

# What Explains Smartwatch Adoption? A Comparative Study of South Korea and Indonesia<sup>☆</sup>

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## Abstract

Identifying factors that influence consumers' intentions to adopt a smartwatch has become a major research interest in marketing literature, yet little is known about it in dissimilar cultural settings. The current research employs a comparative study of South Korea and Indonesia, which differ in location and cultural heritage, smartwatch penetration rate, geographic size, level of income, and developmental stage as a country. An extended model of TAM is proposed, and PLS-SEM is employed to test the model on data collected from 262 respondents. The findings indicate that complementary goods and healthtology have positive influences on perceived usefulness and visibility has a positive influence on social image; these, together with perceived price value, lead to the behavioral intention to adopt a smartwatch in both countries. Perceived cost was only significant for Indonesia. Theoretical contributions and practical implications are further discussed.

*Keywords:* Smartwatch, Smartwatch adoption, South Korea, Indonesia, TAM, Fashion, Healthtology

## 1. Introduction

The smartwatch is known to be the most popular wearable device in the worldwide wearables market. Compared to other kinds of smart wearables such as smart clothing, earwear, etc., the highest number of shipments recorded in 2018 came from wrist wearable technology, of which the smartwatch ranked first with 72.4 million units, followed by the wristband with 44.2 million units (Statista 2018). Based on the forecasting study of Mordor Intelligence, this popularity is expected to continuously grow at a compound annual growth rate of 14.5% between 2021 and 2026 (Mordor Intelligence 2020). Moreover, based on the same study, the highest growth of the smartwatch market during this five-year course is expected to take place in the Asia-Pacific region as a result of its growing tech-savvy populations and the increasing health awareness among them (Mordor Intelligence 2020).

This highlights the importance of the Asia-Pacific market for smartwatch manufacturers in the upcoming years. However, despite its potential, smartwatch penetrations in Asia-Pacific countries are vary: some can be classified as quite high, such as Hong Kong, with 13.2%, and China, with 10.3%, and medium growth occurs in Australia, with 9%, and South Korea, with 6.6%, but the majority of them can be classified as low penetration, which includes Indonesia, with 2%, Bangladesh, with 2.2%, Brunei Darussalam, with 2.3%, Philippines, with 3.4%, and Japan, with 4% (Statista 2020a,b,c,d,e,f,g,h,i). This low penetration of smartwatches in most Asia-Pacific countries shows a huge opportunity for growth of the smartwatch market (Kim, Chung, and Jung 2014). Furthermore, the variation in penetration level among the above Asia-Pacific countries signals the existence of potential cultural differences among smartwatch consumers that must be addressed. Therefore, a study on the adoption of

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smartwatches is relevant, for which a cross-cultural study across Asia-Pacific countries on the issue is needed.

Dutot, Bhatiasevi, and Bellallahom's (2019) study was the one of the early cross-cultural studies on smartwatch adoption, comparing China, Thailand, and France, and employing variables related to the technological perspective of the smartwatch such as perceived affective quality, mobility, availability, and trust. They found that consumers in each country weighed each construct differently, which then confirmed the existence of cultural differences in smartwatch-adoption behavior. In the current study, we posit that the level of technological advancement and consumers' readiness to adopt the new technologies—including their cultural characteristics—are important determinants of different patterns of smartwatch adoption. We also expect the cross-cultural study would generate a managerial implication so that manufacturers can better penetrate the smartwatch market by executing strategies that fitted to each culture's unique characteristics. However, despite its importance, cross-cultural research on smartwatch adoption is scarce. Most studies, as noted in Table 1, restrict themselves to smartwatch adoption in a single-country setting.

The smartwatch itself is perceived to be the most intimate information and communication technology hitherto developed by human beings because of its wearable characteristics (Choi and Kim 2016). Thus, research on smartwatch adoption has expanded from merely technology-related to consumer-driven studies. Kim and Shin (2015) explored smartwatch adoption from a technological perspective and investigated the factors of affective quality, relative advantage, and mobility to determine the intention to continuously use a smartwatch. In the following studies, researchers began to consider not only utilitarian but also hedonic motivational force that may drive consumers to adopt a smartwatch (Lee, Park, and Im 2017). Choi and Kim's (2016) findings show that fashion-related factors associated with the smartwatch play an important role in South Korean consumers' intentions to adopt a smartwatch—particularly the need for uniqueness. In a different cultural setting, Chuah et al. (2016) similarly found that Malaysian consumers perceive the smartwatch as both a technology and fashion item simultaneously. Furthermore, with the growth in smartwatch awareness, consumers began to develop their own expectations as to the type of smartwatch they wished to purchase; for example, health-conscious consumers demanded a smartwatch that could

assist them in their fitness activities. Thus, the use of the smartwatch as a way to promote health consciousness and motivation emerged as an important determinant of smartwatch adoption (Dehghani 2018; Dehghani, Kim, and Dangelico 2018). In sum, an extended cross-cultural study incorporating another perspective toward the potential benefits of smartwatch functionality, such as its use as a fashion accessory and health assistant, is needed. This is to include the growing number of consumers who may possess different motivational factors in terms of their intentions to adopt a smartwatch.

It is also important to examine the relationship of perceived cost and value associated with smartwatches on consumers' intentions to adopt them—especially in a cross-cultural investigation. This is because the cost of a smartwatch may be perceived as expensive or affordable depending upon the consumer's purchasing power, for the smartwatch can be perceived either as a basic necessity or as a luxury product. Furthermore, as the number of smartwatch users and manufacturers grows, consumers are more exposed to a wider range of brand options for smartwatches. Despite that a study to explore the effect of brand name is needed, there have been limited studies in smartwatch adoption have considered brand name effects.

In conclusion, although there has been a handful of studies on smartwatch adoption, no comprehensive study acknowledging its use as a technology, fashion accessory, and healthcare assistant has been performed. Additionally, a cross-cultural investigation that compares the perspective of a developed country to that of a developing one is still lacking. To fill these gaps, this study identifies what drives smartwatch adoption by proposing a comprehensive framework conducted in a cross-cultural setting, comparing potential consumers in South Korea and Indonesia. The current study aims to establish whether or not the comprehensive framework of smartwatch adoption can be conceptualized in the same way between the two countries and to investigate whether or not the relationship paths on the framework can be meaningfully compared between Indonesian and South Korean consumers. Contrasting countries such as South Korea and Indonesia, with quite distinct traits in the size of their respective economies and in their respective technology adoption rates, is expected to generate insightful results for academicians and practitioners in the field of smartwatch adoption.

Table 1. Past studies on smartwatch adoption and usage intention.

