



Contents lists available at ScienceDirect

## Technological Forecasting &amp; Social Change

journal homepage: [www.elsevier.com/locate/techfore](http://www.elsevier.com/locate/techfore)

## Factors that influence an individual's intention to adopt a wearable healthcare device: The case of a wearable fitness tracker

Sang Yup Lee<sup>a,\*</sup>, Keeheon Lee<sup>b</sup><sup>a</sup> Department of Communication, Yonsei University, 109 Billingsley Hall, 50 Yonsei-ro, Seodaemun-gu, Seoul 03722, South Korea<sup>b</sup> Department of Creative Technology Management, Techno Art Division, Yonsei University, Underwood International College, 50 Yonsei-ro, Seodaemun-gu, Seoul 03722, South Korea

## ARTICLE INFO

## Keywords:

Wearable healthcare device  
Wearable fitness tracker  
Innovation adoption

## ABSTRACT

Despite the importance of wearable healthcare devices, little has been known about what influences individual adoption of a wearable healthcare device. The purpose of this study was to examine factors that influence an individual's intention to adopt a wearable fitness tracker, which is a type of wearable healthcare devices. Factors examined in this study included interpersonal influence, personal innovativeness, self-efficacy, attitudes toward a wearable fitness tracker, health interests, and perceived expensiveness of the device. Adoption intentions of two groups of individuals were compared. One group included individuals who already knew about fitness trackers; the other included those who were unaware of such devices. Analyzing data collected from 616 respondents, we found that the intention to adopt was stronger among respondents who were aware of wearable fitness trackers than it was among those who were not aware. Results of ordered logistic regressions indicate that in both groups of respondents, consumer attitudes, personal innovativeness, and health interests had statistically significant and positive associations with the intention to adopt a wearable fitness tracker.

## 1. Introduction

Advances in sensors and communication technologies have made it possible for people to continuously monitor various physiological conditions using wearable healthcare devices. According to Fotiadis et al. (2006, p.3816), a wearable healthcare device can be defined as “a device that is autonomous, that is noninvasive, and that performs a specific medical function such as monitoring or support over a prolonged period of time.” Such a device is either carried on the body or included in a piece of clothing and monitors physiological data including, but not limited to, the amount of activity, heart rate, and blood pressure. The collected data can be transmitted to smartphones or medical monitors for detailed analysis, thereby providing useful health information.

Continual monitoring of health status, using a wearable healthcare device, provides significant user or patient benefits. First, changes that are related to a disease or illness are detected as they occur and alert the patient or the physician who takes care of the patient. Such continuous monitoring is especially beneficial to patients with chronic diseases such as diabetes, heart conditions, and asthma (Roman et al., 2015).

Furthermore, the physiological data monitored by a wearable device can be transmitted to healthcare facilities such as a hospital. This

means that remote monitoring of physiological data and health status is possible. Remote evaluation of patient health status might also significantly decrease medical costs by decreasing the number of unnecessary patient visits to medical facilities (Hung et al., 2004; Roman et al., 2015).

Wearable healthcare devices may also improve or change individual lifestyles. For example, continuous monitoring of foods consumed and exercise activities can help individuals change their eating and exercising habits and adopt a healthier lifestyle. Consequently, wearable healthcare devices are expected to be useful for preventing lifestyle-related diseases and illnesses such as those caused by obesity and smoking.

Wearable healthcare devices can be a good solution for reducing the increasing medical costs (Behkami and Daim, 2012; Roman et al., 2015). According to Roman et al. (2015), the medical cost savings that can be realized by wearable healthcare devices can be up to \$305 billion only in the United States. In order to achieve these medical cost savings, it is critical for a majority of individuals to adopt wearable healthcare devices.

Despite the expected benefits of wearable healthcare devices, the market for them is still in its initial phase. A recent survey (Barnes et al., 2014) found that many people were interested in wearable healthcare

\* Corresponding author.

E-mail addresses: [sangyuplee@yonsei.ac.kr](mailto:sangyuplee@yonsei.ac.kr) (S.Y. Lee), [keeheon@yonsei.ac.kr](mailto:keeheon@yonsei.ac.kr) (K. Lee).<https://doi.org/10.1016/j.techfore.2018.01.002>Received 14 February 2017; Received in revised form 28 December 2017; Accepted 3 January 2018  
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devices, but only a small number of them had adopted a wearable healthcare device. To expedite the adoption of wearable healthcare devices by individuals, we first need to understand what factors influence an individual's intention to adopt such devices. Nonetheless, to the best of our knowledge, no directly relevant studies have been published.

Many studies of the factors that influence the adoption of a new technology or service such as smartphones (Lee, 2014), e-commerce (Pavlou and Fygenson, 2006), and wireless internet services (J. Lu et al., 2005) have been conducted. Wearable healthcare devices have technology-related attributes similar to those devices or services but differ from them in several ways, which makes it worthwhile to examine factors that influence the adoption of a wearable healthcare device.

First of all, a wearable healthcare device is a health-related device. Thus, health-related factors should be considered when studying intention to adopt a wearable healthcare device. For example, it is likely that a person's interest in health would influence his/her intention to adopt a healthcare device. There are some studies that have examined the intention to adopt or use healthcare devices (e.g., J. Lu et al., 2005; Park and Chen, 2007). But most of them were focused on the intention of health-related workers such as doctors and nurses. Not much research has focused on general consumers or patients' intentions to adopt a health-related device.

