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Consumer valuation of the wearables: The case of smartwatches

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ABSTRACT

Wearable devices indicate objects encompassing both mobile computing and fashion characteristics. Although the combination of the two characteristics is relatively new, consumers' recognition of smartwatches, one type of wearable, is increasing. However, despite the heightened interest in smartwatches, sales are growing more slowly than expected. In order to comprehend this, we should understand potential consumers' perceptions of smartwatches. This study explored how much potential consumers value various smartwatch attributes by examining their preference structure of the wearable. The preference structure was generated from a conjoint analysis including five smartwatch attributes: brand, price, standalone communication, display shape, and display size. We also compared findings by user group (current wristwatch users vs. non-users). Results showed that display shape and standalone communication are more critical factors influencing respondents' smartwatch choices than brand and price for both types of users. Results also revealed that a curved display shape is most preferred.
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1. Introduction

Since personal computers (PCs) were introduced a few decades ago, computers have become closer to human beings, both physically and psychologically. In the early stages of PCs, computers were mainly used for operational purposes in organizations. After penetrating into homes and being used in daily life, PCs became more familiar to people. Advances in mobile systems and information technology (IT) led to the diffusion of smaller, lighter, and networked computers, and now, most individuals have their own personal devices (i.e., smartphones). For example, over 90 percent of the world's population owns a mobile phone device, and approximately half of the world's population uses mobile broadband services (ITU, 2015). Furthermore, wearable computing devices, which are closer to our bodies than mobile phones or notepad computers, have undergone experimentation and have recently begun to be diffused. With wearable computing, sensors and transmission chips are embedded into ordinary objects that are then put on the body (e.g., smart clothing, smart glasses) (Mann, 1997). Wearable devices are distinctive from mobile phones or portable computers, in that wearables work without interruption and are more inextricably intertwined with the human body than prior personal devices (Mann, 2014). Now, as wearable devices are becoming popularized, computers are physically closer to users than ever before.

As the smartphone market is maturing, IT vendors are trying to create new demand for mobile devices, and much of their attention is directed to wearable computing devices. Although experiments on wearables have been conducted since the early 1980s (Mann, 1996), wearables have only recently come into their own as a device for general users. While other types of wearables (e.g., smart clothing, smart glasses, and smart accessories) have not become very popular, the smartwatch is regarded as the first commercialized wearable device for consumers. Smartwatches have been called the next big thing in consumer technology (Sangani, 2013). Leading IT industry players, such as Samsung Electronics, Sony, and Apple, have released diverse styles of smartwatches. Consumers bought 3.6 million smartwatches in 2014, and it is predicted that the purchase volume will grow to 36 million in 2015 and reach 101 million in 2020 (IHS Technology, 2015).

The wide diffusion of the smartwatch is important for the future of wearable computing, in that it is the first step toward commercialized wearables. Furthermore, the success of the smartwatch would spur the IT industry, which is facing a slowdown of growth (Ribeiro, 2014). Nevertheless, skeptical views on the future of smartwatches have been presented. Some analysts maintain that smartwatches do not replace wristwatches or smartphones but are

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rather an accessory for smartphones (Kendrick, 2013). According to the results of a survey conducted by Harris Interactive (2013), while most U.S. adults have an interest in owning a smartwatch, nearly half of respondents said that smartwatches are just a fad that may not become common. Consumers' curiosity about this novel product does not seem to negate their doubts about the necessity of smartwatches. The full boom of smartwatches can be achieved through the diffusion beyond the current early adopters to general or potential consumers. In this study, we attempt to explore which smartwatch attributes affect potential consumers' choice of smartwatches. Specifically, we focus on the effect of five key smartwatch attributes (i.e., standalone communication, display shape, display size, brand, and price) on users' choices. By providing information about the relative importance of these attributes, the study enables us to understand potential consumers' assessments of smartwatches, the device currently leading wearable computing.

2. Smartwatches

2.1. Key smartwatch attributes

The notion of wristwatches equipped with computing technologies is not new, in that those types of devices appeared in science fiction several decades ago. Although initial computer-based wristwatches (e.g., the Fossil wrist PDA, IBM/Citizen WatchPad, Microsoft's STOP Watch) were released in the early 2000s, their functional limitations prevented their success (Rawassizadeh, Price, & Petre, 2015). Computer-based watches were not widely adopted until the Pebble watch was successful in 2012. Currently, leading IT vendors—including Google, Samsung Electronics, Microsoft, Sony, and LG Electronics—are releasing their novel models of smartwatches. As Apple recently launched its Apple Watch, the smartwatch market is indeed heating up.