Author	Sample	Independent Variable	Mediating/Moderating Variable	Dependent Variable	Theory	Method
Kim and Shin (2015)	N = 363 (South Korea)	Affective Quality, Relative Advantage, Mobility, Availability, Subcultural Appeal, Cost	Perceived Usefulness, Perceived Ease of Use, Attitude	Intention	Technology Acceptance Model (TAM)	CFA and SEM
Choi and Kim (2016)	N = 562 (South Korea)	Perceived Compatibility, PIIT, Vanity, Need for Uniqueness	Perceived Usefulness, Perceived Ease of Use, Perceived Enjoyment, Perceived Self-Expressiveness	Behavioral Intention	Technology Acceptance Model (TAM)	PLS-SEM
Chuah et al. (2016)	N = 226 (Malaysia)	Technology, Fashion	Perceived Usefulness, Perceived Ease of Use, Visibility, Attitude toward Using	Adoption Intention	Technology Acceptance Model (TAM)	CFA, Maximum Likelihood Estimator MPlus 7.2, Post hoc analysis
Dehghani (2018)	–	Perceived Usefulness, Functionality, Complementary Goods, Fashionability, Compatibility, Enabling Technologies, Perceived Ease of Use, Healthology	–	Continuous Intention to Use	Qualitative study	Netnography
Dehghani et al. (2018)	N = 385 (Italy)	Hedonic Motivation, Aesthetic Appeal, Operational Imperfection, Complementary Goods, Healthology	Continuous Intention	Usage	–	PLS

## 2. Conceptual background

### 2.1. Smartwatch adoption in South Korea and Indonesia

The wearables penetration worldwide has been continuously dominated by consumers in North America for five consecutive years, and it is forecasted that by 2022, 25% of North American adults will be using wearable technologies in their daily lives (Statista 2021). However, it is also important to note that by 2022, North America together with the Asia-Pacific region will account for around 70% of the wearable 5G connections worldwide (Statista 2021). This signals the high potential of spurt growth of the wearables market in the Asia-Pacific region for the upcoming years.

Countries in the Asia-Pacific region itself cannot be grouped together as one pool country such as North America because the former region consists of countries with different levels/forms of economic growth, culture, lifestyle, and new technology adoption readiness. Take the example of South Korea, a North-East Asian country, and Indonesia, a South-East Asian country. Even though both countries are located in Asia, the adoption of new technology such as wearables can be quite different. In 2021, Indonesia is expected to reach a 2% penetration rate of wearables users, while South Korea is predicted to reach more than three times penetration rate of Indonesia in the same year (Statista 2020a,b,c,d,e,f,g,h,i). In addition, a high penetration rate is also projected to take place in other North-East Asian countries such as Hong Kong (13.2%) and China (11.3%) (Statista 2020a,b,c,d,e,f,g,h,i). In the case of South-East Asian countries such as Philippines and Brunei Darussalam, the penetration rate is expected to be less than 3.5% (Statista 2020a,b,c,d,e,f,g,h,i). This high wearable penetration rate in North-Asian countries can be attributable to their active role as global manufactures of wearable devices, including companies such as Samsung and LG from South Korea and Huawei and Xiaomi from China. Despite the apparent cultural differences among countries in the Asia-Pacific region, very few cross-cultural studies have explored this issue. To fill this gap, we conduct a comparable study focusing on Indonesia, the most populous country in South-East Asia, and South Korea, as a representative of North-East Asian countries.

Indonesia is classified as a lower-middle-income country, while South Korea—with almost an 8-fold larger per capita GNI than Indonesia—is classified as a high-income country, grouped together with

the United States, Singapore, Japan, and other large economies (United Nations 2019). Despite belonging to the same continent, both exhibit different cultural characteristics, especially in relation to technology-adoption behavior. South Koreans in general have greater knowledge and adaptive attitudes toward digital technologies than Indonesians. According to the IMD World Competitiveness Center, which measures countries' ability to adopt and explore digital technologies by aggregating three factors, namely knowledge, technology, and future-readiness, in 2019, South Korea was included in the top 10 countries in the world; Indonesia, on the other hand, was located at the back of the line, placing at 56th out of the 63 countries included in the study (Brits and Cabolis 2019). However, among the Asia-Pacific countries, Indonesia is projected to be the country with highest sales potential for the smartwatch market (Ipsos 2018).

In sum, South Korea was chosen as a research site to understand the relatively mature smartwatch consumer market, which possesses more adaptive characteristics and stronger economic capabilities compared to majority of countries in Asia. Further, researching Indonesian consumers will provide us with the perspective of a potential market in which the consumers are still in the early adoption stage, and which has relatively lower adaptive characteristics to new technology and lower financial capabilities.

As the smartwatch has a low penetration in Indonesia, studies on the adoption or continuous use of the smartwatch in Indonesia are also very scarce. One study by Anggraini, Kaburuan, Wang, and Jayadi (2019) investigates the relationships among usability, brand, and prices in relation to the perception of the smartwatch among consumers in Indonesia. The results suggest that the use of the smartwatch is less significant for consumer perceptions, but brands and prices do strongly influence perceptions among those who have used the smartwatch. The authors suggest that Indonesians buy smartwatches in pursuit of prestige, fitness tracking, trend following, and tracking family members' locations (Anggraini et al. 2019).

On the other hand, South Korea—one of the earliest countries to adopt the smartwatch—perceives the smartwatch not only as an innovation in mobile technology but also as a fashion item that reflects the wearer's identity and helps express one's uniqueness (Choi and Kim 2016). They also suggest that South Koreans do not perceive smartwatches as valuable or rare enough to reach luxury-watch status.

## 2.2. Technology acceptance model and the proposed model

Consumers' adoption of new technologies are examined by the innovation diffusion model (Rogers 1962), the technology acceptance model (TAM, Davis 1989), the theory of planned behavior (Ajzen 1991) and so on. Among them, the technology acceptance model (TAM) is the most widely used theoretical framework in explaining the adoption of technology, including the smartwatch (Choi and Kim 2016; Chuah et al. 2016; Kim and Shin 2015).

The TAM postulates two main cognitive dimensions that form a potential user's attitude and then determine his/her intention to use and actual use: perceived usefulness and perceived ease of use. Perceived usefulness is defined as "the extent to which a person believes that using a particular technology will enhance his/her job performance" (Davis 1989, p. 320). On the other hand, perceived ease of use is defined as "the degree to which a person believes that using a technology will be free from effort" (Davis 1989, p. 320). This definition further reflects an aspect of technology that results from a user's level of efficacy in using said technology (Venkatesh and Davis 1996), which relates to the internal determinants of individuals.

Utilizing a partial concept of the TAM, this study considers a range of relevant and intriguing variables related to current consumer behaviors to comparatively examine Indonesia and South Korea in respect of smartwatch adoption. Incorporating external variables, which are context-specific, is mentioned to improve the applicability of TAM model and to increase its explanatory power (Aye et al. 2013). In a time when the adoption of the smartwatch is not in its early stage, consumers are already exposed to a certain amount of information related to smartwatch technology and form expectations regarding its functions. For a product such as the smartwatch, the value of which depends highly on the facilitation of applications attached thereto (Dehghani et al. 2018), complementary goods become an important construct to be included in the framework. In addition, as people in the world are becoming conscious about living a healthy lifestyle, individuals are shifting their ways of life to be healthier—not only by changing their food intake but also by engaging in more fitness exercises. In this context, the smartwatch is perceived to be able to act like a health-watch monitoring system (Dehghani et al. 2018) that can assist consumers in collecting data such as calories burned, miles run, and

heart rate, which is deemed important in supporting their health goals. Therefore, new construct health-technology has become sufficiently relevant as to merit inclusion in the study.