Second, different from other technologies or services such as smartphones and e-commerce whose features were well-known among potential consumers, the benefits and features of a wearable healthcare device are not well-informed among potential users (PwC, 2014). Furthermore, still many people are not aware of a wearable healthcare device. For example, of the 616 respondents in the present study, 247 (40%) were not aware of a wearable fitness tracker.

Because of the characteristics specific to wearable healthcare device, it is likely that the factors that influence intention to adopt a wearable healthcare device are different from those that influence other technologies examined by previous studies such as smartphones and e-commerce. Accordingly, this study investigated factors that influence the intention to adopt a wearable healthcare device.

Primary factors considered in this study are interpersonal influence, self-efficacy, personal innovativeness, and attitudes toward a wearable healthcare device. Interpersonal influence has long been recognized as an important factor that influences an individual's intention to perform a particular behavior (e.g., Ajzen, 1991; Fishbein and Ajzen, 1975; Rogers, 2010). Studies of consumer behavior, especially those of adoption of new products, found the significant interpersonal influence on a consumer's adoption of a new product (or intention to adopt a new product) (e.g., Bearden et al., 1989; Mangleburg et al., 2004). Self-efficacy, which is defined as an individual's belief that s/he has the capability to perform the behavior in question (Compeau and Higgins, 1995), is also important in explaining adoption of a new product (Compeau et al., 1999; Compeau and Higgins, 1995). In this study, we examine how a person's IT (information technology) related self-efficacy influences the person's intention to adopt a wearable healthcare device, because a wearable healthcare device is a type of IT device. Personal innovativeness is also important in explaining why consumers adopt innovative products (Hirschman, 1980), and is a particularly important predictor of adoption of a new IT device or service (e.g., Y.-C. Lu et al., 2005; Varma Citrin et al., 2000). As wearable healthcare devices are both innovative and recently introduced in the marketplace, it is expected that personal innovativeness can influence an individual's intention to adopt one. We also consider the influence of attitudes that a consumer has toward a wearable healthcare device. According to Fishbein and Ajzen (1975) and Ajzen (1991), in this study attitudes toward a wearable healthcare device are defined as the degree to which an individual has a favorable or unfavorable evaluation of a wearable healthcare device. Individual attitudes toward a product have been found to significantly influence the intention to adopt it (e.g., Boyd and Wandersman, 1991; Pavlou and Fygenson, 2006).

In addition to the above four factors, interest in health and perceived expensiveness of a wearable healthcare device are also considered as independent variables that could influence the intention to adopt a wearable healthcare device. Studies of health behavior indicate that an individual's interest in health influences the intention to perform health-related behaviors (e.g., exercise or adoption of medical devices) (Godin et al., 1991; Godin and Gionet, 1991). Furthermore because a wearable healthcare device is a product that an individual must invest money to purchase it, it is likely that the consumer's perceived expensiveness of a wearable healthcare device influences the person's adoption intention.

### 1.1. Types of wearable healthcare devices

There are three types of wearable healthcare devices with characteristics and functions appropriate in 1) disease management, 2) disease prediction, and 3) activity monitoring (Kim, 2015). Disease management devices are designed to monitor patients with chronic diseases such as asthma, heart conditions, and diabetes, and are intended to improve health status or assist in treating patients who have already been diagnosed with a particular disease. Disease prediction devices are used to monitor physiological information that can be used to prevent individuals from developing an as-yet undiagnosed disease. Activity monitoring devices track everyday activities such as the amount of activity (e.g., number of steps or distance covered), calorie expenditure, and heart rate. These devices can help individuals achieve health-related goals such as weight loss or regular exercise by monitoring the relevant activities. Commercially available activity monitors (or fitness trackers) include devices made by FitBit, Garmin, and Jaw-Bone, among others. Unlike the first two types of devices, which might require a doctor's prescription to purchase, activity monitors can be purchased without a prescription.

The present study focuses on the third type of wearable healthcare devices (i.e., activity monitors or fitness trackers) and examines factors that influence an individual's intention to adopt the third type of wearable healthcare devices. The main reasons for this choice were difficulties in accessing patients with chronic disease to survey their willingness to wear monitoring devices, and the scarcity and general lack of awareness of wearable devices designed for disease prediction.

### 1.2. Types of potential users

Because a large percentage of potential consumers are not aware of a fitness tracker, in this paper we divide potential consumers of a wearable fitness tracker into two different groups. The first group is those who are aware of a wearable fitness tracker and the other group is those who are not aware of it. The intention to adopt a fitness tracker is likely to vary depending on personal awareness of its properties. Product awareness might also reflect individual differences related to factors that can influence the intention to adopt the device. Those who are aware of a wearable fitness tracker could be more innovative or more interested in the device than someone who is unaware of the device. Those aware of the device might be more interested in health than those who are not aware. Thus, this study examines how the adoption intentions of individuals within groups differed and whether the effects of the influencing factors differed depending on consumer product awareness.

## 2. Theoretical background

In this section, we review theoretical backgrounds of the primary independent variables that we focused on as predictors of the intention to adopt a wearable healthcare device. Again, these are 1) interpersonal influence, 2) attitudes toward a wearable healthcare device, 3) self-efficacy, 4) personal innovativeness, 5) health interest, and 6) perceived expensiveness.

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