. In order to get acquainted and create a friendly and open atmosphere among the participants, the moderator hosting the focus groups started the sessions by inviting all participants to present themselves (e.g., name, age, occupation).

During each session, the moderator hosting the focus group followed an a priori compiled topic guideline. Although the emphasis during focus groups is to freely explore and understand consumer perspectives (Kent, 2007), a topic guideline allows for semi-structuring the group discussions. As such the brainstorm and the resulting output could be guided in the direction of answering the four aforementioned research questions. In particular, the topic guide covered the following topics: (1) motives consumers have regarding their sense of 'touch' in physical stores, (2) particular applications of touch-enabling technologies that would add value to the online shopping experience, (3) drivers and barriers to use touch-enabling technologies in online shopping, and (4) stages in the path-to-purchase when the technology would be most valuable to the consumer.

In order to elicit free associations of the participants upon starting the focus group with the first topic (i.e., motives to touch in physical stores), the moderator started by asking input from the group by raising the following questions: 'When we go shopping, we sometimes need/want to touch products. Why? What properties do we mainly wish to know more about? What do we want to experience?'. A powerpoint slide was shown depicting these key questions, to facilitate consumer response elicitation in the group. The participants were asked to put down ideas on post-its as well as to share them out loud. The moderator clustered the post-its on the blackboard around common underlying topics.

Subsequently, the moderator guided the participants of the focus group to the topic of online shopping. Some advantages of shopping online were presented, after which also some



disadvantages were covered, among which the lack of a multi-sensory shopping experience. After this introduction, the participants were asked whether they had already heard about touch-enabling technologies. In order to enable a rich discussion on this second topic in the topic guideline (i.e., impression of touch-enabling technologies in online shopping and imagining valuable applications), as well as the subsequent topics (i.e., drivers/barriers to use the technology, and when in the path-to-purchase the technology would be particularly valuable), two different touch-enabling technologies were presented to the focus group respondents.

There are many technologies documented in the IT literature and in related practitioner magazines (cf. Section 2.3), but only two were selected by a team of marketing experts, mainly focusing on the criterion of the plausibility of the technology and particularly the ease of imagining using it. Both pertain to the category of actuators, which is at present the most developed class of touch-enabling technologies. The first selected technology entails a *haptic touchscreen tablet* that conveys tactile sensations via ultrasonic vibrations (cf. Figure 1). The technology is presented as being incorporated in a tablet and can transmit textures and the sensation of interacting with a surface or object. The second technology consists of a *haptic glove and virtual environment* (cf. Figure 2). The user must wear a glove that contains actuators that allow for the transfer of tactile properties such as texture, weight, temperature, and interaction with an object. Other, more far-fetched and still rather futuristic touch-enabling technologies were discarded for the focus groups. Many advancements in the development of touch-enabling technologies still find themselves in a prototype stage, at which the conception of the technology is rather abstract, and still lacks comprehensible demonstration means that would serve to illustrate the functionalities to regular consumers who are novice to the IT domain.

For the two selected illustrative touch-enabling technologies, an insightful demonstration video was available to play as support during the focus groups, providing an accessible basic overview of some of the main possibilities of the respective technologies. None of the demonstrations depicted in the videos however pertained specifically to marketing-related applications. The videos merely demonstrate the touch properties that are enabled via the technology and how they are made accessible to the user.

*[please insert figures 1 and 2 about here please]*

## **5. Research results**

This section presents the results of the four conducted focus groups, organized according to the four research questions that are central in this study. Section 5.1 reports on consumer motivations to touch in physical stores (i.e., RQ1a) while section 5.2 documents on the value that consumers see in touch-enabling technologies for online shopping (RQ1b). Section 5.3 details on drivers and barriers for the adoption and usage of such technologies from a consumer perspective (RQ2a). Finally, section 5.4 situates at which stage of the consumers' path-to-purchase this kind of technology seems most likely to be of value and to get adopted by consumers (RQ2b). Quotes from focus group participants illustrating the results are presented consistently in italics and within quotation marks.