Several studies posit that the smartwatch is no longer seen only as a technological device but also a fashion item (Choi and Kim 2016; Chuah et al. 2016). Therefore, specific constructs related to the perspective of the smartwatch as a fashion item such as visibility and social image are employed in the framework. Moreover, as there are currently more smartwatch brands on the market than in the early days of smartwatch adoption, we believe it is essential to include such constructs as brand name into the framework. In addition, to be able to account for the differences in consumer behavior between South Korea and Indonesia, which exhibit a wide gap in financial ability and knowledge and adaptive attitudes toward technology, two constructs—namely perceived cost and perceived price value—are included in the model. We offer a detailed explanation of the theoretical rationale for the model's causal relationship and each construct definition in the following section.

## 2.3. Perceived usefulness

Perceived usefulness is a fundamental component of the TAM that is defined as the "degree to which a person believes that using a particular system would enhance his or her job performance" (Davis 1989). According to this definition, perceived usefulness focuses on the role of a technology to help complete the tasks, which is closely related to a narrower context, namely work environment (Chuah et al. 2016). Therefore, this study instead followed the definition of perceived usefulness suggested by Chuah et al. (2016), who applied a more general approach. They redefined perceived usefulness as the extent to which consumers believe that using a smartwatch increases their personal efficiency (Chuah et al. 2016). Prior research suggested that perceived usefulness positively influences consumers' intention to adopt technologies in various context, such as smart clothing (Hwang et al. 2016), augmented reality smart glasses (Reuchneabel et al. 2016), mobile fitness devices (Jang Yul 2014), and smartwatches (Choi and Kim 2016; Kim and Shin 2015). In particular, Choi and Kim (2016) support that perceived usefulness influences smartwatch-adoption intentions more than other latent variables such as perceived ease of use and perceived self-expresiveness. Therefore, we posit the following hypothesis:

H1. Perceived usefulness is positively associated with behavioral intention to adopt smartwatch.

#### 2.4. Social image

Social image refers to “the extent to which users may derive respect and admiration from peers in their social network as a result of their IT usage” (Lin and Bhattacharjee 2010). Social image has been known to be an important explanatory variable in technology acceptance (Ajzen and Fishbein 1980; Cui and Im 2021). This is due to the fact that consumers continuously seek to express themselves, present their distinct characteristics from others, and improve their image in social environment through possession of new technologies (Buenaflor and Kim 2013; Horton et al. 2012). This applies particularly when consumers perceive new technologies to have fashion characteristics attached to them (Kalantari 2017). The smartwatch itself is perceived not only as a technological device but also a fashion statement (Kim and Shin 2015). Consumers would like to use the smartwatch because of its functionality and the social image they can receive by wearing a smartwatch (Jeong et al. 2017). The smartwatch mediates how an individual is perceived by others and interacts with them (Jeong et al. 2017). Yang et al. (2016) also suggest that consumers perceive social image as the most influential component of perceived value of wearables. Based on this, we posit the following hypothesis:

H2. Social image is positively associated with behavioral intention to adopt smartwatch.

#### 2.5. Perceived price value

Perceived price value is explained as consumers' trade-off between perceived benefits and monetary costs (Talukder et al. 2018). It indicates how consumers appraise the overall utility of products or services based on their perception of the benefits that they received and the costs associated with them (Zeithaml 1988). If consumers perceive that a product's benefits surpass its cost, the perceived price value would be positive, meaning that this product would be worth the price (Venkatesh et al. 2012). This variable has been known to be an important variable to consider in the adoption of new technologies as consumers may not be able to recognize the benefits of a new technology and solely evaluate the product from its price, which is mostly seen as expensive. In 2015, Kentico surveyed 1000 internet users worldwide and revealed that 7

out of 10 consumers do not purchase a smartwatch due to its cost (eMarketer 2016). Moreover, 38% of the entire respondents expressed that they do not have enough reason to use a smartwatch, and thus they refrain themselves from purchasing one. This is presumably because at the early adoption stage, consumers fail to comprehend the distinct benefits of the smartwatch as some of its functions such as sending and receiving message or calls have been fulfilled by their smartphones. In conclusion, when consumers perceive higher benefits relative to the perceived costs, they will be more likely to adopt the smartwatch. Therefore, we posit the following hypothesis:

H3. Perceived price value is positively associated with behavioral intention to adopt smartwatch.

#### 2.6. Perceived cost

Users' purchasing behaviors and intentions are largely determined by their perceived cost (Kim and Shin 2015). Hung, Ku, and Chang (2003) found that high perceived cost has a negative effect on users' behavioral intentions to use mobile commerce. Turel, Serenko, and Bontis (2010) highlighted that consumers may reject a useful and enjoyable product that possesses positive extrinsic and intrinsic utilities if its perceived cost is too high. Kim and Shin's (2015) findings also support the negative relationship between perceived cost and the adoption intention of a new product. Thus, we posit the following hypothesis:

H4. Perceived cost is negatively associated with behavioral intention to adopt smartwatch.

#### 2.7. Complementary goods

Schilling (2005) defines complementary goods as products or services that add value to another particular product. By this definition, such a product may have little value without its compliments, and thus consumers tend to use both the main product and its complementary goods together. The smartwatch is among these. Some products—such as smartphones and smartwatches—are indeed viewed as functional when a set of complementary goods is available to supplement them (Claussen, Essling, and Kretschmer 2015). Deghani et al. (2018) confirmed this proposition by showing that the more practical and enjoyable the smartwatch apps become, the higher the usage frequency of the product. Claussen, Essling, and Kretschmer (2015)

further highlighted that releasing a technologically sophisticated core product will not be enough if it is not accompanied by set of complementary goods. This is due to the fact that complementary goods will act as a performance enhancer when consumers perceive core technology to be obsolete. This is particularly true in the case of smartwatch, as many consumers hardly recognize the need to adopt a smartwatch because they perceived no additional benefit in using it and felt satisfied with their smartphones. Though [Dehghani et al. \(2018\)](#) have tested the association between complementary goods with actual usage and continued usage of a smartwatch, the effect of complementary goods on behavioral intention to adopt a smartwatch has yet to be explored. Therefore, in view of the above discussion, we hypothesize that the availability of smartwatch applications guides the consumer perception of the usefulness of the smartwatch.

**H5.** Complementary goods are positively associated with the perceived usefulness of the smartwatch.

## 2.8. Healthtology

Due to the growing awareness of healthy lifestyle among consumers, smartwatches have been gaining attention, especially with regard to their function to support health in everyday living. The smartwatch, as well as other wearable products that provide healthcare services, has shifted from the healthcare industry focus toward a prevention approach, in which consumers are encouraged to be active and responsible for their own health condition ([Canhoto and Arp 2017](#)). Smartwatches enable consumers to perform self-monitoring of personal activity, deriving feedback based on their digital records, which then allow them to identify behavior patterns and take action needed ([Reeder and David 2016](#)). A meta study revealed that consumers have been using smartwatches for detection of activity levels, temperature, emotional state, tremor, posture, heart rate, dieting, medication-taking, scratching behaviors, etc. ([Reeder and David 2016](#)). Along with this increasing trend of wearables utilization for healthcare purposes, the introduction of a new construct to simultaneously measure technology and health seemed necessary ([Dehghani 2018](#)). Accordingly, a new construct, one that refers to a component that allows health- and technology-conscious people to monitor their health more conveniently through technology, is proposed ([Dehghani 2018](#)). “Healthtology” is derived from the words “health” and “technology,” indicating that it

refers to the interactions among health, informatics, and technology and seeks to provide innovative approaches to satisfy any healthcare need ([Dehghani et al. 2018](#)).

