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CONTINUOUS USAGE OF FITNESS TRACKER SYSTEMS

EXPANDING THE UTAUT2 MODEL WITH RISK, HEALTH VALUATION, AND SATISFACTION

EXAMINATION COMITEE
Dr. A.D. Beldad
Prof. Dr. M.D.T. de Jong

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Christian Streichan

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Expanding the UTAUT2 model with perceived privacy risk, health valuation, and satisfaction

MASTER THESIS

Name:	Christian Streichan
Student number:	s2207451
E-mail:	c.streichan@student.utwente.nl
Institution:	University of Twente
Faculty:	Behavioural, Management, and Social Sciences (BMS)
Master:	Communication Science
Specialization:	Digital Marketing Communication
Supervisor:	Dr. A.D. Beldad
Second supervisor:	Prof. Dr. M.D.T. de Jong
Date:	June 15, 2020

ABSTRACT

Purpose
Wearable fitness trackers are becoming increasingly important in the everyday lives of millions of individuals in Germany. The popularity of these systems, combined with their nature to be an ambivalent source of both benefits and risk scenarios, leads to the question of which factors influence the users' intention to continue to use them. The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) was extended by introducing the determinants perceived privacy risk, health valuation, and satisfaction into the model. Additionally, gender was proposed as a moderator.

Method
The study used an online survey with 35 items to measure the nine different constructs. Furthermore, eight questions were used to measure demographic and use context variables. The online questionnaire was posted on several social networks. Recipients were asked to spread the survey to their social environment further, thus instrumentalizing snowball sampling. The survey was also posted to specific groups on Facebook and LinkedIn. The only limitation in terms of sample respondents was the exclusion of individuals who were not currently using an FTS. Due to the chosen distribution method, the collection of the sample can be considered a convenience sample. The cleaned data set contained 307 usable responses.

Findings
A hierarchical regression analysis was conducted with the data. The results showed that effort expectancy, habit, and satisfaction were significant positive predictors of the individuals' intention to continue using a fitness tracker system. Besides these positive influences, the results also implied that perceived privacy risk had a significant adverse effect on continuous usage intention. The results suggested that effort expectancy, habit, and satisfaction are the most important predictors of continuous usage intention of fitness tracker systems. Interestingly, performance expectancy, descriptive social norms, and health valuation did not influence the users' continuous usage intentions. Lastly, findings implied that gender did not have any moderating effect on the dependent variable.

Conclusion
In conclusion, it can be said that effort expectancy, habit, and satisfaction have a significant influence on the behavioral intention to continue using an FTS. This means that when trying to increase user loyalty, changes that improve the user experience in terms of effort, satisfaction, and habits should be prioritized. Moreover, perceived privacy risk proofed to be a significant negative predictor, which means that there is a need to simplify the risk assessment process for the users. Performance expectancy, descriptive social norms, and health valuation did not influence the intention to continue using an FTS. Thus, users that are already using the technology, are not influenced by their surroundings, or the possibilities the technology offers in terms of fitness or health self-management. Furthermore, gender did not show to moderate any of the predictors of continuous usage intention of FTSs.

Keywords
Fitness tracker system, continuous use, UTAUT2, perceived privacy risk, health valuation, satisfaction.

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1. INTRODUCTION

In today's world, the presence of computers is ubiquitous. There is almost no facet of life that cannot be enhanced, tracked, or supported using different computers. One of the most prominent examples of technology that becomes increasingly important in the everyday lives of millions of individuals are wearable fitness trackers. A growing number of brands provide fitness tracker systems (e.g., Garmin, Samsung, Jawbone, Polar, Xiaomi) that allow customers to self-monitor their fitness and health-related progress. The International Data Corporation expects that the overall market for wearables grows from 113 million units sold in 2017, to around 220 million units sold in 2021 (IDC, 2016.). About 26 millions of these wearable devices were fitness trackers, with the most popular brands being Fitbit (13%), Xiaomi (13%), and Apple (10%) (IDC, 2016).

Fitness trackers are typically connected to the body, mainly the wrist. These devices allow the customer to measure health-related data continually and to track their daily activities through displaying factors such as step count, heart rate, or burned calories (Gao, Li & Luo, 2015). The fitness trackers predominantly use Bluetooth connections to communicate and sync the collected data with the smartphone, which automatically uploads the collected data to mobile apps, linked websites, cloud services, or a combination of all of these (Gao et al., 2015; Das, Pathak, Chuah, & Mohapatra, 2016). The fitness tracker system (FTS) relevant to this research comprises the three main components: fitness tracker device, App, and cloud service. Research shows data collected by FTSs has significant value in self-health management, as the displayed data, for example, enables the user to quickly understand how much energy their body needs and thus can be used to prevent weight gain (Thomas et al., 2017).

Besides these beneficial use cases in self-management, FTSs also open the field for different risk scenarios. Most of these originate from the lack of security of personal data (Fereidooni, Frassetto, Miettinen, Sadeghi, & Conti, 2017). The information that is collected often seems innocuous to users. Still, if the information is collected over a period, or combined with other types of data, it can provide extremely detailed and private insights into the habits and health of individuals when provided to third parties (Christovich, 2016). Furthermore, the generated data is often not owned by the user. The information is stored and collected by the manufacturer, and usually, only a summary of results is provided. The sharing of data can happen automatically, for example when an FTS syncs with a third-party app, or when users actively decide to share their data with others, but also when the production company chooses to share or sell users' data with third parties (Fitbit, 2016; Fitbit 2018). Some companies claim that they only share ‘anonymized’ data. However, the simple removal of identifying features or distortion does not guarantee an adequate level of anonymity (Venkataramanan, 2014). User identity can still be revealed by cross-referencing the generated data with other digital behavioral user data, and specific behaviors are adequately predicted (Montjoye, Hidalgo, Verleysen & Blondel, 2013).

Considering the mentioned potential benefits and privacy risk scenarios, it becomes necessary to study the continuous usage of FTSs, as it would broaden the limited understanding of their continuous usage determinants. One theoretical framework widely used in previous studies concerning the use and adoption of FTS technology is the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) created by Venkatesh, Thong, and Xu (2012). In recent years several studies showed that UTAUT2 could also be used to significantly predict the continuous usage intention in terms of other information system technology (Cheng, Sharma, Sharma, & Kulathunga, 2020; Lee, Sung, & Jeon, 2019; Alalwan, 2020). However, until today no study has utilized the UTATU2 model to study the continuous usage intention of FTSs.

Another reason for deploying the UTAUT2 in this research is its superior performance compared to eight other information system (IS) models in terms of explaining individual IS usage (Venkatesh et al., 2012). Venkatesh et al. (2012) indicated that when applying UTAUT2

to different research contexts, extension or modification of the model might be needed to better understand a pivotal occurrence. Considering the stated risk scenarios, the setting of current usage, and the health-related self-management functions of FTS, extending the model with other determinants becomes necessary. Perceived privacy risk, health valuation, and satisfaction have been included as an extension to the UTAUT2 model to broaden the theoretical relevance of the model and evaluate these possible extensions of UTAUT2 in a continuous use context.

The research dedicated to information systems and technology in terms of continuous usage (e.g., Lee et al., 2019; Cheng et al., 2020; Yuan, Ma, Kanthawala & Peng, 2015) is usually focused on the relationship of different influence factors of use. Thus, there continues to be a gap in understanding whether there is a difference between males and females in continuous use, especially concerning FTSs. Thus, this research examines the moderating effects of gender in this model and aims at empirically disclosing whether or not there is a gender difference.

The practical contributions of this research will be most relevant to providers of FTSs, as these entities have a keen interest in customer loyalty. The results will give them a more comprehensive understanding of which predictors influence their customer base's continuous usage intention and allow them to adapt their services and products accordingly, and attract more users in a targeted manner.

In conclusion, the primary target of this research can be summarized in the two main research questions:

1. *What factors influence the intention of German users to continue using a fitness tracker system?*
2. *To what extent are the effects of performance expectancy, effort expectancy, descriptive social norms, habit, perceived privacy risk, health valuation, and satisfaction on intention to continue using a fitness tracker system moderated by gender?*

2. THEORETICAL FRAMEWORK

In the following chapter, the necessary literature review regarding the research model, the extension made to the original model, as well as the moderating variables within the model will be discussed. The derivation of the UTAUT2 model marks the beginning of this chapter. This is followed by an explanation for every UTAUT2 determinant, the necessary extensions to the model, and, finally, the moderating factor.

2.1. The research model

Due to the novelty of fitness tracker systems, it is not fully understood which factors drive the intention of the individual to continue using them. The UTAUT2 (Venkatesh et al., 2012) is an extension of the technology acceptance model (TAM) by Davis (1989) and the original UTAUT that was established by Venkatesh et al. (2003). The researchers combined the TAM with different decision-making frameworks such as the theory of social cognitive theory, innovation diffusion theory, and theory planned behavior (Yuan, Lai, & Chu, 2018).

The UTAUT2 model is also an extension of the original UTAUT model, proposed with seven elements: performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit (Venkatesh et al., 2012). UTAUT2 has shown superior predictive validity compared to other adoption and usage models applied in the literature (Venkatesh et al., 2012). While previous models focused on the organizational context, UTAUT2 keeps the focus on the consumer context (Venkatesh et al., 2012). The focus of studies on information technology using the UTAUT2 framework has mainly been on technology adoption and not continuous technology usage (Kalantari, 2017). In recent years several studies showed that UTAUT2 could also be used to significantly predict the continuous usage intention in terms of other information system technology (Cheng et al., 2020; Lee et al., 2019; Alalwan, 2020).

In their original model, Venkatesh et al. (2012) also promoted the idea of four moderators: Age, gender, experience, and voluntariness of use. Due to the nature of the sample, the data is not well suited to run comparisons across individual characteristics such as age, experience, and voluntariness. Therefore, this research excludes the exploration of age, experience, and voluntariness and only explores the moderation role of the individual characteristic gender on the relationships from independent variables to the dependent variable, as proposed in UTAUT2 (Venkatesh et al., 2012).

Venkatesh et al. (2012) indicated that when applying UTAUT2 to different research contexts, extension or modification of the model might be needed to better understand a pivotal occurrence. This means that with the extension of the model, the explained variance of the model should also grow. Health valuation adds that current research suggests that if individuals see no positive outcome from using a technology, in this case, individual health or wellness, they will not use it (Beldad & Hegner, 2017). Given the potential of FTSs to improve the health condition of users' (Gao et al., 2015), the role of the users' health valuation in increasing the continuous use intention of those systems also deserves observation.

Early research regarding information technology has empirically validated the direct relationship between satisfaction and usage intention (Bhattacherjee, 2001). More recent studies in the field confirm that user satisfaction has a significant influence on continued information system usage intention (e.g., Wang, Park, Chung, & Choi, 2014; Deng, Turner, Gehling, & Prince, 2010). Still, current research concerning the topic of FTS does not take satisfaction into account when researching the intention for continuous use. Thus, the next construct added to the extended model is satisfaction.

Prior studies show that individuals' decision to use mobile technology is not primarily driven by the fear of third-party data (mis-)use. The decision is much rather driven by the popularity, usability, and price of a technology (Kim, Park, & Oh, 2008; Kelley, Cranor, & Sadeh, 2013).

At the same time, however, people are concerned about their privacy and especially its potential (mis-)use of third parties (Smith, Dinev, & Xu, 2011; Barth & de Jong, 2017). This inconsistency between the concern of privacy risks and the actual usage behavior is called the privacy paradox. This paradox is essential to take into account when studying the continuous usage intention of FTSs. Thus, the next factor that this research adds to the model to create a more comprehensive model of continuous use of FTSs is perceived privacy risk, which has been proven by different studies to negatively influence technology usage (e.g., Tan, 1999; Egea & González, 2011).

This study excluded two variables of the original UTAUT2: The price value of the FTS and hedonic motivation. The reason for excluding the determinant price value is that this research targets users' intentions for continuous use. Since FTSs do not require ongoing monetary payment, the price value is not a relevant variable. The exclusion of hedonic motivation can be justified with the findings of Dwivedi, Shareef, Simintiras, Lal, and Weerakkody (2016). They argued that there is no direct effect of the construct on behavioral intention in a health-related environment. Furthermore, the overall construct should have less relevance to a fitness- and health-conscious individual.