### *5.1. Consumer motivations for using the sense of 'touch' in physical stores*

Consumers were probed with respect to their motivations for using their sense of 'touch' while shopping in bricks-and-mortar stores (cf. RQ1a). Regarding the question on why consumers want to touch things in physical retail settings, top of mind answers that were

elicited can be classified into three main classes: (1) the *material* of the product, (2) *geometric* product specifications, and/or (3) *general impressions* that one can form by experiencing a product via touch (cf. Table 2). For each of the elicited touch-related properties, the participants were in a subsequent round invited to reflect on particular product categories for which these particular touch characteristics are important in forming an evaluation. Doing so, the moderator indirectly also guided the participants in a step-by-step way into thinking in terms of scenarios for which touch-enabling technologies in online shopping would prove valuable (cf. RQ1b – see Section 5.2).

First, the *material* properties of the product comprise elements such as the texture, hardness, softness or warmth of a material. Such properties were largely associated by the participants with apparel, but also with cosmetics, jewellery, interior products such as tiles, wall paper and curtains, as well as building materials.

Second, gaining information about *geometric* product specifications such as the weight, size, dimensions, and fit was also associated with in-store touch. The respondents seemed to associate these properties most strongly with products such as electronics, for which they want to see whether the product is easy to handle and fits within the person's allocated space (e.g. a pocket or a bag), but also for the fit of clothing and shoes, the weight of jewellery, the shape of interior products, and so forth.

Note that the associations between elicited touch-related elements (i.e., material as well as geometric) and product categories that were deemed in need of being physically inspected in this regard, was generally uniform among participants, and across all four focus groups. However, the product categories that were mentioned did seem to differ somewhat between female and male respondents (e.g., clothing and jewellery for women; building materials and cars for men).

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Third, the participants raised more general 'experience'-related motives for touching as well. In this case, touch serves as a means to appraise the overall product quality, its luxuriousness or the ease of use of the product. Apparently, the ability to touch certain products can also allow for holistic impression formation, allowing consumers to take shortcuts (heuristics) in their information processing about the product. Whereas previous motives mainly contribute to provide consumers with 'information' via touch (i.e., material and geometric properties evaluation), a 'fun' aspect of touch through experience is as such deemed relevant as well. The following quotes illustrate this point:

*"Sometimes when I go to the clothing store, I just touch, even without the intention of buying. I just touch the other stuff along the way. It is fun, we all do it."*

*"When you see a winter coat and it is soft, I enjoy touching it."*

Touch-related elements	Product categories with need of 'touch'
<b>PRODUCT MATERIAL</b>	Apparel & shoes
- Texture	Cosmetics
- Hardness	Jewellery
- Smoothness	Fruits and vegetables
- Warmth	Furniture
<b>PRODUCT SPECIFICATIONS</b>	Electronics
- Size	Building materials
- Dimensions	Interior
- Fit	Cars
- Weight	Toys
<b>PRODUCT IMPRESSIONS / EXPERIENCE</b>	
- Luxury	
- Quality	
- Freshness/ripeness	
- Ease of use	
- Usage experience	
- Fun	

**Table 2.** In-store touch motivations: Properties and product categories

## 5.2. Applications of touch-enabling technology for online shopping

This section addresses RQ1b and reports on online shopping applications that participants could imagine for each of the two specific touch-enabling technologies that were illustrated by playing a video demonstration. Broadly two categories of customer value seem to be covered by the elicited applications, namely utilitarian and hedonic customer value.

#### *5.2.1. Applications providing utilitarian customer value*

The facilitation of evaluating *geometric* touch properties (such as the size, dimensions and weight of a product) was by no means associated with the tablet technology, in either of the four focus groups. The glove, on the other hand, was strongly associated with enabling inspection of these kinds of geometric properties. It is a technology that appears largely linked to the evaluation of particularly the product category of consumer electronics (e.g., allowing to examine how heavy a mobile phone or laptop is), but also with products such as jewellery. In addition, the fit of products, such as shoes was also something that the participants could image being potentially addressed by the glove technology (e.g., with a foot glove), while the fitting of clothing was deemed not achievable with a small tool of a size similar to that of the glove.