The above study found a significant impact of healthtology on actual use, which indirectly signals that using a smartwatch promotes personal health monitoring among actual users. On the other hand, [Sabbir et al. \(2020\)](#) tested the association between healthtology and attitude to adopt smartwatch and found significant positive results. We posit that as consumers across the world become more aware of their health and wellbeing, they may form a specific motivation to adopt a smartwatch in order to improve their health. Consumers will also perceive the smartwatch's usefulness in terms of its functionality as a healthcare assistant. Based on the above discussion, we posit the following hypothesis:

**H6.** Healthtology is positively associated with the perceived usefulness of the smartwatch.

## 2.9. Brand name

Brand name has been known to be one of important determinants affecting consumers' choice of products or services ([Brucks et al. 2000](#); [Dodds et al. 1991](#)). The brand name element is even particularly predominant for product categories that consumers feel unfamiliar with ([Erdem and Keane, 1996](#)), such as the smartwatch, which can be categorized as a novel technological breakthrough in the consumer market. This is because consumers utilize brand name information as a tool in mitigating risks associated with choosing and using certain products or services ([Bauer 1960](#)). Furthermore, the role of brands as social signals has also been explained as a decisive factor in consumer choice ([Lannon and Cooper 1983](#)). [Brucks, Zeithaml, and Naylor \(2000\)](#) demonstrated that a high percentage of respondents in their study rely on judgment of brand name as well as price to evaluate the prestige dimension of product quality. Prestige quality itself relates to how a product can attract respect and admiration from others. Therefore, as consumers perceive the smartwatch not only as a technological device but also a fashionable belonging ([Kim and Shin 2015](#)), they may rely on the brand name characteristic of the smartwatch to gain acceptance in society. Empirically, the association of brand name and social recognition is demonstrated in the study of [Park and Chen \(2007\)](#) in the context of luxury products, which can be considered as predictable as most consumers purposely seek recognition from their luxury goods possession. In both cases,

however, the association is proven to go beyond the luxury products. While consumers in South Korea view the smartwatch as a non-luxury product (Choi and Kim, 2016), Yang et al. (2016), in their study of wearable device acceptance in South Korea, found that along with visual attractiveness, brand name is positively associated with social image. This means that although the smartwatch may not be perceived as a luxury item, consumers still infer social benefit from its symbolic meanings. Therefore, we hypothesize the following:

**H7.** Brand name is positively associated with the social image of the smartwatch.

### 2.10. Visibility

In numerous studies, visibility, or “observability,” is defined as the individual's beliefs concerning the extent to which their possession of technology is noticed by others (Chuah et al. 2016; Fisher and Price 1992). Following this definition, it may therefore be concluded that visibility focuses on the physical nature of technology (Fisher and Price 1992). From the social image point of view, impression on first encounters is found to be influenced strongly by visible components of the appearance relative to the less-visible cues (Bierhoff 1989). For example, aspects of fashion, such as clothes and makeup, are found to be important aspects of individuals' impression formation (Tunca and Fueller 2009). New technologies, especially wearables, can potentially form a certain image and impression of the wearer insofar as they are worn on the body, which makes them easily recognizable by others. Extant studies have confirmed the influence of visibility in various types of technology including smartwatches (Chuah et al. 2016; Krey et al. 2016), smart clothing (Ko et al., 2009), and fitness and health wearables (Canhto and Arp 2017). A recent study by Krey et al. (2019) demonstrated a positive and strong influence of visibility on the self-expressiveness construct, which is somewhat close to the social image construct proposed in the current study. Based on the above discussion, we posit the following hypothesis:

**H8.** Visibility is positively associated with social image of the smartwatch.

### 2.11. Control variables

Diverse demographic factors in South Korea and Indonesia may influence the smartwatch-adoption

behavior as a confounding factor. Thus, we control two variables in the model, employment status and monthly income, which are different in the chosen countries and are potentially important factors in predicting smartwatch-adoption behavior. Adoption of new technology often relies heavily on consumers' perception of its acquisition cost (Kim and Shin 2015; Luarn and Lin 2005), and this perception is influenced by consumers' ability to pay, which, in general, is related to their income. Even though the smartwatch is perceived to be a non-luxury product in South Korea (Choi and Kim 2016), this perception may differ meaningfully in the case of Indonesia. In addition, employment status is also suspected to have potential confounds effect on the adoption behavior, as people who are working compared to students are generally more financially independent, and this may increase their ability to afford and their intention to adopt the smartwatch—especially in case of Indonesian consumers. Thus, including monthly income and employment status as control variables is expected to rule out variations in smartwatch-adoption behavior (see Fig. 1).

## 3. Research methodology

### 3.1. Measures

To measure the proposed constructs, questionnaire items were adapted from relevant studies. The items were measured on a 7-point Likert-type scale, ranging from 1, “strongly disagree,” to 7, “strongly agree.” The wording of the original questionnaire items was slightly modified to specifically reflect the context of smartwatch adoption. To check the quality of the questionnaire and the validity of the instrument, we conducted a pretest with three participants contacted through convenience sampling. All participants confirmed that the questionnaire was clear and easily understood.

### 3.2. Data collection

In total, 262 participants were recruited using off-line and online methods, with 127 from Indonesia and 135 from South Korea (see Table 2). The questionnaire for this study was written in two languages, Korean and Indonesian. Back-translation, using the help of marketing experts in South Korea and Indonesia, was used to check the translations. In addition to the dissemination of paper-based surveys in person at a university, an online version was distributed via social media channels (e.g., Instagram and Whatsapp) to enable as many respondents as possible to be



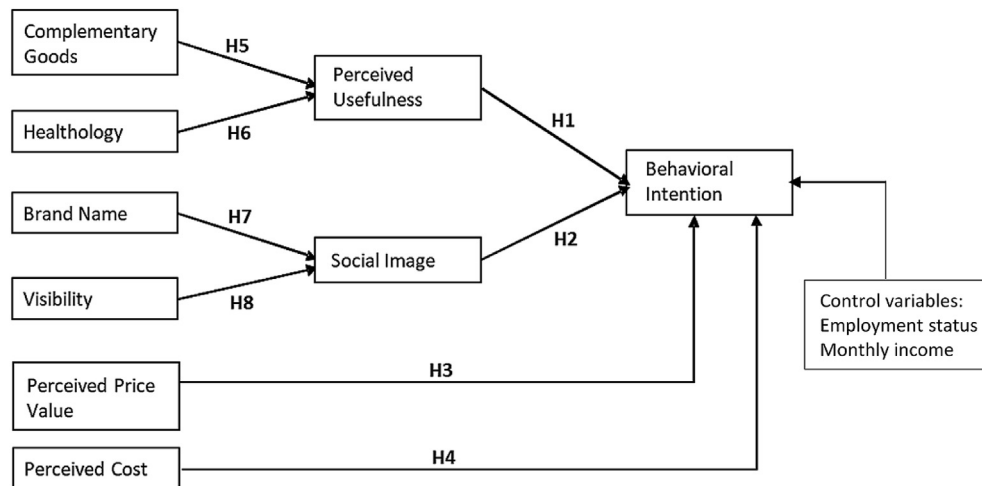


Fig. 1. Research model.

reached. The data collection was performed from December 5, 2019, to December 20, 2019, and from May 12, 2020 to June 2, 2020.