2.2. Using UTAUT2 to estimate an individual's intention to continue using an FTS

The first factor included in the UTAUT2 model, performance expectancy, is widely seen as one of the most critical factors influencing behavioral intention (Venkatesh et al., 2003). Venkatesh et al. (2012) define performance expectancy as "the degree to which using technology will provide benefits to consumers in performing certain activities." With regards to fitness tracker systems, this can be specified to the degree to which the FTS will assist the user in fitness self-management. Looking at the vast possibilities created in terms of self-management (e.g., preventing weight gain or tracking training progress) (Thomas et al., 2017), it is expected that a factor such as performance expectancy is a significant predictor towards the continuous usage of the technology. Different current studies show that performance expectancy has an influence on the behavioral intention to use fitness tracker systems, but show different levels of importance. A study by Reyes-Mercado (2018) found a strong influence of performance expectancy on behavioral intention to use FTSs. Another study by Gao et al. (2015) analyzing wearable technology in healthcare found that although performance expectancy contributes to the behavioral intention of using the technology, the relationship is not as significant as other factors in the UTAUT2. The conclusion from this is that if the consumer feels that using an FTS to monitor physiological indicators helps him or her to self-manage and improve their overall quality of life, then they are more likely to continue using their FTS. Thus, it can be hypothesized:

H1: The performance expectancy of FTS usage positively affects the behavioral intention of the user to continue using an FTS.

The next factor that originates from the original UTAUT2 model is effort expectancy. Effort expectancy is defined as "the degree of ease associated with consumers' use of technology" (Venkatesh et al., 2012). Effort expectancy is operationalized as a measure of how easy it is for the user to monitor physiological indicators or to self-manage with their FTS. This means that it is assumed that the more comfortable to use the user expects the technology to be, the more likely he is to continue using it. Similar to performance expectancy, effort expectancy is another strong predictor for behavioral intention and technology usage (Venkatesh et al. 2012). Prior studies in other contexts, such as application banking (Baptista & Oliveira, 2017) and mobile app-based e-commerce (Tak, & Panwar 2017), indicate a significant positive relationship between effort expectancy and technology adoption and usage. Beldad and Hegner (2017) showed that effort expectancy significantly influenced the intention to continue using a fitness app. In the wearable context, several studies (Talukder, Chiong, Bao, & Hayat Malik, 2019;

Reyes-Mercado, 2018) show that effort expectancy significantly positively influences consumers' intention to utilize wearable technology. This finding means that it is reasonable to assume that effort expectancy would be positively associated with more positive behavioral intention to continue using an FTS. Thus, it can be hypothesized:

H2: The effort expectancy of FTS usage positively affects the behavioral intention of the user to continue using an FTS.

The crucial next factor the UTAUT2 model in its original form is social influence. In this research, social influence is operationalized as descriptive social norms. Descriptive social norms comprise information about a typical behavior (e.g., what people actually do). These norms work by creating shortcuts in decision-making "to the identification of useful behavior and by making use of a motivation to maintain an accurate representation of the world" (Cialdini & Goldstein, 2004). The result of this is that people tend to adopt these norms and favor them as acceptable. The influence of the construct descriptive social norms in the technological environment has been researched in different studies, for example in mobile payment services (Yang, Lu, Gupta, Cao, & Zhan, 2012), instant messaging (Lu, Zhou, & Wang, 2009), or a study regarding use-related behavior in fitness apps (Beldad & Hegner, 2017). The spreading popularity of FTS might explain why the awareness of individuals of this could increase their willingness to continue to use these technologies. The related hypothesis thus is:

H3: Descriptive social norms positively affect the behavioral intention of the user to continue using an FTS.

The next concept of the original UTAUT2 framework are the so-called facilitating conditions. This concept is defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system" by Venkatesh et al. (2003) in their original UTAUT model. In his UTAUT2 model, Venkatesh et al. (2012) regard facilitating conditions as comparable to the perceived behavioral control construct of the theory of planned behavior (Zhou, Lu, & Wang, 2010). Facilitating conditions are described as environmental influences that either accelerate or hinder the acceptance of the technology. In the realm of the continuous use of FTSs, facilitating conditions include the experience with the system of the individual, knowledge, or possibilities to receive product support. Some FTSs might require more experience or training (e.g., in the form of YouTube tutorials) from consumers than others. As a result, expertise or support concerning FTSs is theorized to influence the continuous use of users. Users that have more or better knowledge of how to use the system are more likely to continue using them. Thus, it can be hypothesized:

H4: Facilitating conditions of FTS usage positively affect the behavioral intention of the user to continue using an FTS.

Habit is defined as "self-reported perception of automatically engaging in a certain behavior" (Yuan et al., 2015), which has been proven to be an essential predictor of other mobile technology use (Venkatesh, Thong & Xu, 2012; Khan, Hameed, & Khan, 2017). Research by Peters (2008) in the context of communication technology adoption showed that habitualization strongly influenced the expected use of the technology. Habit was demonstrated in previous studies as a critical factor in technology context use (Limayem et al., 2007). It also depends on the level of use of the target technology (Venkatesh, Thong & Xu, 2012). As most users use their FTS 24/7 (Tehrani & Michael, 2014), continuous usage of FTS technology likely creates a habit, which, in turn, increases the intention to continue using the technology. Thus, it can be hypothesized:

H5: Habit positively affects the behavioral intention of the user to continue using an FTS.

2.3. The impact of health valuation

As established in previous research, fitness trackers allow the user to measure health-related data continually and to track their daily activities through displaying factors such as step count, heart rate, or burned calories (Gao et al., 2015). These functionalities have significant value in self-health management. The displayed data, for example, enables the user to understand how much energy their body needs quickly and thus can be used to prevent weight gain or allows them to track their training progress (Thomas et al., 2017). These facts lead us to conclude that the expansion of the original UTAUT with the usage behavior predictor health valuation is a worthwhile endeavor to understand the continuous usage of FTSs. The decision to include health valuation as a factor is based on the idea that if people to do not see a potential beneficial result (e.g., improved health), that can be obtained by using a particular technology (in this case the FTS) they will not see any purpose in utilizing it (Beldad & Hegner, 2017). Beldad and Hegner (2017) define health valuation as the degree to which people prioritize their health compared to other basic needs. The researchers compare this to the concepts of health consciousness by McGloin, Embacher, and Atkin (2017) and the "level of attention people give to their health" (Cho, Park, & Lee, 2014). Concerning the studies of Cho et al. (2014) and McGloin et al. (2017) that dealt with health apps, Beldad and Hegner (2017) found out that individuals who put more value on their health are more likely to use health apps than the individuals who put less value on their health. Regarding FTSs, it is implausible that an individual uses such a product (however useful and usable) when they do not value their health. Beldad and Hegner (2017) mentioned that the extension of the UTAUT2 with the construct health valuation implies that the effort to comprehend the user's continuous usage intention must also take into account the context of the use. While the factor performance expectancy focusses on a fitness context, health valuation focusses on a health context. In the case of FTSs, users that do not value the health benefit that can be drawn from the system's usage may not continue to use their FTS. Thus, it can be hypothesized:

H6: Health valuation positively affects the behavioral intention of the user to continue using an FTS.

2.4. The influence of satisfaction

Consumer satisfaction is widely regarded as a critical factor for continuous usage. Satisfaction is the overall affective response to the gap between perceived performance and performance expectancy during usage (Oliver & DeSarbo, 1988). In this study, satisfaction is defined as the user's total usage perception when using their FTS. The research on user satisfaction and continuous usage has emerged as an essential issue in information system literature. In his 2001 study, Bhattacherjee argued that users with high levels of satisfaction towards a specific online channel have stronger intentions to continue to use this channel. More recent research in the field of information systems also confirms that user satisfaction has a significant influence on continued information system usage intention (e.g., Wang et al., 2014; Deng et al., 2010). Based on these results, it is very likely that user satisfaction influences the usage of FTSs. Thus, it can be hypothesized:

H7: Satisfaction positively affects the behavioral intention of the user to continue using an FTS.

2.5. The impact of perceived privacy risk

As FTSs generate extremely detailed and private insights into the habits and health of individuals (Christovich, 2016), the collected data should be a susceptible privacy risk to individuals, when compared to other types of information, such as demographics (Bansal, Zahedi, & Gefen, 2010). The perceived privacy risk of an individual is expected to have an impact on FTS usage. Due to the negative emotions connected to perceived privacy risk, the

effect of it is probably negative. Different studies conducted in distinctive settings show that the perception of risks has a negative effect on technology usage (Cocosila & Trabelsi, 2003; Rheingans, 2016). Furthermore, prior studies showed that in comparison with the positive effects of trust on usage intention, perceived privacy risks could harm usage intention (Glover & Benbasat, 2010; Gupta, Iyer, & Weisskirch, 2010). Thus, the influence of privacy risk on the continuous use of FTS is highly relevant to this research.

Usually, individuals' conduct risk-benefit calculation when they are requested to provide personal information to organizations. This process is regarded as privacy calculus (Awad & Krishnan, 2006). Like Gao et al. (2015), privacy calculus was merged into this framework, since wearable devices hold the potential to intensify individuals' privacy concerns due to the potential misuse of the collected data (Li, Wu, Gao, & Shi, 2016). The decision of the consumer to adopt wearable technology would include a highly salient privacy calculus in which users may face the trade-off between perceived privacy risks and perceived benefits (Xu, Teo, Tan, & Agarwal, 2009). This means that the adoption and use of FTSs are dependent on when or if the perceived benefits exceed the perceived privacy risk. Summarizing, this research hypothesizes:

H8: Perceived privacy risks of using an FTS negatively affect the behavioral intention of the user to continue using an FTS.

2.6. The moderating effect of gender

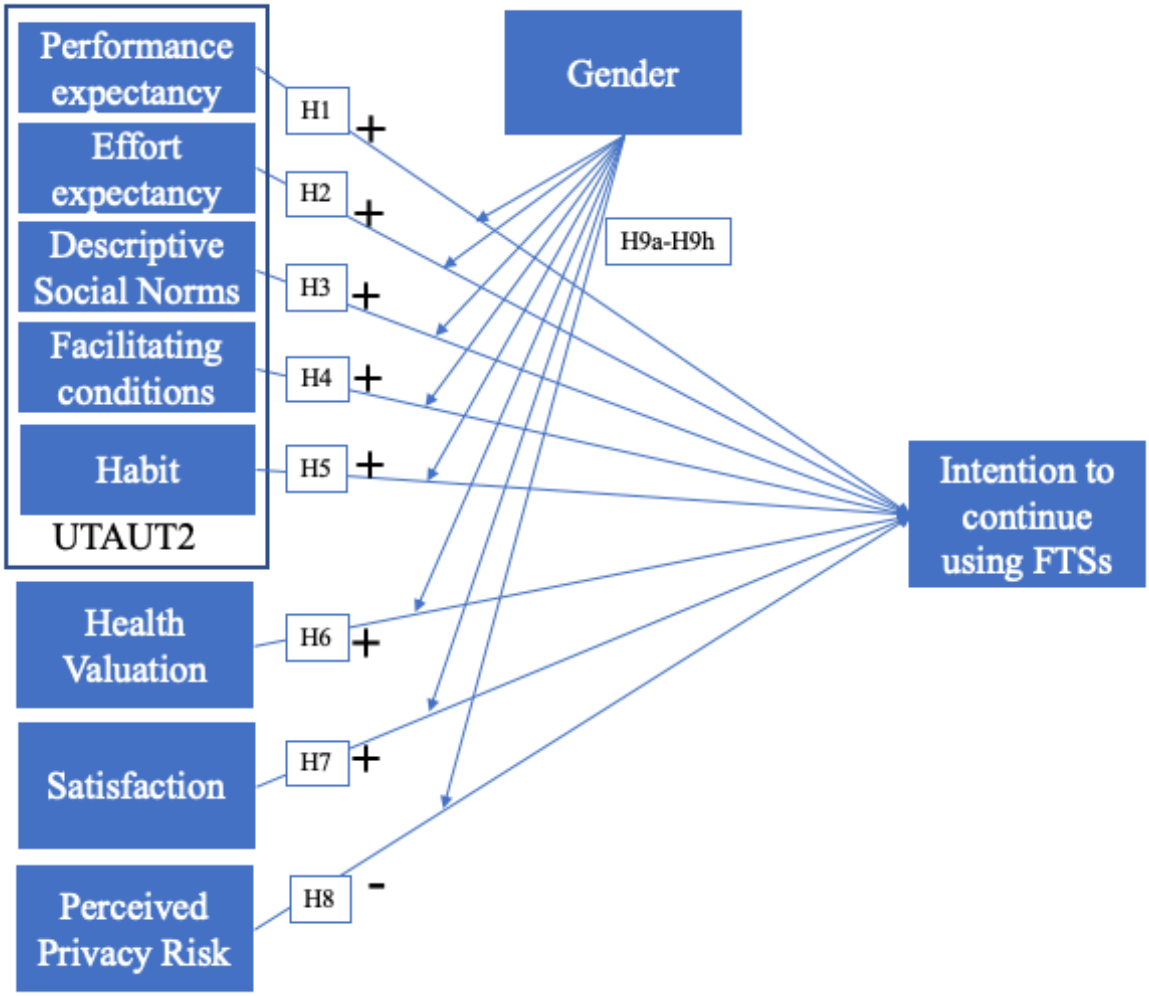
Venkatesh, Thong, and Xu (2012) proposed for the UTAUT2 model, that gender moderates the relationship between determinants and intention. In their research, effort expectancy and social influence were more influential for the female participants. In contrast, performance expectancy was more prominent for the male participants—recent research in the area of technology usage studies gender as a critical moderator. A study by Lee (2019) researching the determinants of mobile payment usage found that the construct of facilitating conditions had a significant positive effect on usage intention for males, but not for females. Their findings showed that perceived privacy risk had a significant adverse impact on the intention to use mobile payment services for females but not males. Hoy and Milne (2010) found similar gender moderations in their research concerning the usage of social network services; females were more concerned about privacy risks than male participants. Evidence that female users are more concerned with privacy risks in digital environments was also found by Taddicken (2013).