*Material* touch properties like texture, softness and smoothness were found to be transferrable via both types of technologies (i.e., both the tablet and the glove under study). With regards to the tablet, texture is the predominant property conveyed by the technology. As such, the technology could provide information about the softness, smoothness, etc. of a product. Although the haptic glove technology also allows for the transmission of texture, which is also mentioned in the demonstration video, the associations of this application with this technology are much less abundant. The takeaway that most respondents rather link to this glove technology is either related to geometric touch properties or the experience of

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Helena Van Kerrebroeck, Kim Willems and Malaika Brengman. (2017). "Touching the void: Exploring consumer perspectives on touch-enabling technologies in online retailing." *International Journal of Retail & Distribution Management*, 45(7/8), 892-909.

holding the product in general or using the product, as illustrated by the following quote of one of the participants:

*"For example when buying a razor, you could feel what the shaving result would be like without physically having to buy the product."*

In addition, the glove also allows for the transmission of the material property temperature. Temperature could, for instance, be interesting or of diagnostic value when evaluating travel locations, in terms of whether or not the (water) temperature at the destination in a certain season is to a person's liking.

#### *5.2.2. Applications providing hedonic customer value*

When shopping, touch is an element that can provide sensory gratification, as argued by one of our focus group participants: *"When I go shopping for clothes, I can feel them. It is fun."* Besides using the technology for informational purposes, it can also provide consumers with novel and fun ways to interact with products. According to the respondents, this holds true for both types of technology. The technologies allow consumers to actually *"get a feel of [the product]"*. For the tablet, this is mostly related to the texture of the product. For the glove, this extends beyond material properties to geometric properties as well, providing a fun aspect, as *"it is like a magician's glove"*. As such, it can allow one to hold a mobile phone and really experience what it would be like to hold it and use it.

Helena Van Kerrebroeck, Kim Willems and Malaika Brengman. (2017). "Touching the void: Exploring consumer perspectives on touch-enabling technologies in online retailing." *International Journal of Retail & Distribution Management*, 45(7/8), 892-909.

	<b>Geometric properties</b>	<b>Material properties</b>	<b>Hedonic value</b>	<b>Types of products</b>
<b>Tablet</b>	/	Texture Hardness Smoothness Glossiness Resistance	Fun	Apparel Mobile phones Interior: curtains, tiles, wallpaper Furniture Building materials
<b>Glove</b>	Size Dimensions Weight Fit	Warmth Texture	Usage experience Ease of use Fun	Electronics Cars Shoes Jewellery Clothing

**Table 3.** Touch associations per technology

### 5.3. Drivers and barriers for consumers' acceptance of touch-enabling technologies

The insights generated regarding RQ2a mainly centred around three themes: (1) ease of use of the technology, (2) perceived usefulness of it, and (3) general attitude toward the technology.

#### 5.3.1. Ease of use

A general consensus in all groups appeared to exist with regards to the acceptance and use of the technologies. The tablet is considered to be the technology with the lowest usage barrier. It seems to be the technology which is easiest to envision given its incorporation in a tablet, a device which most consumers nowadays are used to. The glove, by contrast, is often perceived as rather unwieldy due to the fact that one has to wear a special glove. One of the participants illustrated this point as follows: *"I cannot imagine that I would walk around carrying the glove with me all day, so that I have it ready to use just in case I want to buy something online"*. Nevertheless, the glove is also considered to be the more versatile touch-enabling technology.

#### 5.3.2. Perceived usefulness

While the barriers pertaining to the tablet seem lower, a general preference towards the glove is expressed almost unanimously. Overall, it is the technology that is perceived as being "more advanced" as the range of product properties that can be examined is expected by the consumers to be wider. The tablet is considered to be useful mainly for "*products for which you solely wish to feel the texture*" such as clothing or the material of a sofa.