### 3.3. Data analysis

This study used the methods of component-based partial least squares (PLS) and structural equation modeling (SEM) to assess the research model. This combination was deemed more appropriate than covariance-based SEM methods such as LISREL

because this study was undertaken to predict key target constructs (Hair, Ringle, and Sarstedt 2011). To identify differences between countries, a multi-group analysis (MGA) was used in SmartPLS 3.0.

## 4. Results

### 4.1. Measurement model

In PLS-SEM, a reflective measurement model is assessed through internal consistency (reliability),

Table 2. Demographic profile of respondents.

		Indonesia (n = 127)		South Korea (n = 135)			
		F	Percentage	Percentage	F		
Gender	Male	29	22.8%	65.9%	89	Male	
	Female	98	77.2%	34.1%	46	Female	
Marital Status	Single	115	90.6%	88.1%	119	Single	
	Married	11	8.7%	10.4%	14	Married	
	Others	1	0.8%	1.5%	2	Others	
Age	<20	18	14.2%	10.4%	14	<20	
	20–30	107	84.3%	80.7%	109	20–30	
	31–40	2	1.6%	2.2%	3	31–40	
	>40	–	0.0%	6.7%	9	>40	
Education	High School Graduate	38	29.9%	69.6%	94	High School Graduate	
	Bachelor	61	48.0%	25.2%	34	Bachelor	
	Others	28	22.0%	5.2%	7	Others	
Employment Status	Full-time Employee	47	37.0%	8.9%	12	Full-time Employee	
	Student	57	44.9%	81.5%	110	Student	
	Others	23	18.1%	9.6%	13	Others	
Residence	D.K.I Jakarta	23	18.1%	48.9%	66	Gyeonggi Province	
	West Java	15	11.8%	34.1%	46	Chungcheong Province	
	East Java	10	7.9%	5.9%	8	Jeolla Province	
	Central Java	45	35.4%	11.1%	15	Gyeongsang Province	
	D.I. Yogyakarta	27	21.3%				
	Others	7	5.5%				
Monthly Income	< US\$142	72	56.7%	87.4%	118	< US\$1696	
	US\$142 – US\$355	15	11.8%	1.5%	2	US\$1696 – US\$2544	
	US\$356 – US\$710	35	27.6%	2.2%	3	US\$2545 – US\$4239	
	> US\$710	5	3.9%	8.9%	12	> US\$4239	

convergent validity, and discriminant validity. Composite reliability (CR) is used to evaluate the internal consistency, and average variance extracted (AVE) is used to evaluate the convergent validity. As shown in Table 3, the composite reliabilities for all variables exceed the threshold value of 0.70, and the AVE for all focal variables exceeds the 0.50 benchmark, demonstrating that the constructs have acceptable psychometric properties (see Table 4).

Next, discriminant validity was assessed using the heterotrait–monotrait (HTMT) ratio. All HTMT values were lower than the threshold of 0.85. In addition, neither of the 95% bias-corrected and accelerated confidence intervals (CIs) for the HTMT ratio of the correlations statistic included the value of 1.00 (Table 5), and so discriminant validity was established.

Furthermore, Henseler, Ringle, and Sarstedt (2016) suggest that to examine a multigroup analysis using SEM, the measurement invariance of composites (MICOM) should be performed. The results in Table 6 show that partial measurement invariance is established for both the Indonesian and South Korean groups.

PLS multi-group analysis was used to test differences in group-specific results that build on the PLS-SEM bootstrapping results. As shown in Table 8, three path relationships that were significantly different between Indonesia and South Korea appeared, namely visibility to social image, perceived cost to behavioral intention, and social image to behavioral intention, and the remaining values were nonsignificant.

#### 4.2. Structural model

A bootstrapping procedure was conducted to generate t-statistics and standard errors with 1000 bootstrap subsamples to estimate the significance of the hypothesized relationship among the variables. The  $R^2$  statistics refer to the amount of variance explained by the connected latent variables. It was found that 64.2% of the behavioral intention to use smartwatch in the Indonesian sample and 67.9% of that for the South Korean sample could be explained by perceived usefulness, social image, perceived price value, and perceived cost. This study also incorporates two control variables namely employment status and monthly income, to parcel out any additional variance in the model. Results show that both control variables are nonsignificant for Indonesia ( $\beta = 0.338$  employment status;  $-0.037$  monthly income,  $p > 0.1$ ) as well as South Korea ( $\beta = 0.049$  employment status;  $0.034$  monthly income,  $p > 0.1$ ).

Table 7 summarizes the results of the hypotheses testing. The results for the path analysis showed that complementary goods ( $\beta = 0.358$  Indonesia;  $0.483$  South Korea,  $p < 0.01$ ) and healthtology ( $\beta = 0.5$  Indonesia;  $0.363$  South Korea,  $p < 0.01$ ) were positively and strongly related to perceived usefulness for both Indonesians and South Koreans. Brand name was not related to social images in either country. Visibility was positively associated with social images in both countries ( $\beta = 0.578$  Indonesia;  $0.346$  South Korea,  $p < 0.01$ ). Moreover, perceived price value was positively related to behavioral intention for respondents in Indonesia ( $\beta = 0.119$ ;  $p < 0.1$ ), and even more significantly for South Koreans ( $\beta = 0.278$ ;  $p < 0.01$ ). Perceived cost, as expected, was negatively related to behavioral intention, but it was only significant for Indonesian respondents ( $\beta = -0.174$ ;  $p < 0.05$ ), not for South Koreans ( $\beta = 0.043$ ;  $p > 0.1$ ). Finally, perceived usefulness ( $\beta = 0.469$  Indonesia;  $0.361$  South Korea,  $p < 0.01$ ) and social images ( $\beta = 0.333$  Indonesia;  $0.343$  South Korea,  $p < 0.01$ ) were positively related to behavioral intention for both Indonesia and South Korea.

## 5. Discussion and conclusion

### 5.1. Discussion

This study examined antecedents for smartwatch-adoption intention in two countries, Indonesia and South Korea. A PLS-SEM path analysis showed that complementary goods and healthtology were associated with perceived usefulness. Brand name and visibility were associated with social image, and perceived usefulness, social image, perceived price value, and perceived cost were all associated with behavioral intention for smartwatch adoption. This general pattern of structural relationship was valid for both Indonesian and South Korean respondents, which indicates that the model can be used to explain general phenomena of smartwatch adoption in both countries.

This study added empirical support to the study of smartwatch adoption by demonstrating a strong relationship of perceived usefulness and behavioral intention to smartwatch adoption, which appeared to reach the greatest magnitude relative to other constructs for both countries. This paper supports the conventional wisdom that perceived usefulness is a pivotal factor in consumers' decision to adopt new products or services. Thus, the original technology acceptance model was reinforced.