However, some researchers also state that there is no moderating effect of gender (Lee, 2019). Examples for this include no significant moderating effect of gender in online shopping scenarios (Lian & Yen, 2014), mobile commerce technology (Faqih & Jaradat, 2015), and NFC mobile payments (Tan et al., 2014). Based on these findings, it is necessary to determine if and which predictors of continuous usage intention are moderated by gender. Thus, it can be hypothesized:

H9a-h: The gender of an FTS user moderates the relationship between performance expectancy/ effort expectancy/ descriptive social norms/ facilitating conditions/ habit/ perceived privacy risk/ health valuation/ satisfaction and continuous use intention of fitness tracker systems.

Figure 1 graphically summarizes the constructs and relationships of the critical points discussed in the theoretical framework.

Figure 1: The research model



3. METHODOLOGY

For this study, the necessary data to test the research model was collected by conducting an online survey. It included both items to measure the constructs of the model and items to collect different demographic data. The collected data is used to test the formulated hypotheses and answer the research questions. The following chapter presents the research design, procedure, participants, measurements, and construct validity and reliability of this study.

3.1. Research design

To test the research model depicted in figure 1, an online survey was conducted with German users. The research instrument was developed and implemented with the Qualtrics software. The survey data was collected in one single-phase and distributed at the same time to ensure collection within a reasonable period, as well as to generate as many participants as possible. Data collection with the survey was conducted from March 8 to March 26. The link to the online questionnaire was posted on personal, as well as professional social network channels. Channels that the link to the online survey was distributed on included: Facebook, LinkedIn, and WhatsApp. Recipients were asked to further spread the link to the online questionnaire to their social environment, thus instrumentalizing snowball sampling. The link was also posted to specific groups on Facebook and LinkedIn that deal with fitness tracker related topics. The only limitation that was given in terms of sample respondents was the exclusion of individuals who were not currently using an FTS. Due to the chosen distribution method, the collection of the sample can be considered a convenience sample.

3.2. Procedure

The first section of the online questionnaire introduced the respondents to the nature and the objectives of the research project. Furthermore, informed consent was obtained. The section was used to set forth the purpose, benefits, and risks of the study and provide the required information to permit the members to make an informed and deliberate choice of whether to participate.

The second section of the questionnaire was used for the eligibility question to participate in the survey: “Do you own a fitness tracker?”. This filter question was necessary to avoid the collection of information of, potentially biased, non-fitness tracker users, who were not in the defined target group of the study.

After the filter question, the third section followed. This section contained questions regarding the socio-demographics of the survey participants. Here information concerning age, gender, civil status, and the highest educational degree was requested. After the socio-demographics, a short section concerning the current use and context of the use of the FTSs follows.

The total number of participants was n=407. However, after cleaning the data set, the data of n=307 respondents were usable for the statistical analysis.

3.3. Participants

The participants were split into 60% (n = 182) females and 40% (n = 123) males. Two of the respondents (1%) chose not to indicate their gender. The mean age of respondents was M=37.61 (SD = 10.87). This means that even though a large data sample was collected, the research cannot be considered representative, as the usage of FTS is spread evenly among the German population (GfK, 2016). Added to this is the fact that the data is skewed towards users with high levels of education. 73 % of participants are highly educated (University entry-level & university degree), while only 25 % have received only relatively low levels of education (None at all, basic secondary school, & secondary school). Only participants who indicated using an

FTS were considered to complete the survey. Participants that are not current users of FTSs were dismissed from the survey.

Participants that were not dismissed from the survey were asked which brand of FTS they are currently using. The top three FTS brands of participants mentioned in the survey are Garmin (36 %), Apple (27 %), and Fitbit (20 %). An overview of the demographic data can be seen in table 1.

Table 1. Demographic information of survey respondents.

Demographic		**Frequency**	**Percent**
Gender	Female	182	59.3
	Male	123	40.1
	No answer	2	0.7
Level of education	Low education	76	24.8
	High education	223	72.6
	I prefer not to answer	8	2.6
Frequency of activity	No at all	19	6.2
	1-2 times a week	95	30.9
	3-4 times a week	118	38.4
	5-6 times a week	55	17.9
	More than 6 times	18	5.9
	I prefer not to answer	2	0.7
FTS brand	Apple	83	27
	Fitbit	60	19.5
	Garmin	111	36.2
	I don't know	2	0.7
	Other	51	16.7
Usage time	Up to 12 months	120	39.1
	More than 12 months	187	60.9
Own purchase?	Yes	263	85.7
	No	44	14.3
Variety of uses	One usage scenario	24	7.8
	Two or more usage scenarios	283	92.2
TOTAL		**307**	**100**

3.4. Measurements

The survey comprised 35 items that provided the measurements for all nine constructs. To guarantee that the relevant scales would provide valid measurements, most items were adopted from the previous related literature. Using Brislin's method (1970), all items were translated into German and then translated back to English. To ensure that the items are unambiguous, the back translation to the original document was done by a 'blind' second translator to the original text. A pretest was conducted with five individuals. To test the questionnaire and identify potential problems and misunderstandings. The survey used statements that were answered on a 7-point Likert scale ranging from strongly disagree to agree strongly. The reason to use a 7-point Likert scale is that it provides a wider variety of options, which increases the probability of measuring people's objective reality (Joshi, Kale, Chandel, & Pal, 2015).

The measurement of the dependent variable intention to continue using an FTS was conducted with four statements. All of these statements were initially constructed for this research. Two

examples for these items are “I plan to continue to use my fitness tracker system frequently'” and “I intend to continue using my fitness tracker system in the future.”

The independent variable performance expectancy was measured with four items inspired by the scale established by Venkatesh, Thong, and Xu (2012). Two examples for items that measure performance expectancy are “using my fitness tracker system helps me to accomplish fitness goals more quickly” and “using my fitness tracker system motivates me to achieve my fitness goals.”

The independent variable effort expectancy was measured by four different items. The items for these measurements were adapted from the scale by Venkatesh, Thong, and Xu (2012). “My interaction with my fitness tracker system is not difficult” and “I find my fitness tracker system is easy to use” are two examples for measuring items.

The independent variable descriptive social norms was measured with five items. The items were adapted based on the scale established by Beldad and Hegner (2017). “Most users of this fitness tracker recommend its use” and “this fitness tracker is currently used by a lot of people” are two examples for measuring items.

The independent variable facilitating conditions was measured with four items and scales developed by Venkatesh et al. (2012). “I have the resources necessary to use my fitness tracker system” and “I have the knowledge necessary to use my fitness tracker system” are two examples of these items.

The independent variable habit was measured by adapting three items established on the scale by Venkatesh et al. (2012). Two examples for items that measure this variable are “the use of my fitness tracker system has become a habit for me” and “I must use my fitness tracker to track my fitness progress.”

The independent variable perceived privacy risk was measured using a three-item scale adopted from Zhou (2012). Two examples of items are “I believe providing my service provider with my personal information would involve many unexpected problems” and “I believe it would be risky to disclose my personal information to my service provider.”

The independent variable, health valuation, was measured with three items originally constructed by Beldad and Hegner (2017). Two examples of items that measure the health valuation of the participant are “I value my health more than anything else” and “staying healthy is very important for me.”

The independent variable of this research, satisfaction, was measured with four originally developed items and scales. “I am satisfied with the results I get from using my fitness tracker system” and “in general I am satisfied with the features of my fitness tracker system” are two examples of items that measure the satisfaction of the participant.

The last independent variable perceived privacy risk was measured using a three-item scale adopted from Zhou (2012). Two examples of items are “I believe providing my service provider with my personal information would involve many unexpected problems” and “I believe it would be risky to disclose my personal information to my service provider.”

3.5. Construct validity and reliability

Before the created model could be tested, requirements in terms of instrument reliability and validity had to be met.

An exploratory factor analysis was conducted to determine the discriminant and convergent validity of the used scales and to determine the validity of the constructs. The exploratory factor analysis helped to decide whether the 35 items selected for the nine constructs of the study measured their respective constructs. According to Kaiser (1974), factor loadings bigger than 0.5 can be accepted as mediocre, values between 0.7 and 0.8 as good, values between 0.8 and

0.9 as great, and values more prominent than 0.9 as excellent. After the conduction of six subsequently conducted factor analyses of 35 original items, 30 remained. All items removed for the final analysis had a score of below 0.50, and all constructs remaining had reliability scores higher than 0.50, thus indicating acceptable reliability. Of the initial twelve constructs, eight remained.

The construct that could not reliably be measured by the created model was facilitating conditions. Thus, hypotheses 4 "*facilitating conditions of FTS usage positively affect the behavioral intention to continue using an FTS of the user"* was dropped from the analysis. The complete factor analysis was conducted in six steps. Furthermore, the item "this fitness tracker system has not failed me in achieving my goals" measuring satisfaction, was removed from the analysis as it cross-loaded with the items measuring performance expectancy. The final version of the exploratory factor analysis can be viewed in table 2.

Following the check for validity and the subsequent deletion of the construct facilitating conditions, the internal consistency was tested. The internal consistency was analyzed utilizing the Cronbach's alpha, which was calculated for each construct. The construct can be considered entirely reliable if the alpha score is higher than 0.70. Table 3 depicts the scores of each construct in terms of its mean, standard deviation, and the alpha score. Most of the scores scored a value higher than 0.7 and can be considered entirely reliable.