The usefulness of the technology is, according to the consumers, primarily determined by the product category it would be used for. If, for instance, the technology is used for fruits or vegetables, respondents do not consider it to be useful due to the fact that you can get information about the ripeness of the fruit in general, but not about the exact piece of fruit you are actually going to receive if you order it online. Similarly, consumers are reserved in terms of the functionalities of the technologies, and expect that they cannot provide the full range of information for all products:

*"When you feel textile, it can help you distinguish whether something is, for instance, synthetic or not. But when it comes to different shades of quality, then it gets complicated."*

Overall, consumers are more likely to perceive the technology as useful for (1) products they find important and are thus likely to investigate more thoroughly before buying, (2) more expensive and luxurious products as the perceived risk is higher, (3) products that are not readily available in physical stores nearby and for which one has to travel far to try them out (e.g. a special type of material for building) and (4) products for which the tactile information available via the technology is sufficient and can be transmitted via touch on the hands (e.g. sitting in a sofa or driving a car cannot be transmitted solely via touch on the hands as the entire body is involved in this sensory experience).

*"There are plenty of things you can only feel with other parts of your body than your hands. Imagine the feeling of sitting in a leather couch wearing shorts so with your*



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Helena Van Kerrebroeck, Kim Willems and Malaika Brengman. (2017). "Touching the void: Exploring consumer perspectives on touch-enabling technologies in online retailing." *International Journal of Retail & Distribution Management*, 45(7/8), 892-909.

*naked thighs on the couch seating... How that feels to your skin, particularly on a hot summer day... That is relevant information, but in fact, you cannot feel it that way in a regular store either."*

### 5.3.3. Attitude toward the technology

Whether or not consumers consider a technology to be useful and/or easy to use will impact their attitude toward the technology and its adoption. The general perception of the technologies is that the tablet is the more "accessible" technology, while the glove is considered more "futuristic" and "exciting, but there is something creepy about it as well". The accessibility of the technology actually depends on how present it is, as people are more likely to use the technology "if it is available by default". As such, the participants believe that marketers should first focus on providing accessible touch-enabling technology such as the tablet to the market, in order to prime consumers to be more familiar with the concept of touch-enabling technologies, before introducing a more far-fetched technology, such as the glove, which may become more acceptable once the touch tablet becomes mainstream.

In addition, the attitude towards using the technology is currently also hampered by the element of trust. This is a factor that is commonly associated with acceptance issues regarding, for instance, online shopping, as a lack of trust increases the level of perceived risk (Benedicktus et al., 2010; van der Heijden et al., 2003), as evidenced by the following questions raised by one of the focus group participants:

*"Who protects the consumer in saying that this is the actual feel?"*

### 5.4. Impact according to the stage in the path-to-purchase

According to the responses from the participants, touch-enabling technologies can primarily assist in the first three stages of the path-to-purchase, namely in the need recognition stage, the information search and the search stage in which alternatives are evaluated.

#### 5.4.1 *Need recognition*

The technologies could draw consumers' attention by informing them about new products. For example, if consumers see an advertisement for a sofa or a mobile phone, for instance, and could then actually feel it, this could trigger them to visit a store to buy it. Whether this effect would last in the long-run is uncertain, as touch-enabling technologies could certainly draw consumers' attention, "*especially if you are the first mover*", but when all retailers provide it, it will seem "*normal*". So, on the basis of these participant comments, the novelty effect, that is likely to initially draw consumers' attention and incite latent needs, may wear-out over time.

#### 5.4.2. *Information search*

The technologies can provide certain touch-related information. They can provide consumers with information on how likely they will be satisfied with certain products, "*depending on whether they like the feel of the material on their skin*" or the type of finish various paints or varnishes can provide (matt, glossy,...). Depending on the technology, different properties could be conveyed more effectively (cf. Table 3 and section 5.2.1).