In addition, the present study extended the given model by viewing not only the smartwatch as

Table 3. Measurement model.

Construct	Indicator	Indonesia				South Korea			
		Loadings	Cronbach's Alpha	Composite Reliability	AVE	Loadings	Cronbach's Alpha	Composite Reliability	AVE
Complementary Goods	cg1	0.675	0.566	0.776	0.540	0.838	0.715	0.839	0.636
	cg2	0.659				0.735			
	cg3	0.854				0.815			
Healthology	hl1	0.880	0.920	0.950	0.864	0.820	0.882	0.928	0.812
	hl2	0.955				0.944			
	hl3	0.951				0.934			
Brand Name	bn1	0.818	0.807	0.885	0.721	0.911	0.696	0.788	0.560
	bn2	0.897				0.597			
	bn3	0.829				0.704			
Visibility	vl1	0.787	0.772	0.864	0.680	0.908	0.926	0.953	0.871
	vl2	0.818				0.959			
	vl3	0.866				0.932			
Perceived Price Value	pv1	0.784	0.824	0.894	0.739	0.732	0.835	0.898	0.747
	pv2	0.910				0.925			
	pv3	0.880				0.921			
Perceived Cost	cs1	0.913	0.782	0.854	0.663	0.944	0.907	0.940	0.839
	cs2	0.718				0.874			
	cs3	0.799				0.928			
Perceived Usefulness	pu1	0.927	0.933	0.957	0.882	0.921	0.933	0.957	0.881
	pu2	0.936				0.948			
	pu3	0.954				0.947			
Social Image	si1	0.873	0.932	0.946	0.746	0.858	0.909	0.930	0.690
	si2	0.921				0.886			
	si3	0.888				0.868			
	si4	0.835				0.717			
	si5	0.800				0.801			
	si6	0.860				0.843			
Behavioral Intention	bi1	0.762	0.905	0.925	0.640	0.800	0.913	0.931	0.658
	bi2	0.846				0.856			
	bi3	0.855				0.804			
	bi4	0.841				0.885			
	bi5	0.822				0.816			
	bi6	0.799				0.752			
	bi7	0.656				0.758			

Table 4. Correlation matrix.

Variable	N	Mean	SD	1	2	3	4	5	6	7	8
<b>1 Complementary Goods</b>											
Indonesia	127	5.013	0.845	1							
South Korea	135	4.173	1.079	1							
<b>2 Healthology</b>											
Indonesia	127	4.433	1.456	.210*	1						
South Korea	135	3.548	1.444	.476**	1						
<b>3 Brand Name</b>											
Indonesia	127	5.808	1.054	.248**	.209*	1					
South Korea	135	5.689	1.026	.229**	0.120	1					
<b>4 Visibility</b>											
Indonesia	127	5.113	1.042	.242**	.220*	.326**	1				
South Korea	135	4.467	1.392	.278**	.360**	0.099	1				
<b>5 Perceived Price Value</b>											
Indonesia	127	4.425	1.121	.398**	.226*	0.116	0.149	1			
South Korea	135	3.388	1.045	.535**	.482**	0.108	.217*	1			
<b>6 Perceived Cost</b>											
Indonesia	127	4.336	1.266	-.205*	-0.147	-0.021	0.088	-.190*	1		
South Korea	135	4.946	1.301	-.203*	-0.130	-0.082	0.061	-.447**	1		
<b>7 Perceived Usefulness</b>											
Indonesia	127	4.480	1.141	.468**	.582**	.260**	.399**	.231**	-.320**	1	
South Korea	135	3.867	1.317	.645**	.596**	0.129	.430**	.556**	-0.009	1	
<b>8 Social Image</b>											
Indonesia	127	4.152	1.403	.206*	.247**	.232**	.570**	0.098	0.034	.511**	1
South Korea	135	3.154	1.240	.414**	.428**	0.107	.352**	.464**	-0.020	.622**	1
<b>9 Behavioral Intention</b>											
Indonesia	127	4.475	1.142	.538**	.500**	.287**	.409**	.304**	-.320**	.717**	.574**
South Korea	135	3.731	1.273	.601**	.456**	0.147	.257**	.580**	-0.082	.720**	.678**

\* $p < 0.05$ ; \*\* $p < 0.01$ ; multicollinearity diagnosis of perceived usefulness to behavioral intention (VIF: 1.636;  $2.034 < 10$ ) for Indonesia and South Korea respectively.

technology but also as a fashion accessory and healthcare assistant, all in one framework. For the smartwatch as technology, complementary goods appeared to play a decisive role in consumers' perception of its usefulness. This supported the suggestion that the more practical and enjoyable the complementary applications for the smartwatch are, the more useful it is perceived to be by consumers (Dehghani et al. 2018).

Second, in the era of artificial intelligence, where health and technology are playing inseparable roles, the involvement of the healthcare perspective in assessing smartwatch adoption is pivotal. Regarding healthcare functions, the smartwatch is mostly utilized to measure calories burned and heart rate, to detect falls and medical emergencies, and to help wake the consumer up when desired. This suggests that the smartwatch may be viewed as a health-monitoring system to motivate its user to perform more exercise through the collection of personal data. Aligned with this perspective, the study findings suggest a significant impact of the healthology construct on perceived usefulness, which means that consumers in Indonesia and South Korea perceive the smartwatch's usefulness in terms of its functionality as a healthcare assistant.

Further, in terms of the smartwatch as a fashion accessory, social images also showed a strong, positive, and direct relationship with behavioral intentions in both countries. This finding extended the existing understanding that had previously only been shown to exist in an indirect relationship between social images and intention to use a smartwatch and wearables (Choi and Kim 2016; Yang et al. 2016). Thus, we may also conclude that the smartwatch should no longer be considered only as a utilitarian technological device but also a personalized and trendy item that reflects individual identity. In addition, the multigroup analysis also showed that the path relationship of social images to behavioral intention in both countries exhibited a significant difference. This means that South Korean respondents perceived a stronger positive association of social images as an antecedent of behavioral intention to adopt the smartwatch than the Indonesian respondents. This finding indicates that the smartwatch is considered to be a fashion item that helps to express one's uniqueness and identity among South Koreans (Choi and Kim 2016).

This study also suggests that visibility is strongly associated with an individual's social image in both countries. One plausible explanation is that

Table 5. Discriminant validity assessment results.