Table 2. Results of exploratory factor analysis with Varimax rotation and Cronbach's Alpha

Construct	**Item**	**Factor**								
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Effort Expectancy	Using my fitness tracker system is easy.	.89								
α: .95	Using my fitness tracker system is not complicated.	.91								
	My interaction with my fitness tracker system is not difficult.	.88								
	I find my fitness tracker system is easy to use.	.91								
Intention to continue using	I intend to continue using my fitness tracker system in the future.		.73							
α: .84	Sometimes I think about stopping to use my fitness tracker system.		.73							
	I plan to continue to use my fitness tracker system frequently.		.77							
	I will use my fitness tracker system to track my next training.		.58							
	I will not hesitate to continue using my fitness tracker system.		.80							
Performance Expectancy	Using my fitness tracker system helps me to accomplish my fitness goals.			.80						
α: .87	Using my fitness tracker system motivates me to achieve my fitness goals.			.88						
	Using my fitness tracker system motivates me to stay fit.			.84						
	Using my fitness tracker system helps me to avoid health problems.			.59						
Descriptive Social Norms	Most users of this fitness tracker system recommend its use.				.54					

α: .76	This fitness tracker system is currently used by a lot of people.	.65				
	A lot of my favorite sports influencers use a fitness tracker system.	.63				
	This fitness tracker system is popular where I live.	.84				
	A lot of people I know use this fitness tracker system.	.85				
Perceived privacy Risk	I believe providing my fitness tracker system with my personal information would involve many unexpected problems.		.87			
α: .88	I believe it would be risky to disclose my personal information to my fitness tracker system.		.89			
	I expect there would be a high potential for loss in disclosing my personal information to my service provider.		.89			
Habit	The use of my fitness tracker system has become a habit for me.			.77		
α: .94	I consider it natural to use my fitness tracker system.			.80		
	I do not have to think when I am using my fitness tracker system.			.81		
Health valuation	I value my health more than anything else.				.84	
α: .80	Staying healthy is very important to me.				.81	
	I will do everything I can to stay healthy.				.88	
Satisfaction	I am satisfied with the results I get from using my fitness tracker system.					.59
α: .77	In general, I am satisfied with the features of my fitness tracker system.					.77
	This fitness tracker system has not failed me in achieving my goals.					S*
	I am happy with this fitness tracker system.					.75
Facilitating conditions	I have the resources necessary to use my fitness tracker system.					S*
	I have the knowledge necessary to use my fitness tracker system.					S*
	I can get help from others when I have difficulties using my fitness tracker system.					S*
	My fitness tracker ecosystem is compatible with other technologies I use.					S*

4. RESULTS

The main goal of this research was to study which factors of the extended UTAUT2 model influence the intention of users to continue using an FTSs and to find out if and to what degree the determinants of the model are moderated by gender. Chapter four presents the interpretation and analysis of the results. A hierarchical regression analysis was conducted to test the different hypotheses. Furthermore, the SPSS Macro PROCESS by Andrew F. Hayes was used to investigate the potential moderation effect of gender,

4.1. Respondents self-reported perceptions

Table 3 depicts both mean scores and standard deviations of the measured constructs for the respondents. This overview creates an indication about the respondents' self-reported perceptions and beliefs. The results in the table show that especially for the constructs' intention to continue using an FTS, effort expectancy and habit means in terms of self-reported perception and beliefs are high. The construct that scores lowest in terms of self-reported behavior is perceived privacy risk.

Table 3. Overview of items, constructs, mean, standard deviation and Cronbach's alpha

	Mean	**Std. Deviation**	**Cronbach's alpha**
Intention to continue using	6.36*	0.95	0.84
Performance expectancy	5.30*	1.23	0.87
Effort expectancy	6.34*	0.82	0.95
Descriptive social norm	4.82*	1.06	0.76
Habit	6.12*	1.09	0.94
Perceived privacy risk	3.88*	1.42	0.88
Health valuation	5.84*	0.86	0.80
Satisfaction	5.97*	0.75	0.77

* Likert-scale for each statement: 1 (strongly disagree) to 7 (agree strongly)

4.2. Relationships among constructs

Before examining the correlation between the different factors, it is vital to check for multi-collinearity. Multi-collinearity occurs when there are high correlations among predictor variables, which lead to unreliable estimates of regression coefficients. The most widely applied diagnostic for multi-collinearity is the variance inflation factor (VIF). Even though there is no general rule, the VIF is generally perceived as harmful when it exceeds 10 (Yoo, 2014). The VIF's that were calculated for each predictor were in the range between 1.08 and 1.87. Thus, it very unlikely that the data is significantly influenced by multi-collinearity.

The various constructs were scaled and tested for correlation. The scores of the different constructs in terms of Pearson's correlation can be seen in Table 4. Most of the correlation values that can be seen in the table only have a weak uphill positive linear relationship. Some of the different constructs show a moderate uphill positive relationship with each other. The most prominent of this is the correlation of habit with the intention to continue using with a score of 0.62. Additional moderate correlations can be found between satisfaction and performance expectancy (.53), habit and performance expectancy (.51), and satisfaction and habit (.51).

Table 4. Correlation between the different constructs

	ICU	PE	EE	DSN	H	PPR	HV	S
Intention to continue using	1							
Performance expectancy	.35	1						
Effort expectancy	.37	.19	1					
Social norm	.13	.35	.17	1				
Habit	.62	.51	.37	.23	1			
Risk	-.27	.003	-.19	.10	-.15	1		
Health valuation	.06	.22	.09	.14	.13	.11	1	
Satisfaction	.49	.53	.41	.31	.51	-.10	.26	1

4.3. Hierarchical regression analysis on the intention to continue using

The hypotheses were tested in a hierarchical regression analysis. This analysis method allows the researcher to determine the effects of the defined constructs onto the dependent variable in serialized form. The regression analysis was performed in three separate blocks (see Table 5). The table includes path coefficients (β), the significance levels (sig.), and the explained variance (R^2). Table 5 depicts two different models in three blocks.

The first block of the table contains the four original predictors of UTAUT2 that were reliably measured: Performance expectancy, effort expectancy, social norm, and habit. The F value for this model is 53.08 and a significance of $p < 0.001$. The explained variance for this model is .41, implying that 41% of the variance for the factors that influence continuous usage behavior of FTSs can be explained by the four remaining variables of the original UTAUT2 model.

The second block of the multiple regression analysis includes the predictors that were additionally added to the research model: Perceived privacy risk, ealth valuation, and satisfaction. This model scored an F-value of 37.25 and a significance of $p < 0.001$. The model results in an explained variance of 0.47, which implies that an increase of 6% explained variance of the continuous usage behavior of FTSs could be attributed to the addition of the factors satisfaction, health valuation, and perceived privacy risk to the model.

In the third block, the demographic variables (age and level of education) and the context of FTS use (frequency of activity, usage time, own purchase, variety of uses) were entered. The explained variance promptly increased to .48 with an F-value of 22.39 and a significance of $p<0.001$. The explained variance indicated that 48% of the variance for the factors that influence the continuous usage behavior of FTSs could be explained by the different independent variables. However, the only background factor that was found to be significant is age.

Table 5. Hierarchical Regression Analysis

		Unstandardized Coefficients		Standardized Coefficients				
Block	**Predictor**	**B**	**SE**	**β**	**p**	**Adj. R Square**	**F**	**p**
1						.41	54.62	.000
	Performance expectancy	.05	.04	.06	.238			
	Effort expectancy	.20	.06	.17	.000			
	Descriptive social norms	-.04	.04	-.04	.391			
	Habit	.46	.05	.53	.000			
2						.47	38.89	.000
	Performance expectancy	.01	.04	.01	.871			
	Effort expectancy	.11	.06	.10	.048			
	Descriptive social norms	-.03	.04	-.04	.441			
	Habit	.40	.05	.46	.000			
	Satisfaction	.28	.07	.22	.000			
	Health valuation	-.06	.05	-.05	.242			
	Perceived privacy risk	-.10	.03	-.15	.001			
3						.48	22.39	.000
	Performance expectancy	.02	.04	.02	.741			
	Effort expectancy	.13	.06	.12	.02			
	Descriptive social norms	-.02	.04	-.02	.661			
	Habit	.40	.05	.46	.000			
	Health valuation	-.08	.05	-.07	.130			
	Satisfaction	.30	.07	.23	.000			
	Perceived privacy risk	-.09	.03	-.14	.002			
	Age	.01	.01	.12	.010			
	Level of education	-.05	.09	-.03	.546			
	Frequency of activity	.03	.04	.04	.447			
	Usage Time	-.08	.09	-.04	.367			
	Own purchase?	-.01	.12	-.01	.933			
	Variety of uses	-.04	.02	-.08	.090			

The final model possesses an acceptable fit to describe the intention to continue using an FTS. While the model supports a number of the formulated hypotheses, it also shows that several hypotheses are not.

In the final model, effort expectancy concerning the usage of an FTS is a vital factor influencing the behavioral intention to continue using their FTS, therefore supporting hypothesis two. Furthermore, habit excels a strong positive influence on the behavioral intention to continue using an FTS, thus supporting hypothesis five. Besides effort expectancy and habit, also satisfaction positively influences the continuance intention of using an FTS. Therefore hypothesis seven is supported by the model. Finally, perceived privacy risk is shown to influence the continuance intention of FTSs negatively, thus supporting hypothesis eight.

However, it also needs to be mentioned that several hypotheses drawn in chapter 2 are not supported. In the final research model performance expectancy, descriptive social norms and health valuation are not shown as factors that significantly influence the intention to continue using an FTS. Therefore, hypotheses one, three, and five are not supported by the research model.

4.4. Differences in means between female and male participants

An independent-samples t-test was conducted to compare the differences in means between female and male participants. The results are displayed in table 6. These results show that there is no significant difference in means for the intention to continue using FTS, performance expectancy, social norm, risk, health valuation, and satisfaction for female and male participants. However, the results show that there are significant differences in scores between female and male participants for effort expectancy and habit.

Table 6. Results of independent t-test.

	Female (n=182)		**Male (n=123)**		
Construct	**M**	**SD**	**M**	**SD**	**t-test p value**
Intention to continue using	6.40	.89	6.27	1.02	.24
Performance Expectancy	5.39	1.16	5.19	1.31	.17
Effort Expectancy	6.42	.70	6.20	.97	.04
Descriptive social norms	4.80	1.03	4.90	1.11	.64
Habit	6.23	.98	5.96	1.23	.03
Perceived privacy risk	3.95	1.41	3.78	1.44	.31
Health valuation	5.87	.79	5.80	.95	.49
Satisfaction	5.99	.71	5.94	.80	.52

4.5. Moderation effect of gender

As proposed by Venkatesh et al. (2012), gender is used to moderate the relationship between the different independent constructs of the model and the dependent variable, the intention to continue using a fitness tracker system. More specifically, the remaining constructs of the model: Performance expectancy, effort expectancy, descriptive social norm, habit, health valuation, satisfaction, and perceived privacy risk. PROCESS v3.4 in SPSS 26 was used to test for two-way interactions with model 1, to conduct a simple moderation analysis. The results of the moderation analysis are presented in Table 7. The results do not support a significant impact of the moderator variable gender onto any of the different paths between constructs. Therefore, hypotheses 9a-9h are not supported by the research model.

Table 7. Results of the moderation analysis using PROCESS.

H	Path	M	Coeff	SE	T	p	LLCI	ULCI	Decision
Moderating effect of gender b/w PE and ICU									
H9a	PE -> ICU	Gender	-.02	.08	-.28	.7816	-.18	.14	Not supported
Moderating effect of gender b/w EE and ICU									
H9b	EE -> ICU	Gender	.07	.12	.60	.5454	-.17	.32	Not supported
Moderating effect of gender b/w DSN and ICU									
H9c	DSN -> ICU	Gender	-.10	.10	-.96	.3375	-.30	.10	Not supported
Moderating effect of gender b/w H and ICU									
H9e	H -> ICU	Gender	-.12	.08	-1.50	.1342	-.27	.04	Not supported
Moderating effect of gender b/w PPR and ICU									
H9f	PPR -> ICU	Gender	-.06	.07	-.85	.3935	-.21	.08	Not supported
Moderating effect of gender b/w HV and ICU									
H9g	HV-> ICU	Gender	.12	.12	.97	.3343	-.13	.37	Not supported
Moderating effect of gender b/w SAT and ICU									
H9h	SAT -> ICU	Gender	-.04	.13	-.30	.7653	-.29	.21	Not supported

5. DISCUSSION

This research investigated which factors of the extended UTAUT2 model, including performance expectancy, effort expectancy, descriptive social norms, habit, health valuation, satisfaction, and perceived privacy risk, influence the intention of German users' to continue using a fitness tracker system. Furthermore, it also investigated the extent to which the effects of the variables on the behavioral intention to continue using a fitness tracker system are moderated by gender. The study used an online survey with 35 items to measure the nine different constructs and eight questions to measure demographic and use context variables. The collected data was used to conduct a three-step hierarchical regression analysis to answer the first research question and to conduct moderation analysis separately to answer the second research question. This section discusses the main findings, theoretical and practical implications, limitations of the research, recommendations for future research, and gives a conclusion to answer the research questions.