#### 5.4.3. *Evaluating alternatives*

Both touch-enabling technologies used to guide the focus groups are deemed appropriate and useful when comparing different products. Although the technology may not lead to an online purchase per se, it can most certainly assist in narrowing down the set of products in which a consumer is interested. For instance when purchasing a mobile phone, the glove could allow a person to compare the weight and dimensions between their current mobile phone and the phone they may purchase. Similarly, the tablet can help to narrow down the potential products one is interested in, by offering input regarding texture and how alternative products differ from one another in this regard:

*"If I already know that sofas 1, 5 and 10 are most to my liking in terms of texture and softness, I no longer need to try every single sofa in order to decide."*

Nonetheless, according to the input elicited from the focus group participants, touch-enabling technologies do not facilitate the stage of the purchase itself, nor the post-purchase follow-up stage, as illustrated by the following quote linked to the sofa example (i.e., product category with relatively high perceived risk given the amount of expenditure that is related):

*"It can give you a general first impression of a product, but this would be too limited to find out much more. I would still go to the store afterwards."*

#### 5.4.4. Purchase

In general, the touch technologies are perceived as interesting, but providing too little information to encourage the actual purchase of products. Although having a touch technology is considered as *"better than nothing"* to make the final decision, it is generally considered as *"not enough"* as not all information is there, because *"you're still not touching reality"*.

Instead, the focus groups do point out that touch technologies have a role to play in the purchase decision. However, rather than persuading consumers to purchase, the participants

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Helena Van Kerrebroeck, Kim Willems and Malaika Brengman. (2017). "Touching the void: Exploring consumer perspectives on touch-enabling technologies in online retailing." *International Journal of Retail & Distribution Management*, 45(7/8), 892-909.

seemed to agree on the fact that the technologies provide input that consumers value in order to avoid buyer's remorse. The information provided by the technology can disillusion the individual, in case it reveals that the product is not exactly as hoped: *"I wouldn't spend any more time on [purchasing the product] if I know it is not as expected"*.

#### 5.4.5. Post-purchase

While the presented touch-technologies do not seem to incite the actual purchase of a products, they do show potential regarding the reduction of product returns. As bad purchases are avoided due to the additional touch information provided, the number of product returns can in consequently be reduced. The participants indicated that when they receive information that displeases them (e.g., the texture being rougher than expected), they *"wouldn't buy it, but then also not have to return it"*.

## 6. Conclusions and discussion

*"Improving sensory experience in remote channels is often difficult. [...] research is being directed to invent methods of sensory information transmission over computer-mediated channels such as computer mice that "feel" textures [...]. Such research may seem far-fetched, but [...] these efforts may be well justified"*. (Weathers, Sharma and Wood, 2007, p. 399)

While some pioneering marketing scholars already recognized the potential of touch-enabling technologies a decade ago, academics have so far not examined the value these technologies may have for remote sensory retail experiences. Instead, prior studies addressed the issue by examining compensatory and substituting measures such as enhanced mental imagery or virtual try-on offered online (Overmars and Poels, 2015a; Kim and Forsythe, 2009).

As such, the findings of this study contribute to the literature as they shed a first light on how touch technologies can improve the sensory experience of consumers via remote retail channels.

More specifically, the study addresses two main research objectives. First, it identifies which touch-related properties are worthwhile to address in online retailing, in what particular product categories they matter most, and how they can add value. Second, this study reveals the main drivers and barriers toward consumers' acceptance of the technology, and – beyond – whether effects can be expected on consumers' purchase and post-purchase behaviour. First, regarding the touch-related properties, the participants identified both utilitarian and hedonic uses for the touch-technologies, as they can provide the users with product information but also appear to be fun to use. On top of that, a wide range of product types were identified for which the technologies could be useful (e.g., interior products, jewellery, apparel and electronics), thus extending the scope of remote touch research beyond fabrics and apparel as focused on mainly in prior research.

Regarding the acceptance of the technologies, users are critical, as the technologies are still in their infancy. Nevertheless, the technology is deemed useful within several stages of the path-to-purchase, as it can help draw consumers' attention to a particular product, provide product-related information which helps in the search process and to evaluate alternatives. Regarding the actual purchase, the technologies are deemed less impactful, although they do inhibit erroneous purchases as a result of the additional information provided, thus potentially leading to a decline in product returns during the post-purchase process. As such, this study pioneers in mapping the potential value of a specific touch-technologies for online marketing purposes.