Variable	Behavioral Intention	Brand Name	Complementary Goods	Perceived Cost	Healthology	Perceived Usefulness	Perceived Price Value	Social Image
Brand Name	Indonesia [0.518, 0.338] South Korea [0.32, 0.187]							
Complementary Goods	Indonesia [0.894, 0.758] South Korea [0.865, 0.751]	[0.575, 0.389] [0.423, 0.304]						
Perceived Cost	Indonesia [0.54, 0.375] South Korea [0.149, 0.123]	[0.075, 0.073] [0.16, 0.114]	[0.459, 0.307] [0.493, 0.256]					
Healthology	Indonesia [0.714, 0.548] South Korea [0.664, 0.514]	[0.423, 0.237] [0.232, 0.153]	[0.453, 0.295] [0.774, 0.606]	[0.269, 0.178] [0.308, 0.161]				
Perceived Usefulness	Indonesia [0.898, 0.788] South Korea [0.861, 0.786]	[0.503, 0.301] [0.311, 0.156]	[0.812, 0.645] [0.903, 0.798]	[0.581, 0.375] [0.064, 0.049]	[0.771, 0.628] [0.775, 0.657]			
Perceived Price Value	Indonesia [0.531, 0.35] South Korea [0.766, 0.663]	[0.269, 0.155] [0.215, 0.141]	[0.776, 0.589] [0.808, 0.694]	[0.413, 0.239] [0.689, 0.525]	[0.475, 0.266] [0.71, 0.562]	[0.486, 0.266] [0.747, 0.623]		
Social Image	Indonesia [0.784, 0.633] South Korea [0.822, 0.746]	[0.457, 0.265] [0.217, 0.161]	[0.41, 0.295] [0.679, 0.508]	[0.228, 0.169] [0.093, 0.086]	[0.486, 0.269] [0.635, 0.477]	[0.709, 0.549] [0.765, 0.673]	[0.199, 0.134] [0.683, 0.526]	
Visibility	Indonesia [0.697, 0.489] South Korea [0.465, 0.286]	[0.559, 0.406] [0.216, 0.133]	[0.557, 0.378] [0.553, 0.345]	[0.205, 0.145] [0.145, 0.077]	[0.458, 0.254] [0.57, 0.399]	[0.656, 0.457] [0.61, 0.462]	[0.393, 0.194] [0.424, 0.246]	[0.8, 0.661] [0.526, 0.385]

Notes: The numbers in brackets are the 97.5% bias-corrected and accelerated confidence intervals of the HTMT statistic.

consumers expect to improve their social images by purchasing a wearable due to its nature of being worn on the body, which makes it naturally exposed to one's peers (Yang et al. 2016). However, a multi-group analysis on the path relationship of visibility to social images between the two countries showed a significant difference. This means that Indonesian respondents perceived a stronger positive association with visibility as an antecedent of social images than did South Korean respondents.

The relationship between brand name and social image was nonsignificant for both countries, which leads us to conclude that in neither country do consumers perceive that the brand of a smartwatch will improve their image or gain them social acceptance. The familiarity perspective may explain this phenomenon. Hui (2010) found that consumers' reliance on brand names in adoption decisions can be reduced by their knowledge with a study on adoption of antivirus software. Because smartwatches are a mature product in the South Korean market, we can infer that potential consumers in South Korea are already familiar with it and have sufficient knowledge about it. Due to this familiarity, smartwatch adoption and ownership can be considered casual buying. Therefore, brand names may be perceived to not have any social acceptance effect. Contrastingly, for the Indonesian market, because the smartwatch is not yet well known, it is plausible that people only recognize the smartwatch as a technological innovation but fail to recognize differences among brands of smartwatch. To understand fully the difference between these two countries on the effect of brand names, future research is needed. Such research may generate interesting insights to establish effective marketing strategies depending on consumers' familiarity levels with the innovative products.

Next, we test the perceived cost and perceived price value to assess purchasing power and perceived worth of the smartwatch to the consumers in both countries. "Perceived cost" refers to how expensive the smartwatch is in the eye of the consumer (Kim and Shin 2015), and perceived price value reflected how much a product worth its price (Venkatesh et al. 2012). The results showed that perceived cost was negatively and strongly associated with behavioral intention only for Indonesian consumers, and perceived price value was positively related to behavioral intention for both countries. This result suggests that as the price of the smartwatch increases, Indonesian consumers become less willing to adopt it. However, if the increase in price is balanced with increased value, Indonesian consumers may perceive a positive value therein and may thus be willing to adopt it. On the other hand,

Table 6. Measurement invariance (MICOM) assessment.

Variable	Indonesia vs. South Korea	
	C	5% quantile of Cu
Complementary Goods	0.997	0.986
Healthology	1.000	0.998
Brand Name	0.948	0.705
Visibility	0.998	0.993
Perceived Usefulness	1.000	1.000
Social Image	0.998	0.999
Perceived Price Value	0.998	0.992
Perceived Cost	0.991	0.912
Behavioral Intention	0.999	0.999

Notes: If  $C < 5\%$  quintile of  $C_u$ , compositional invariance requirements are violated.

the study suggests that perceived cost is not a significant antecedent for the behavioral intention of South Korean, which may be because South Korean consumers do not perceive the smartwatch to be an expensive product, and so its perceived cost is not significant in their adoption decision.

The multigroup analysis showed that the path relationship of perceived cost to behavioral intention between the two countries exhibited a significant difference. This means that Indonesian respondents perceived a stronger negative association with

perceived cost as an antecedent of behavioral intention than did South Korean respondents. This reconfirms the supposition that perceived cost is a decisive factor for Indonesian consumers in adopting the smartwatch. The result is highly expected because Indonesia's economy and purchasing power are much smaller than South Korea's.

## 5.2. Theoretical contribution and managerial implications

The technology acceptance model (TAM) is one of the most frequently used theoretical frameworks for examining innovation adoption. Yet, the TAM has been mostly used to confirm the utilitarian motivational aspects related to technology hitherto. This study extends the TAM and increases its explainability by exploring the smartwatch as a fashion accessory as well as a healthcare-assistance provider. The present research contributes to the literature by providing empirical findings on smartwatch adoption in a comparative study. In particular, this study employs a comprehensive framework on smartwatch adoption by exploring unexamined variables. We also discussed how consumers of two countries from North-East and

Table 7. Result of the country-specific structural model.

Path relationships	Indonesia	If supported	South Korea	If supported
H1: Perceived Usefulness -> Behavioral Intention	0.469***	Yes	0.361***	Yes
H2: Social Image -> Behavioral Intention	0.333***	Yes	0.343***	Yes
H3: Perceived Price Value -> Behavioral Intention	0.119*	Yes	0.278***	Yes
H4: Perceived Cost -> Behavioral Intention	-0.174**	Yes	0.043	No
H5: Complementary Goods -> Perceived Usefulness	0.358***	Yes	0.483***	Yes
H6: Healthology -> Perceived Usefulness	0.500***	Yes	0.363***	Yes
H7: Brand Name -> Social Image	0.044	No	0.124	No
H8: Visibility -> Social Image	0.578***	Yes	0.346***	Yes
R <sup>2</sup>				
Perceived Usefulness	0.460***		0.536***	
Social Image	0.353***		0.142***	
Behavioral Intention	0.642***		0.679***	

Notes: \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

Table 8. Multigroup comparison test results.

Relationship	Indonesia vs. South Korea	
	diff	p-value
H1: Perceived Usefulness -> Behavioral Intention	0.108	0.438
H2: Social Image -> Behavioral Intention	0.01*	0.926
H3: Perceived Price Value -> Behavioral Intention	0.159	0.143
H4: Perceived Cost -> Behavioral Intention	0.217**	0.021
H5: Complementary Goods -> Perceived Usefulness	0.124	0.192
H6: Healthology -> Perceived Usefulness	0.137	0.197
H7: Brand Name -> Social Image	0.079	0.486
H8: Visibility -> Social Image	0.231**	0.014

Notes: \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

South-East Asia, respectively, representing more developed and less developed economies, show different responses to smartwatch adoption. This study also is one of the early examinations of smartwatch adoption focusing on Indonesia.