5.1. Main findings

The ever increasing popularity and ubiquity of fitness tracker systems is undeniable. In combination with future projections, recent numbers show that the availability and accessibility of FTSs might be rightfully considered one of the most important trends to the fitness-conscious individual (IDC, 2016). Various factors are known to influence the usage intention of technology users. While perceived privacy risks might reduce the intention to continue using, other factors such as habit, health valuation, and satisfaction should increase the user's intention to continue using a fitness tracker system. Some of these predicted impacts are mirrored by this research, while some of them are not.

The first block of this research's main findings is related to the original UTAUT2 model's predictors. The data analysis results show that performance expectancy does not significantly predict the intention to continue using an FTS. In terms of the second factor of the model, effort expectancy, the main finding is that the construct had a significant impact on the dependent variable. This means that effort expectancy is a significant predictor of the intention to continue using an FTS. The findings concerning the construct descriptive social norms are also interesting. The results of the data analysis show no significant effect of descriptive social norms on the intention to continue using an FTS. The last main finding regarding the original variables of the UTAUT2 model is that habit is the strongest predictor of the dependent variable in this model. In conclusion, it also has to be stated that the model shows a high explained variance.

The second block of the main findings includes the constructs used to extend the original UTAUT2 model. Results show that the predictor health valuation has no significant influence on the intention to continue using an FTS. The next finding relates to the predictor satisfaction. Satisfaction is the second most influential determinant to continuance intention in this model, second only to habit. The last construct added to the original UTAUT2 model is perceived privacy risks. Concerning this predictor, the results show that it has a significant negative influence on the intention to continue using an FTS.

The theoretical framework theorized that the demographic variable gender would moderate the relationships in the model. Interestingly, the data analysis shows that the respondent's gender does not significantly moderate the independent variables' effect on the dependent variable.

Even though the analysis shows no differences in terms of moderation by gender, the independent t-test indicates significant differences in construct means for effort expectancy and habit between male and female participants.

Last, it is necessary to state that the only background variable added to the last block of the hierarchical regression analysis that influenced the intention to continue using a fitness tracker

system was age. Level of education, frequency of activity, usage time, whether or not respondents purchased the FTS themselves, and the variety of uses showed no significant influence on the dependent variable.

5.2. Theoretical contribution

In the past, most studies focusing on smart wearable systems did not restrict the research object to a specific type of wearable system (e.g., a fitness tracker system). Furthermore, most of those studies focused on how the technology can be utilized for several purposes (Lymberis, 2003; Chan, Esteve, Fourniols, Escriba, & Campo, 2012), rather than focusing on what makes the audience utilize the technology. The UTAUT2 model has been shown to significantly predict the continuous usage intention in terms of other information system technology (Cheng et al., 2020; Lee et al., 2019; Alalwan, 2020). However, it has never been used to explain the continuance intention of FTSs. Therefore, the operationalization and extension of the model adds knowledge to the research field. The research results can be used as a starting point to a more pinpointed exploration of the determining factors.

According to Venkatesh et al. (2003), performance expectancy should be one of the strongest predictors of usage intention. However, the results show that the factor does not significantly influence continuance intention. The operationalization of performance expectancy related the expected performance to the possibilities the technology offers in terms of fitness self-management, for example, to prevent weight gain (Thomas et al., 2017). An explanation for the non-significance of the effect could be that a large portion of the participants was already active in a fitness-oriented lifestyle (87.2% participated in sports activities at least twice a week). These previous experience might influence their look on the technology, as they spent a significant amount of time (83.7% indicated that they used their FTS for at least six months) interfaced with their FTS. They have observed the performance of the product in relation to their fitness-oriented lifestyles. Thus, they are keenly aware of the benefits that can be derived from continuous FTS usage and might be more likely to be affected by other determinants, such as habit and satisfaction. However, this result contrasts with previous studies that show, at least, varying levels of influence (Reyes-Mercado, 2018; Gao et al., 2015). This contrast might be explained by previous studies focused on the adoption of the technology rather than continuous use.

Within this research, effort expectancy is operationalized to measure the perceived ease of use of fitness tracker systems for monitoring physiological indicators or to self-manage. It is expected to be another strong predictor for technology usage (Venkatesh et al. 2012). The results show a significant influence of the construct. However, it is relatively small. The relatively low impact of effort expectancy onto intention to continue using an FTS might be related to the fact that this study had its focus on continuous usage and not solely on technology adoption. Still, this result is in line with previous studies in a wearable context (Talukder et al., 2019; Reyes-Mercado, 2018), as well as in other contexts, such as application banking (Baptista & Oliveira, 2017) and mobile app-based e-commerce (Tak & Panwar, 2017), and fitness apps (Beldad & Hegner, 2017). Especially interesting in this case is a study by Wang et al. (2014), which states that the amount of time and effort which is necessary to operate a service might deter users from continuing to use a service. This finding could partially explain why effort expectancy is significant, and performance expectancy is not. Effort expectancy is especially important as a predictor when taking into account that the providers of FTSs frequently update their products and services. The addition of additional functions or bug fixes might positively or negatively influence the effort the user has to put in, or how satisfied the user is with the product. Effort expectancy matters not only for new users of an FTS product or service but also for current and long-term users.

The hypothesis for the construct descriptive social norms was that it positively influences the continuance intention. However, the results show that there is no significant effect. This finding is in line with the results and the argumentation of Beldad and Hegner (2017). Three different arguments can be made to explain this result. First, presumably, the effect of descriptive social norms on technology usage is only present during the adoption process and with no prior experience regarding the technology. It can be argued that prior experience might already be adequate to form a decision towards continuous use. Second, the respondents' average age was quite high (37.61 years), which means that they are more likely not as susceptible to social pressure as younger individuals (Steinberg & Monahan, 2007). Third, cultural factors might also influence the perception of social pressure. German culture is generally considered to be individualistic. In such a culture, people are not as susceptible to social pressure as in, for example, more collectivistic cultures (Hofstede, 2011).

The finding that the last independent variable of the original UTAUT2 model, habit, is the strongest predictor in this model, is entirely in line with the expectations developed from the literature review and the results of prior studies (Venkatesh, Thong & Xu, 2012; Khan et al., 2017). Habit is a critical factor in technology context use (Limayem et al., 2007) and also shown to depend on the level of usage of the target technology (Venkatesh, Thong & Xu, 2012). In general, the respondents of this study are well acquainted with this specific technology, as 83.7% indicated that they used their FTS for at least six months, and it is safe to assume that they are also acquainted with different categories of similar technology. The resulting level of skill and knowledge might be essential for the formation of habit concerning fitness trackers. In conclusion, this research confirms that the continuous usage of FTS creates a habit, which, in turn, increases the intention to continue using an FTS.

Prior studies showed that in comparison with the positive effects of trust on usage intention, perceived privacy risks could harm usage intention (Glover & Benbasat, 2010; Gupta et al., 2010). Accordingly, it can be concluded that perceived privacy risk is an influential factor that might deter individuals from continuing to use an FTS. The research supports this hypothesis. A reason for the relatively small negative impact of perceived privacy risk onto continuous usage intention might be due to the unawareness of respondents to the potential risks of FTS usage. Furthermore, the significant impact of risk could also be influenced by cultural factors. Hofstede (2011) states that the value people attach to their privacy is influenced by culture. For example, when compared to other nationalities, Germans are very privacy risk-aware (Schomakers, Lidynia, Müllmann, Ziefle, 2019). Thus their perceived privacy risk is higher.

The finding concerning health valuation is in line with the results of Beldad and Hegner (2017), which found that the construct is not a significant predictor for the continuous use of a fitness app. Even though respondents indicated a high valuation of their health, their usage might not be entirely based on the health functionalities of the FTS, but rather on the functions that help them to stay fit. Only 30.3% of respondents indicated that they used their fitness tracker system to track their health. A different explanation for a similar outcome is given by McGloin et al. (2017) concerning the use of distance tracking apps. The researchers elaborate that people who put a high value on their health might not see a fitness-related product as a necessary mean to follow a health-oriented lifestyle. This explanation is followed by Beldad and Hegner (2017), who speculated that individuals who try to achieve a healthy lifestyle focus more on other means and strategies to attain this goal.

We defined satisfaction as the overall affective response to the gap between perceived performance and performance expectancy during usage (Oliver & DeSarbo, 1988). Satisfaction is the second most influential determinant to continuance intention in the model, second only to habit. This result is in line with the current research in the field of information technology (Wang et al., 2014; Deng et al., 2010). It shows that satisfaction with their system induces people to use a fitness tracker system continuously.

There are significant differences in construct means between male and female participants in the research sample for effort expectancy and habit. This finding is interesting as this means that females, on average, find their FTS easier to use than male participants. Venkatesh et al. (2013) showed that women care more about the effort to use technology in the early stages of the adoption process. This finding could be connected to the findings in this research since those female individuals who overcame the threshold necessary to operate an FTS, are now better equipped with the skills to use FTSs and perceive its use as more natural. Lastly, this research also showed that there is a significant difference in means concerning the habitual use of FTS. Female FTS users are more likely to develop a habitual use of an FTS.

During the analysis, no significant moderation effect of gender was found. The result is at least partly in line with prior research; for example, some researchers also state that there is no moderating effect of gender (Lee, 2019). Examples for this include the findings of Lian and Yen (2014), who found no significant moderating effect of gender in online shopping scenarios, Faqih and Jaradat (2015), who researched mobile commerce technology, and Tan, Ooi, Chong, and Hew (2014) in regards to NFC mobile payments. Still, prior research found a moderating effect of gender, especially in the relationship between perceived privacy risk and usage intention (Hoy & Milne, 2010; Lee, 2019). However, a factor that might play into this is that previous studies did not research continuous usage intention, but rather general usage intention, which takes not into account whether or not the individuals are already using the product.

The finding that age significantly affects the continuous usage intention for an FTS is in line with the current literature. A study by Puri, Kim, Nguyen, Stolee, Tung, and Lee (2017) found out that older individuals mostly have a positive attitude towards fitness tracker systems. Concerning perceived privacy risk, the study also indicated that privacy is less of a concern for older individuals, which, however, may be reasoned in the lack of understanding of those risks.

5.3. Practical contribution

Besides the theoretical implications already discussed, this research results also offer some practical implications. The practical contributions of this research are most relevant to providers of FTSs, as these entities have a keen interest in customer loyalty. The results will give them a more comprehensive understanding of which predictors influence their customer base's continuous usage intention and allow them to adapt their services and products accordingly and attract more users in a targeted manner.

The findings within the research show that effort expectancy, habit, and satisfaction are significant predictors towards the intention to continue using an FTS. For FTS providers, this means that every change to the product that positively affects these predictors should be a worthwhile opportunity to tie users to their service. An example of a change that should be included as fast as possible to influence the effort expectancy of the users are, for example, software bug fixes, or other changes that improve the user experience with the system. Another learning that can be drawn from the results of this research concerns the addition of new functionalities to an FTS. While new functionalities could improve the performance expectancy, it could negatively influence the effort expectancy. As the research shows that only effort expectancy is a significant predictor, more focus should be kept on keeping the necessary effort to operate the system as low as possible. Changes that could influence it should be well thought through.

Another result of this research that needs to be taken into account is the negative effect of perceived privacy risk onto the intention to continue using an FTS. FTS providers should put the focus on increasing the institutional trust of the user by avoiding perceived risks created by an inability to protect user data, or morally questionable decision making (e.g., inappropriate use of data, selling of data without the users' knowledge). Furthermore, providers of FTSs

should try to simplify the risk assessment process of the users. Often companies are not transparent in terms of data protection and are burying their terms and services or intricately expressing them. Customers should be aware of what data is collected and stored and what exactly happens with their information. In conclusion, it can be said that the development of secure and reliable technologies in combination with reasonable policy efforts to protect private information would lower the perceived privacy risks of users and contribute to a more stable and continuous use of FTSs.