## **7. Suggestions for further research**

As this qualitative study indicates that touch technologies can indeed provide value to consumers, this research opens up a new array of future research opportunities for academics. First of all, the focus groups with consumers could be supplemented with follow-up quantitative data as soon as the technology breaks through, in order to verify the exploratory findings. As such, analysis could consider consumer-related personal factors such as technology anxiety or innovativeness (Kim and Forsythe, 2008). Innovativeness has been found to exert a moderating effect between attitudes and actual technology usage. In addition, the concept of technology anxiety may play a role, as the effect of touch-enabling technology on people is not yet known. The glove technology makes use of actuators and is a dedicated device, which may seem disconcerting to certain consumers, more so than the touch tablet.

Second, given the focus on the creation of value for consumers through the introduction of touch-enabling technology, the current study explores consumers' responses. Further research could investigate insights from retailers, as technological innovations may impact corporate strategies (Renko and Druzijanic, 2014).

Third, as the exploration of the barriers toward accepting touch technologies reveals that some limitations regarding the technologies still exist, this research also calls for both academic and practitioner ICT-developers in the field of HCI and touch to further develop the technologies in order to lower the usage barriers (e.g. for the glove) or to combine several touch-enabling techniques in one device to enable retailers to deliver both material and geometric product information.

Fourth, beyond touch, there are two other 'forgotten' senses that could be explored in terms of the potential to address them in online retailing, namely smell and taste. How about spreading a brand signature smell of Abercrombie & Fitch in the consumer's living room as (s)he enters the webshop? Or what about technologies that would allow Ben & Jerry's to

provide a sense of taste of the latest newcomer in their ice cream assortment to online visitors of their website? The imaginable applications most certainly seem legion. Unfortunately the state of development of smell- and taste-enabling technologies for online (retail) purposes is not as far advanced as that of the (also still fairly young) field of touch-enabling technologies. Testing these types of technologies is as such still even more challenging. Given the relevance of online shopping and the fast pace of the evolution in sensory-enabling technology development in the IT discipline, however, the future for further research in this regard in any case looks bright.

## **8. Managerial implications**

When taking a look at the findings from the focus groups and the potential ascribed to touch-enabling technology from the point of view of consumers, we find that they do show potential in terms of affecting the consumers' decision-making process. Combined, the technologies are perceived to be able to address both geometric and material product properties, but also to provide hedonic benefits. As such, consumers' needs for both functional and experiential sensory gratification (cf. Eroglu et al., 2001) in (online) stores could be (partially) addressed via touch technology. When considering each technology in its own right, we find that the tablet is considered to be the most accessible technology that could be introduced to markets with low entry barriers if incorporated in already existing technology such as an iPad. The limitation of this technology is however that only texture-related properties can be conveyed. Yet, consumers also find geometric product properties interesting, which are rather communicated via the glove technology.

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Helena Van Kerrebroeck, Kim Willems and Malaika Brengman. (2017). "Touching the void: Exploring consumer perspectives on touch-enabling technologies in online retailing." *International Journal of Retail & Distribution Management*, 45(7/8), 892-909.

The current findings can encourage online retailers to investigate the extent to which touch technologies can provide value to their company specifically, depending on the type of product they are offering. Retailers providing products for which texture is of great importance could invest in the tablet technology, to provide additional information to their customers. On the other hand, retailers that offer products with geometric product properties could look into technologies such as the glove technology to provide their consumers with relevant touch-related input. Beyond providing information, retailers can also utilize touch technologies to fulfil the needs of more hedonically-oriented customers, thus potentially resulting in more positive consumer patronage behaviour (Kim, Fiore and Lee, 2007). In addition, the findings of this study raise the expectation that touch technologies can lower product returns, which can potentially benefit retailers, as the number of product returns in online retail is high and leads to a decrease in profits (Petersen and Kumar, 2009).

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