The proposed framework is proven to have more than fifty percent explanatory power in terms of the variance of behavioral intention for both countries. This result indicates that incorporating the three perspectives of the smartwatch—namely as a piece of technology, a fashion accessory, and a healthcare assistant—is important in evaluating the smartwatch adoption of current consumers. Moreover, it applies to both a relatively mature market such as South Korea and a relatively emerging and growing market such as Indonesia. Therefore, we suggest that smartwatch manufacturers need to focus both on the fashion aesthetics of their smartwatches and on their usage performance. As consumers' awareness of healthy lifestyle increases, producers can enhance consumers' usage experience through building more applications or functions to better enable consumers to pursue their healthcare activities. Existing smartwatch functions lie mostly in general health monitoring. In the future, this can be expanded by providing advanced applications for health measurements relating to different sports so that each consumer can personalize and link their healthcare activities according to their favorite sports.

Moreover, in general, with the exception of the cost, visibility, and social-image factors, the cross-cultural analysis showed no meaningful difference in either country for assessing smartwatch adoption. This suggests that even though the two countries have different technology adoption rates, consumers evaluate smartwatch adoption similarly—that is, they hold perceived usefulness as the pivotal factor in their adoption decisions. This confirms the long-term importance of the perceived usefulness construct in the continuance of smartwatch adoption. Especially in South Korea, where technological advancement is growing exponentially, producers need to adapt quickly to be able to provide a continuous advancement in creating complementary applications for smartwatch consumers. In addition, for Indonesian consumers, if the smartwatch is perceived to be expensive, it may lessen their intention to adopt it. Thus, smartwatch producers in Indonesia could consider focusing on producing and affordable smartwatches to increase adoption without neglecting functionality.

### *5.3. Limitations and directions for future research*

Although the findings of current research provide meaningful insight into the smartwatch-adoption literature, this study is not without limitation. First of all, the data were collected using a self-reported survey, which may cause a common method bias. Secondly, instead of actual adoption, this study explores intention to adopt. This is due to the consideration that the penetration rate in Indonesia and South Korea is relatively low and moderate, whereby there is potential room for growth. Because current study intends to extend the adoption literature by proposing a new comprehensive framework, therefore we chose to test for the behavioral intention. However, the construct of behavioral intention instead of actual behavior may suffer from social desirability bias. Thus, future studies may minimize this effect by testing the proposed framework on actual smartwatch consumers for their continuous intention to use the smartwatch.

Moreover, there are several issues that should be considered in future research. First, the findings suggest that social images appear to be an important aspect of smartwatch adoption; therefore, future studies need to identify the antecedents of the social images more precisely. The construct of injunctive norm (Cialdini et al. 1990) could be appropriate here. This norm, defined as a consumer's belief that his or her peers (i.e., friends, colleagues, etc.) expect them to adopt smartwatch. This is because individuals in general have a natural need for companionship in their social environment (Cialdini and Goldstein 2004), and extant literature on diffusion of new technologies has proven that consumers' adoption intentions can be affected when their peers start to adopt the new technology (Pescher and Spann 2014). Second, the use of a general questionnaire related to brand names may have been the reason why the brand name has no significant effect on social image. To explicitly identify the effect of brand name on cross-cultural consumers' reactions, future research should aim to better employ the real brand name and confirm the relationship between brand name and social images, as well as behavioral intention to adopt smartwatch. Third, individual differences of consumers were not fully investigated. Future studies could extend this study and generate contributions by addressing the moderating effect of the individual difference such as age and gender.

## APPENDIX.

*Questionnaire items*

Variable	CA	Question Items	Reference
Healthology	0.8	<ol style="list-style-type: none"> <li>1. I expect that owning smartwatch will motivate me to exercise</li> <li>2. I expect that owning smartwatch will help me to have a better control over my daily calorie intake</li> <li>3. I expect that owning smartwatch will help me to have a well-balanced diet</li> </ol>	<a href="#">Dehghani et al. (2018)</a>
Social Image	0.91; 0.86; 0.95	<ol style="list-style-type: none"> <li>1. I expect that owning smartwatch allows me to impress others</li> <li>2. I expect that owning smartwatch allows me to improve my image</li> <li>3. I expect that owning smartwatch allows me to improve how others perceive me</li> <li>4. Wearing smartwatch would make me feel good about myself</li> <li>5. Smartwatch could play a critical role in defining my self-concept</li> <li>6. Wearing smartwatch gives me social approval</li> </ol>	<a href="#">Rauschnabel et al. (2018)</a> <a href="#">Krey et al. (2019)</a> <a href="#">Yang et al. (2016)</a>
Visibility	0.83	<ol style="list-style-type: none"> <li>1. Generally speaking, other people would notice if I wear a smartwatch</li> <li>2. Smartwatches are technology that is recognized by people who see me</li> <li>3. Smartwatches are a technology that is very visible to other people</li> </ol>	<a href="#">Krey et al. (2019)</a>
Complementary Goods	0.8	<ol style="list-style-type: none"> <li>1. There are many practical apps available for smartwatch</li> <li>2. I think updating the smartwatch's operating system is easy</li> <li>3. I think the apps available for smartwatch are enjoyable</li> </ol>	<a href="#">Dehghani et al. (2018)</a>
Brand Name	0.88	<ol style="list-style-type: none"> <li>1. The brand name of smartwatch manufacturer will influence my purchasing decision if all manufacturers provide same features</li> <li>2. The brand name of smartwatch manufacturer is considerable because quality depends on that</li> <li>3. Reliable brand name is one of key factors to choose smartwatch</li> </ol>	<a href="#">Yang et al. (2016)</a>
Perceived Cost	0.72	<ol style="list-style-type: none"> <li>1. I think purchasing a smartwatch is a burden to me</li> <li>2. I think it will be hard for me to easily afford buying smartwatch</li> <li>3. Smartwatch is expensive</li> </ol>	<a href="#">Kim and Shin (2015)</a>
Perceived Price Value	0.94	<ol style="list-style-type: none"> <li>1. Smartwatch is reasonably priced</li> <li>2. Smartwatch is good value for money</li> <li>3. At the current price, smartwatch provides good value</li> </ol>	<a href="#">Talukder et al. (2018)</a>
Perceived Usefulness	0.91	<ol style="list-style-type: none"> <li>1. Smartwatches could help me organize my life better</li> <li>2. Smartwatches could increase my productivity</li> <li>3. Smartwatches could make my life more effective</li> </ol>	<a href="#">Chuah et al. (2016)</a>

(continued on next page)



(continued)

Variable	CA	Question Items	Reference
Behavioral Intention	0.8	1. Using a smartwatch would be a smart decision to make 2. I would be happy to use a smartwatch 3. I would feel excited to purchase a smartwatch 4. I would be willing to use a smartwatch 5. I would be willing to let a smartwatch help me to perform different kinds of tasks	Wu et al. (2016)
	0.79	6. Given I have the financial resources to afford a smartwatch, I would buy one 7. I intend to buy a smartwatch in the near future	Krey et al. (2019)

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