The last factor that significantly influences the intention to continue using an FTS and bears the potential for practical implications is the demographic variable age. The older the users get, the more likely they are to continue using an FTS. This means that older individuals might provide a potential consumer segment that has not been fully developed yet.

5.4. Future research directions

Our research shows some interesting and surprising results. There is still much potential for research to deepen and broaden the understanding of the continuous use of fitness tracker systems. The technology offers so many self-management advantages, while at the same time being the potential source of grave harm scenarios that the technology as a whole and the processes behind it deserve a complete understanding.

The first research direction for the future is a switch of focus from usage intention to continuous usage. While much research has already been conducted concerning the technology adoption of FTS and information technology in general, the continuous use of FTSs has not been a constant focus. This research gives the theoretical foundation for future research. It helps future research in this direction to give us a deeper understanding of why people use fitness wearables and broaden the theoretical knowledge. Furthermore, future research should research the formations of habit. The research showed that habit is one of the crucial predictors of FTS' continuous usage intention. Still, the research only measured the habitual usage and not the insights necessary to understand how exactly individuals form habits.

Another research direction that can be identified based on this study is a more detailed look into how performance expectancy influences the continuous usage intention of FTS users. It was anticipated that performance expectancy would correlate significantly with the behavioral intention to continue using an FTS, but no impact was found. Future research should put due consideration to these findings and explore the implications with a larger sample. Furthermore, different demographics of the sample group could also help in broadening the understanding of the topic. Participants in this research were comprised of mostly fitness-oriented and long-term users of FTS. Future research could compare this group to the sample group that is less fitness-oriented and have been using an FTS for less than six months.

Another potential future research direction involves the categorization of respondents into smaller groups. Even though the analysis showed no significant moderation effects of gender, a narrower categorization, for example, by generation, could show a different result. Generational differences and their effects on the continuous usage of FTSs could prove worthy research targets for future studies.

Lastly, the research showed that satisfaction is the second most influential determinant to continuance intention in this model, second only to habit. As exciting as this result is, it leads us to the question of how the user of an FTS forms their satisfaction. Future research should aim at defining the most critical predictors which form the satisfaction of users with their FTS.

5.5. Limitations

While exciting insights can be generated from this research, there are also some limitations. Some of the operationalizations of this research leave some room to be broadened. First, social influence should be operationalized into the injunctive and descriptive social norms, as proposed by Cialdini and Goldstein (2004), as this would form a more comprehensive picture of social influence.

Second, the user's trust could be operationalized as a single construct rather than include it with perceived privacy risk. Furthermore, risks related to FTS do not only emerge due to security reasons. Other sources of risk are their questionable reliability (Case, Burwick, Volpp, & Patel, 2015), validity (Lee, Kim & Welk, 2014), and safety (Piwek, Ellis, Andrews & Joinson, 2016). Future research could focus on how different kinds of risks influence continuous use.

Third, this research was mostly focused on fitness and health-related features of FTS and the corresponding users. Future research should also consider more peripheral functions like social interaction and gamification to include the construct hedonic motivation in the model. The research did not include these factors, as the focus was not on a specific brand of products. A future study could focus on one particular brand and then include gamification and social interaction constructs.

Another limitation can be drawn from the method of the study. The research did to operationalize facilitating conditions in a way so that a reliable and valid measurement could be made, even though an established scale was used. Future research should rethink the construct and establish a new scale accordingly. Furthermore, some of the use-context variables, such as frequency of activity and usage time, should have been measured as continuous variables. This would have allowed for a more detailed look into how different use varieties, use cases, usage experience, and frequency of use influence or even moderate the relationship between independent and dependent variables.

Lastly, the data collection approach limits the generalizability of the research results due to the combination of the snowball sampling technique, not representative age structure, focus on highly active participants, and the not representative sample size. The participants in this research might not be a perfect reflection of the attitudes, views, and behaviors of the general population of FTS users. Even though an interpretation of the results in this research should be made with caution, the research model could still be used for a more representative sample. Furthermore, as this study was focused on only one specific geographic group (Germans), it might not be suitable to project the results onto groups from a different geographic location due to cultural differences. The variations of how individuals from a different cultural group value privacy might have implications for specific predictors such as trust in the intention to continue using an FTS.

6. CONCLUSION

This research explored which factors of the extended UTAUT2 model, including performance expectancy, effort expectancy, descriptive social norms, habit, health valuation, satisfaction, and perceived privacy risk, influence the intention of German users' to continue using a fitness tracker system. Furthermore, it also examined the extent to which the effects of the variables on the behavioral intention to continue using an FTS are moderated by gender. The study instrumentalized an online survey with 35 items to measure nine different constructs and eight questions to measure demographic and use context variables. The collected data of 307 participants was used to conduct a three-step hierarchical regression analysis to answer the first research question and to conduct moderation analysis separately to answer the second research question.

The study's significant findings concerning the first research question are that effort expectancy, habit, and satisfaction have a significant influence on the behavioral intention to continue using an FTS. This means that when trying to increase the loyalty of users, the focus of FTS providers should be on characteristics that support these constructs. Therefore, changes that improve the user experience in terms of effort, satisfaction, and habit should be prioritized. Furthermore, perceived privacy risk proofed to be a significant predictor of negative influence on the behavioral intention to continue using an FTS, which means that there is a need to simplify the risk assessment process for the users.

Surprisingly, performance expectancy, descriptive social norms, and health valuation do not influence the intention to continue using an FTS. This means that when users are already using the technology, they are not influenced by their surroundings, or the possibilities the technology offers in terms of fitness or health self-management.

To answer whether or not the effects of the independent variables onto the dependent variables are moderated by gender, it must be said that there is no significant moderation effect of gender onto the independent variables when researching the continuous usage of FTSs.

This study's results add to the field of smart wearable device research and are most relevant for providers of FTSs. The theoretical and practical implications can be used as the foundation for future research within the area of continuous smart device usage.

REFERENCES

Alalwan, A. A. (2020). Mobile food ordering apps: An empirical study of the factors affecting customer e-satisfaction and continued intention to reuse. *International Journal of Information Management, 50*, 28–44. doi: 10.1016/j.ijinfomgt.2019.04.008

Awad, N. F. & Krishnan, M. S. (2006). The personalization privacy paradox: An empirical evaluation of information transparency and the willingness to be profiled online for personalization. *MIS Quarterly, 30*(1), 13-28. doi: 10.2307/25148715

Baptista, G., & Oliveira, T. (2017). Why so serious? Gamification impact in the acceptance of mobile banking services. *Internet Research*, *27*(1), 118–139. doi: 10.1108/intr-10-2015-0295

Bansal, G., Zahedi, F. M., & Gefen, D. (2010). The impact of personal dispositions on information sensitivity, privacy concern and trust in disclosing health information online. *Decision Support Systems*, *49*(2), 138–150. doi: 10.1016/j.dss.2010.01.010

Barth, S., & de Jong, M. D. T. (2017). The privacy paradox – Investigating discrepancies between expressed privacy concerns and actual online behavior – A systematic literature review. *Telematics and Informatics, 34*(7), 1038–1058. doi:10.1016/j.tele.2017.04.013

Beldad, A. D., & Hegner, S. M. (2017). Expanding the technology acceptance model with the inclusion of trust, social influence, and health valuation to determine the predictors of German users' willingness to continue using a fitness app: A structural equation modeling approach. *International Journal of Human–Computer Interaction*, *34*(9), 882–893. doi: 10.1080/10447318.2017.1403220

Bhattacherjee, A. (2001). Understanding information systems continuance: An expectation-confirmation model. *MIS Quarterly*, *25*(3), 351. doi: 10.2307/3250921

Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of Cross-Cultural Psychology*, *1*(3), 185–216. doi: 10.1177/135910457000100301

Case, M. A., Burwick, H. A., Volpp, K. G., & Patel, M. S. (2015). Accuracy of smartphone applications and wearable devices for tracking physical activity data. *Jama*, *313*(6), 625-626. doi: 10.1001/jama.2014.17841

Chan, M., Esteve, D., Fourniols, J.-Y., Escriba, C., & Campo, E. (2012). Smart wearable systems: Current status and future challenges. *Artificial Intelligence in Medicine, 56*(3), 137-156. Doi: 10.1016/j.artmed.2012.09.003.

Cheng, Y., Sharma, S., Sharma, P., & Kulathunga, K. (2020). Role of personalization in continuous use intention of mobile news apps in India: Extending the UTAUT2 model. *Information, 11*(1), 33-56. doi:10.3390/info11010033

Christovich, M.(2016). Why should we care what Fitbit shares: a proposed statutory solution to protect sensitive personal fitness information. *Hastings Communication and Entertainment Law J., 38,* 91–116.

Cho, J., Park, D., & Lee, H. E. (2014). Cognitive factors of using health apps: Systematic analysis of relationships among health consciousness, health information orientation, e-health literacy, and health app use efficacy. *Journal of Medical Internet Research*, *16(*5). e125. doi: 10.2196/jmir.3283

Cialdini, R. B., & Goldstein, N. J. (2004). Social Influence: Compliance and conformity. *Annual Review of Psychology, 55*(1), 591–621. doi: 10.1146/annurev.psych.55.090902.142015

Cocosila M., & Trabelsi H. (2016). An integrated value-risk investigation of contactless mobile payments adoption. *Electronic Commerce Research and Applications, 20*, 159-170. http://dx.doi.org/10.1016/ j.elerap.2016.10.006.

Das, A. K., Pathak, P. H., Chuah, C.-N., & Mohapatra, P. (2016). Uncovering privacy leakage in BLE network traffic of wearable fitness trackers. *Proceedings of the 17th International Workshop on Mobile Computing Systems and Applications - HotMobile 16*. 99-104. doi: 10.1145/2873587.2873594

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3)*,* 319-340. doi:10.2307/249008

Deng, L., Turner, D. E., Gehling, R., & Prince, B. (2010). User experience, satisfaction, and continual usage intention of IT. European Journal of Information Systems, 19(1), 60–75. doi:10.1057/ejis.2009.50

Montjoye, Y.-A. D., Hidalgo, C. A., Verleysen, M., & Blondel, V. D. (2013). Unique in the crowd: The privacy bounds of human mobility. *Scientific Reports*, *3*(1). doi: 10.1038/srep01376

Dwivedi, Y. K., Shareef, M. A., Simintiras, A. C., Lal, B., & Weerakkody, V. (2016). A generalised adoption model for services: A cross-country comparison of mobile health (m-health). *Government Information Quarterly, 33*(1), 174–187. doi: 10.1016/j.giq.2015.06.003

Faqih, K. M., & Jaradat, M.-I. R. M. (2015). Assessing the moderating effect of gender differences and individualism-collectivism at individual-level on the adoption of mobile commerce technology: TAM3 perspective. *Journal of Retailing and Consumer Services, 22*, 37–52. doi: 10.1016/j.jretconser.2014.09.006

Fereidooni, H., Frassetto, T., Miettinen, M., Sadeghi, A., Conti, M. (2017). Fitness Trackers: Fit for Health but Unfit for Security and Privacy. *2017 IEEE/ACM International Conference on Connected Health: Applications, Systems and Engineering Technologies (CHASE).* 19-24. doi:10.1109/chase.2017.54

Fitbit. (2016, August 9). Fitbit privacy policy. Retrieved from https://www.fitbit.com/legal/privacypolicy

Fitbit. (2018). Fitbit development: Getting started. Retrieved from https://dev.fitbit.com/

Gao, Y., Li, H., & Luo, Y. (2015). An empirical study of wearable technology acceptance in healthcare. *Industrial Management & Data Systems, 115*(9)*,* 1704–1723. doi:10.1108/imds-03-2015-0087

GfK (2016). Health and fitness tracking, GfK, September 2016. Retrieved from https://geodata.gfk.com/fileadmin/user_upload/website_content/Images/Global_Study/Fitness_tracking/Documents/Global-GfK-survey_Health-Fitness-Monitoring_2016_final.pdf

Glover, S., & Benbasat, I. (2010). A comprehensive model of perceived risk of e-commerce transactions. *International Journal of Electronic Commerce, 15*(2), 47–78. doi: 10.2753/jec1086-4415150202

Gupta, B., Iyer, L.S., Weisskirch, R. S. (2010). Facilitating global e-commerce: A comparison of consumers' willingness to disclose personal information online in the U.S and in India. *Journal of Electronic Commerce Research*. *11*(1), 41-52.