Smartwatches have complicated properties, because they are computing devices that are also regarded as fashion accessories. Based on the current discussion on smartwatches, we chose display size, standalone communication, and shape as key smartwatch attributes. The display size and the voice communication function are essential technological properties of smartwatches in order for them to be independent computing devices (Rawassizadeh et al., 2015). The small display size can be a critical drawback of smartwatches in that they play the role of smartphones in part. A dimension of usability, including screen sizes, has a significant impact on users' satisfaction with mobile services and devices (Cho, Jung, & Im, 2014). Typing and watching video on smartwatches is more challenging than on smartphones. In order to mitigate the limitation of the small display, some smartwatch models (e.g., Google Android Phone) are equipped with a voice input system.

Another technological issue is the possibility of standalone communication. Current smartwatch models are indirectly connected to wireless networks by means of smartphones. Short-distance communication systems, such as Bluetooth, are used to link smartwatches and smartphones. Although this technological characteristic enables smartwatches to work as communication tools, it makes them accessories slaved to smartphones. If smartwatches were capable of standalone communication, they would become more independent, serve diverse functions, and even replace smartphones (Quain, 2015). Accordingly, this capability is vital to their positioning.

Smartwatches have diverse display shapes as wristwatches or fashion accessories (e.g., square, round, curved). Wearable computing devices basically include fashion attributes in that those devices combine daily necessities with computers (Cho, Lee, & Cho, 2009). In the context of smartwatches, individuals are inclined to prefer *round* wristwatches to other shapes. About 90 percent of wristwatches displayed in jewelry or department stores are round (Kelly, 2015). Nevertheless, smartwatches can also be square, as users are familiar with square displays on which they watch textual information or multimedia (e.g., PCs). By adopting a curved shape, some smartwatch models (e.g., Samsung Gear S) not only expand the display size.

2.2. Effect of brand and price on consumers' choice

Brand and price have been studied extensively to investigate consumers' choice of product or service (Brucks, Zeithaml, & Naylor, 2000; Dodds, Monroe, & Grewal, 1991). Brand is a highly influential factor affecting consumer choices, and its power is even more prominent in circumstances involving uncertain product qualities (Erdem & Keane, 1996). In other words, brand is used as a device for mitigating risks related to choosing and using a product (Bauer, 1960). Therefore, brand could have a significant influence on consumers' choice of smartwatch, which is regarded as a novel product that combines a familiar object (i.e., wristwatch) with computing. Price indicates the amount of sacrifice involved in purchasing a product (Dodds et al., 1991). Although some research shows no significant effect of price in using mobile services (e.g., Wong, Tan, Ooi, & Lin, 2015), a higher price usually reduces consumers' willingness to buy. Prior research has confirmed that brand and price have a substantial influence on consumers' selection of mobile phones (Jung & Kim, 2015; Karjaluoto et al., 2005). Therefore, we combined brand and price with key smartwatch attributes (i.e. display size, standalone communication, shape) in order to generate users' preference structure for smartwatches.

3. Methodology

3.1. Conjoint design

Conjoint analysis is a decompositional method that has been widely used to investigate the structure of a consumer's preference for a multi-attributed product (Green & Srinivasan, 1990). Under the assumption that consumer choice of a product is based on an evaluation of its separate characteristics, conjoint analysis assesses their preference of alternatives, each of which combines levels of attributes. Conjoint analysis has been widely used to investigate consumer preference structure (Chen, Hsu, & Lin, 2010). In the analysis, a part-worth indicating a numerical utility, which each level of an attribute has, is computed, and an attribute's set of part-worths is used to generate its value of importance, which is compared to the other attributes' importance (Green & Wind, 1975). To conduct conjoint analysis, a researcher identifies key properties of a product and then creates a set of alternatives, each of which is characterized by levels of attributes. Those alternatives are presented to respondents, and each respondent ranks them. Finally, the ranked data are analyzed using conjoint analysis software.

The first task of the analysis is the determination of attributes and their levels. It is the most important task, because attributes and their levels have a direct effect on the analysis results. Thus, researchers need to strive to identify a product's key attributes and their appropriate levels, which could affect an individual's assessment of the product (Hair, Black, Babin, Anderson, & Tatham, 2006). To decide on attributes and levels, we conducted focus group discussions on choice of smartwatches with graduate students who can be seen as potential smartwatch users. The results of the discussions revealed that brand and price were commonly recognized by participants as important determinants for choosing smartwatches, which is consistent with prior empirical evidence (Jung & Kim, 2015; Karjaluoto et al., 2005). Display size and standalone communication were also frequently mentioned in describing

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