Hofstede, G. (2011). Dimensionalizing cultures: The Hofstede model in context. *Online Readings in Psychology and Culture, 2*(1). 8. doi:10.9707/2307-0919.1014

Hoy, M. G., & Milne, G. (2010). Gender differences in privacy-related measures for young adult Facebook users. *Journal of Interactive Advertising*, *10*(2), 28–45. doi: 10.1080/15252019.2010.10722168

Joshi, A., Kale, S., Chandel, S., & Pal, D. (2015). Likert scale: explored and explained. *British Journal of Applied Science & Technology, 7*(4), 396–403. https://doi.org/10.9734/bjast/2015/14975

Kalantari, M. (2017). Consumers adoption of wearable technologies: literature review, synthesis, and future research agenda. *International Journal Of Technology Marketing, 12*(1)*,* 1. 274-307. doi: 10.1504/ijtmkt.2017.10008634

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika, 39*(1), 31–36. doi:10.1007/bf02291575

Kelley, P.G., Cranor, L.F., & Sadeh, N., 2013. Privacy as part of the app decision-making process. *CHI 2013*, 1-11. doi: 10.1145/2470654.2466466

Kim, G.S., Park, S-B., & Oh, J., 2008. An examination of factors influencing consumer adoption of short message service (SMS). *Psychology & Marketing, 25*(8), 769-786. doi: 10.1002/mar.20238

Khan, I. U., Hameed, Z., & Khan, S. U. (2017). Understanding online banking adoption in a developing country. *Journal of Global Information Management, 25*(1)*,* 43–65. doi:10.4018/jgim.2017010103

Lee, J., Kim, Y., & Welk, G. (2014). Validity of consumer-based physical activity monitors. *Medicine & Science In Sports & Exercise, 46*(9)*,* 1840-1848. doi: 10.1249/mss.0000000000000287

Lee, J.-M. (2019). Determinants of mobile payment usage and the moderating effect of gender: extending the UTAUT model with privacy risk. *International Journal of Electronic Commerce Studies, 10*(1), 43–64. doi: 10.7903/ijecs.1644

Lee, S. W., Sung, H. J., & Jeon, H. M. (2019). Determinants of Continuous Intention on Food Delivery Apps: Extending UTAUT2 with Information Quality. *Sustainability, 11*(11), 3141. doi:10.3390/su11113141

Li, H., Wu, J., Gao, Y., & Shi, Y. (2016). Examining individuals' adoption of healthcare wearable devices: An empirical study from privacy calculus perspective. *International Journal of Medical Informatics, 88*, 8–17. doi:10.1016/j.ijmedinf.2015.12.010

Lian, J.-W., & Yen, D. C. (2014). Online shopping drivers and barriers for older adults: Age and gender differences. *Computers in Human Behavior, 37,* 133–143. doi: 10.1016/j.chb.2014.04.028

Limayem, M., Hirt, S., & Cheung, C. (2007). How habit limits the predictive power of intention: The case of information systems continuance. *MIS Quarterly, 31*(4), 705-737. doi:10.2307/25148817

Lu, Y., Zhou, T., & Wang, B. (2009). Exploring Chinese users' acceptance of instant messaging using the theory of planned behavior, the technology acceptance model, and the flow theory. *Computers in Human Behavior, 25*(1), 29–39. doi:10.1016/j.chb.2008.06.002

Lymberis, A. (2003). Smart wearable systems for personalised health management: Current R&D and future challenges. *Proceedings of the 25th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 4*, 3716-3719. doi: 10.1109/IEMBS.2003.1280967

McGloin, R., Embacher, K., & Atkin, D. (2017). Health and exercise-related predictors of distance-tracking app usage. *Health Behavior and Policy Review, 4*(4)*,* 306–317. doi:10.14485/hbpr.4.4.1

Oliver, R. L., & DeSarbo, W. S. (1988). Response determinants in satisfaction judgments. *Journal of Consumer Research, 14*(4)*,* 495. doi:10.1086/209131

Egea, J. M. O., & González, M. V. R. (2011). Explaining physicians' acceptance of EHCR systems: An extension of TAM with trust and risk factors. *Computers in Human Behavior*, *27*(1), 319–332. doi: 10.1016/j.chb.2010.08.010

Peters, O. (2008). A social cognitive perspective on mobile communication technology use and adoption. *Social Science Computer Review, 27*(1)*,* 76–95. doi:10.1177/0894439308322594
Piwek, L., Ellis, D. A., Andrews, S., & Joinson, A. (2016). The rise of consumer health wearables: promises and barriers. *PLOS Medicine, 13*(2)*,* e1001953. doi:10.1371/journal.pmed.1001953
Puri, A., Kim, B., Nguyen, O., Stolee, P., & Tung, J., Lee, J. (2017). User Acceptance of Wrist-Worn Activity Trackers Among Community-Dwelling Older Adults: Mixed Method Study. *JMIR MHealth and UHealth, 5*(11). e173. doi:10.2196/mhealth.8211
Rheingans, F., Cikit, B., & Ernst, C. H. (2016). The potential influence of privacy risk on activity tracker usage: A study. *Progress in IS The Drivers of Wearable Device Usage,* 25-35. doi:10.1007/978-3-319-30376-5_3
Reyes-Mercado, P. (2018). Adoption of fitness wearables. *Journal of Systems and Information Technology, 20*(1), 103–127. doi:10.1108/jsit-04-2017-0025
Schomakers, E., Lidynia, C., Müllmann, D., Ziefle, M. (2019). Internet users' perceptions of information sensitivity – insights from Germany. *International Journal of Information Management, 46*, 142-150. doi:10.1016/j.ijinfomgt.2018.11.018
Smith J., Dinev, T., & Xu. H. (2011). Information Privacy Research: An Interdisciplinary Review. *MIS Quarterly, 35*(4), 989-1015. doi:10.2307/41409970
Steinberg, L., & Monahan, K. C. (2007). Age differences in resistance to peer influence. *Developmental Psychology, 43*(6), 1531-1543. doi:10.1037/0012-1649.43.6.1531
Taddicken, M. (2013). The privacy paradox in the social web: the impact of privacy concerns, individual characteristics, and the perceived social relevance on different forms of self-disclosure. *Journal of Computer-Mediated Communication, 19*(2), 248–273. doi:10.1111/jcc4.12052
Tak, P., & Panwar, S. (2017). Using UTAUT 2 model to predict mobile App based shopping: evidences from India. *Journal of Indian Business Research, 9*(3*)*, 248–264. doi:10.1108/jibr-11-2016-0132
Talukder, M. S., Chiong, R., Bao, Y., & Malik, B. H. (2019). Acceptance and use predictors of fitness wearable technology and intention to recommend. *Industrial Management & Data Systems*, *119*(1), 170–188. doi: 10.1108/imds-01-2018-0009
Tan, S. J. (1999). Strategies for reducing consumers' risk aversion in Internet shopping. *Journal of Consumer Marketing*, *16*(2), 163–180. doi: 10.1108/07363769910260515
Tan, G. W.-H., Ooi, K.-B., Chong, S.-C., & Hew, T.-S. (2014). NFC mobile credit card: The next frontier of mobile payment? *Telematics and Informatics*, *31*(2), 292–307. doi: 10.1016/j.tele.2013.06.002
Tehrani, Kiana and Michael, A. (2014). Wearable technology and wearable devices: everything you need to know. *Wearable Devices Magazine*. Retrieved from: http://www.wearabledevices.com/what-is-a-wearable-device/.
Thomas, J. G., Raynor, H. A., Bond, D. S., Luke, A. K., Cardoso, C. C., Foster, G. D., & Wing, R. R. (2017). Weight loss in Weight Watchers Online with and without an activity tracking device compared to control: A randomized trial. *Obesity, 25*(6*),* 1014–1021. doi:10.1002/oby.21846
Venkataramanan M. (2014). My identity for sale. *Wired*; *11*. 98–105.
Venkatesh, V., Morris, M. G., Davis G. B., & Davis, F. D. (2003). User acceptance of information technology: Towards a unified view. *MIS Quarterly, 27*(3), 425-478. doi:10.2307/30036540
Venkatesh V., Thong J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly, 36*(1)*,* 157-178. doi:10.2307/41410412
Wang, B. R., Park, J.-Y., Chung, K., & Choi, I. Y. (2014). Influential factors of smart health users according to usage experience and intention to use. *Wireless Personal Communications*, *79*(4), 2671–2683. doi:10.1007/s11277-014-1769-0
Warkentin, M., Gefen, D., Pavlou, P. A., & Rose, G. M. (2002). Encouraging citizen adoption of e-government by building trust. *Electronic Markets, 12*(3), 157–162. doi:10.1080/101967802320245929
"Worldwide wearables market grows 7.3% in Q3 2017 as smart wearables rise and basic wearables decline, says IDC." n.d. Www.idc.com. Accessed April 18, 2019. Retrieved from https://www.idc.com/getdoc.jsp?containerId=prUS43260217
Xu, H., Teo, H.-H., Tan, B. C. Y., & Agarwal, R. (2009). The role of push-pull technology in privacy calculus: The case of location-based services. *Journal of Management Information Systems, 26*(3)*,* 135–174. doi:10.2753/mis0742-1222260305
Yang, S., Lu, Y., Gupta, S., Cao, Y., & Zhang, R. (2012). Mobile payment services adoption across time: An empirical study of the effects of behavioral beliefs, social influences, and personal traits. *Computers in Human Behavior, 28*(1), 129–142. doi:10.1016/j.chb.2011.08.019
Yoo, W., Mayberry, R.M., Bae, S., Singh, K., He, Q.P., & Lillard, J.W. (2014). A study of effects of multicollinearity in the multivariable analysis. *International journal of applied science and technology*, *4*, 9-19.

Yuan, S., Ma, W., Kanthawala, S., & Peng, W. (2015). Keep using my health apps: discover users' perception of health and fitness apps with the utaut2 model. *Telemedicine and e-Health, 21*(9), 735–741. doi:10.1089/tmj.2014.0148

Yuan, Y., Lai, F., & Chu, Z. (2018). Continuous usage intention of Internet banking: a commitment-trust model. *Information Systems and e-Business Management*, *17,* 1-25. doi:10.1007/s10257-018-0372-4

Zhou, T., Lu, Y., & Wang, B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. Computers in Human Behavior, 26(4), 760–767. doi:10.1016/j.chb.2010.01.013

Zhou, T. (2012). Examining location-based services usage from the perspectives of unified theory of acceptance and use of technology and privacy risk. *Journal of Electronic Commerce Research 13*(2)*.* 135-144.

APPENDICES

Appendix A – Screenshots of German survey

UNIVERSITY OF TWENTE.

Einverständniserklärung

Sehr geehrte Damen und Herren,

Vielen Dank, dass Sie an dieser Umfrage teilnehmen. Sie ist Teil der Forschungsstudie ***"Welche Faktoren beeinflussen die kontinuierliche Nutzung von Fitness Tracker Systemen"***, die von Christian Streichan als Teil des Master of Science-Abschlusses in Kommunikationswissenschaften an der Universität Twente, Niederlande, durchgeführt wird.

Der Zweck dieser Forschungsstudie ist, die kontinuierliche Nutzung von Fitness Tracker Systemen zu untersuchen. Das Ausfüllen des Fragebogens wird etwa 15 Minuten in Anspruch nehmen. Die erhobenen Daten werden ausschließlich für eine statistische Analyse verwendet. Ihre Teilnahme an dieser Studie ist vollkommen freiwillig und Sie können die Umfrage jederzeit beenden.

Mit dieser Forschungsstudie sind keine direkten Risiken verbunden; wie bei jeder Online-Aktivität ist jedoch das Risiko eines Datenschutzverstoßes immer möglich. Ihre Antworten werden nach bestem Wissen und Gewissen vertraulich behandelt. Jegliche Risiken für einen Datenschutzverstoß werden minimiert, indem keine sensiblen Daten gesammelt werden, die zur Identifizierung einer bestimmten Person beitragen können.

Die gesammelten Daten werden lokal auf einem passwortgeschützten Gerät gespeichert und werden nur vom Forscher selbst und dem ersten und zweiten Prüfer der Universität Twente eingesehen.

Kontakt für weitere Informationen: c.streichan@student.utwente.nl

Sind Sie einverstanden, an dieser Umfrage teilzunehmen?

- ○ Ja
- ○ Nein

WICHTIG

Im Zusammenhang dieser Studie bezieht sich der Begriff „Fitness Tracker System" auf ein am Körper tragbares Gerät (normalerweise am Handgelenk), das mit einem Smartphone (z.B. per App) und/oder einem Cloud-Service zur langfristigen Datenverfolgung synchronisiert wird. Diese Geräte zeichnen Daten wie zum Beispiel Schritte, Herzfrequenz, oder verbrannte Kalorien auf.

Verwenden Sie derzeit einen Fitness Tracker oder eine Smartwatch mit Fitnesstracking-Funktionen?

- ○ Ja
- ○ Nein

Was ist Ihr Geschlecht?

Wie alt sind Sie?

Was ist ihr höchster Bildungsabschluss?

- Hauptschulabschluss
- Mittlere Reife
- (Fach-)Abitur etc.
- Hochschulabschluss
- Kein Schulabschluss
- Ich bevorzuge es, nicht zu antworten.

Wie oft treiben sie Sport?

- Überhaupt nicht.
- 1-2 Mal pro Woche
- 3-4 Mal pro Woche
- 5-6 Mal pro Woche
- Mehr als 6 Mal
- Ich bevorzuge es, nicht zu antworten.

Von welchem Hersteller ist ihr aktuelles Fitness Tracker Systems?

- Apple
- Fitbit
- Garmin
- Jawbone
- Polar
- Runtastic
- Samsung
- Suunto
- Xiaomi
- Ich weiß nicht.
- Andere

Wie lange nutzen sie ihr Fitness Tracker System bereits?

- Weniger als 6 Monate
- 6 bis 12 Monate
- Mehr als 12 Monate
- Ich bevorzuge es, nicht zu antworten.

Haben sie ihr Fitness Tracker System selbst gekauft?

- ○ Ja
- ○ Nein
- ○ Ich bevorzuge es, nicht zu antworten.

Für was benutzen sie ihr Fitness Tracker System hauptsächlich (Mehrfachnennung möglich)?

- ☐ Tracking von täglichen Aktivitäten
- ☐ Tracking von Sportaktivitäten
- ☐ Schrittzählung
- ☐ Kalorien im Auge behalten
- ☐ Überwachung der Gesundheit
- ☐ Schlaf-Überwachung
- ☐ Als Accessoire
- ☐ Als Gadget (z.B. als Kalender, Wecker, etc.)
- ☐ Andere Nutzen

	stimme überhaupt nicht zu	stimme nicht zu	stimme eher nicht zu	weder noch	stimme eher zu	stimme zu	stimme völlig zu
1. Ich beabsichtige, mein Fitness Tracker System auch in Zukunft zu nutzen.	○	○	○	○	○	○	○
2. Manchmal denke ich darüber nach, mit der Nutzung meines Fitness Tracker Systems aufzuhören.	○	○	○	○	○	○	○
3. Ich plane, mein Fitness Tracker System weiterhin häufig zu nutzen.	○	○	○	○	○	○	○
4. Ich werde mein Fitness Tracker System nutzen, um mein nächstes Training zu verfolgen.	○	○	○	○	○	○	○
5. Ich werde nicht zögern, mein Fitness Tracker System auch weiterhin zu nutzen.	○	○	○	○	○	○	○

	stimme überhaupt nicht zu	stimme nicht zu	stimme eher nicht zu	weder noch	stimme eher zu	stimme zu	stimme völlig zu
6. Die Verwendung meines Fitness Tracker Systems ***hilft mir***, meine Fitnessziele zu erreichen.	○	○	○	○	○	○	○
7. Die Verwendung meines Fitness Tracker Systems ***motiviert mich***, meine Fitnessziele zu erreichen.	○	○	○	○	○	○	○
8. Die Verwendung meines Fitness Tracker Systems ***motiviert mich,*** fit zu bleiben.	○	○	○	○	○	○	○
9. Die Verwendung meines Fitness Tracker Systems ***hilft mir***, gesundheitliche Probleme zu vermeiden.	○	○	○	○	○	○	○

	stimme überhaupt nicht zu	stimme nicht zu	stimme eher nicht zu	weder noch	stimme eher zu	stimme zu	stimme völlig zu
10. Es ist einfach, mein Fitness Tracker System zu benutzen.	○	○	○	○	○	○	○
11. Mein Fitness Tracker System zu benutzen, ist nicht kompliziert.	○	○	○	○	○	○	○
12. Meine Interaktion mit meinem Fitness Tracker System ist nicht kompliziert.	○	○	○	○	○	○	○
13. Ich finde, dass mein Fitness Tracker System leicht zu benutzen ist.	○	○	○	○	○	○	○

	stimme überhaupt nicht zu	stimme nicht zu	stimme eher nicht zu	weder noch	stimme eher zu	stimme zu	stimme völlig zu
14. Menschen, die mir wichtig sind, würden mir die kontinuierliche Nutzung meines Fitness Tracker Systems empfehlen.	○	○	○	○	○	○	○
15. Menschen, die mein Verhalten beeinflussen, empfehlen die kontinuierliche Nutzung meines Fitness Tracker Systems.	○	○	○	○	○	○	○
16. Menschen, deren Meinung ich schätze, empfehlen mir, dass ich mein Fitness Tracker System nutze.	○	○	○	○	○	○	○

	stimme überhaupt nicht zu	stimme nicht zu	stimme eher nicht zu	weder noch	stimme eher zu	stimme zu	stimme völlig zu
17. Nutzer die das gleiche Fitness Tracker System wie ich benutzen empfehlen seine Verwendung.	○	○	○	○	○	○	○
18. Dieses Fitness Tracker System wird derzeit von vielen Menschen genutzt.	○	○	○	○	○	○	○
19. Viele meiner Lieblings-Influencer zum Thema Sport verwenden ein Fitness Tracker System.	○	○	○	○	○	○	○
20. Mein Fitness Tracker System ist dort, wo ich lebe, sehr beliebt.	○	○	○	○	○	○	○
21. Viele Menschen, die ich kenne, nutzen dieses Fitness Tracker System.	○	○	○	○	○	○	○

	stimme überhaupt nicht zu	stimme nicht zu	stimme eher nicht zu	weder noch	stimme eher zu	stimme zu	stimme völlig zu
22. Ich habe die notwendigen Kenntnisse, um mein Fitness Tracker System zu nutzen.	○	○	○	○	○	○	○
23. Ich kann Hilfe von anderen bekommen, wenn ich Schwierigkeiten habe, mein Fitness Tracker System zu nutzen.	○	○	○	○	○	○	○
24. Mein Fitness Tracker System ist mit anderen von mir verwendeten Technologien kompatibel.	○	○	○	○	○	○	○
25. Ich habe die notwendigen Mittel, um mein Fitness Tracker System zu nutzen.	○	○	○	○	○	○	○

	stimme überhaupt nicht zu	stimme nicht zu	stimme eher nicht zu	weder noch	stimme eher zu	stimme zu	stimme völlig zu
26. Die Nutzung meines Fitness Tracker Systems macht Spaß.	○	○	○	○	○	○	○
27. Ich genieße die Nutzung meines Fitness Tracker Systems.	○	○	○	○	○	○	○
28. Die Nutzung meines Fitness-Tracker-Systems ist sehr unterhaltsam.	○	○	○	○	○	○	○

	stimme überhaupt nicht zu	stimme nicht zu	stimme eher nicht zu	weder noch	stimme eher zu	stimme zu	stimme völlig zu
29. Die Nutzung meines Fitness Tracker Systems ist für mich zur Gewohnheit geworden.	○	○	○	○	○	○	○
30. Ich halte es für selbstverständlich, mein Fitness Tracker System zu verwenden.	○	○	○	○	○	○	○
31. Die Nutzung meines Fitness Tracker Systems geschieht bei mir automatisch.	○	○	○	○	○	○	○

	stimme überhaupt nicht zu	stimme nicht zu	stimme eher nicht zu	weder noch	stimme eher zu	stimme zu	stimme völlig zu
32. Ich glaube, dass der Anbieter meines Fitness Tracker Systems zuverlässig und ehrlich ist, und einen sicheren Service bietet.	○	○	○	○	○	○	○
33. Ich glaube, der Anbieter meines Fitness Tracker Systems ist kompetent in der Handhabung und Sicherung meiner Daten.	○	○	○	○	○	○	○
34. Ich glaube, dass der Anbieter meines Fitness Tracker Systems bei der Handhabung und Sicherung meiner Daten vertrauenswürdig ist.	○	○	○	○	○	○	○
35. Ich glaube, dass der Anbieter meines Fitness Tracker Systems meine Interessen berücksichtigt.	○	○	○	○	○	○	○
36. Ich bin zuversichtlich, dass der Anbieter meines Fitness Tracker Systems meine persönlichen Daten nicht ausnutzen wird.	○	○	○	○	○	○	○

	stimme überhaupt nicht zu	stimme nicht zu	stimme eher nicht zu	weder noch	stimme eher zu	stimme zu	stimme völlig zu
37. Ich glaube, dass es viele unerwartete Probleme mit sich bringen würde, meinem Fitness Tracker System meine persönlichen Daten zur Verfügung zu stellen.	○	○	○	○	○	○	○
38. Ich glaube, es wäre riskant, meine persönlichen Daten meinem Fitness Tracker System zu offenbaren.	○	○	○	○	○	○	○
39. Ich gehe davon aus, dass die Offenlegung meiner persönlichen Daten gegenüber meinem Fitness Tracker System potentielle Schäden mit sich bringen könnte.	○	○	○	○	○	○	○

	stimme überhaupt nicht zu	stimme nicht zu	stimme eher nicht zu	weder noch	stimme eher zu	stimme zu	stimme völlig zu
40. Meine Gesundheit ist mir wichtiger als alles andere.	○	○	○	○	○	○	○
41. Gesund zu bleiben, ist für mich sehr wichtig.	○	○	○	○	○	○	○
42. Ich werde alles tun, was ich kann, um gesund zu bleiben.	○	○	○	○	○	○	○

	stimme überhaupt nicht zu	stimme nicht zu	stimme eher nicht zu	weder noch	stimme eher zu	stimme zu	stimme völlig zu
43. Ich bin zufrieden mit den Ergebnissen, die ich durch die Nutzung meines Fitness Tracker Systems erziele.	○	○	○	○	○	○	○
44. Im Allgemeinen bin ich mit den Features meines Fitness Tracker Systems zufrieden.	○	○	○	○	○	○	○
45. Dieses Fitness Tracker System hat mich bei der Erreichung meiner Ziele nicht im Stich gelassen.	○	○	○	○	○	○	○
46. Ich bin mit diesem Fitness Tracker System zufrieden.	○	○	○	○	○	○	○

Wenn Sie an der Verlosung des 50 € Amazon-Gutscheins teilnehmen möchten, geben Sie bitte hier Ihre E-Mail-Adresse ein.

Wir danken Ihnen für Ihre Teilnahme an dieser Umfrage.
Ihre Antwort wurde erfasst.

Appendix B – English survey

Dear respondent,

Thank you for your willingness to complete this questionnaire.

You are being invited to participate in a research study entitled "***What influences the continuous use of Fitness Tracker Systems***". This study is conducted as part of the requirements of the master of science degree in communication science at the University of Twente, the Netherlands by ***Christian Streichan***.

The purpose of this research study is to study the continuous use of fitness tracker systems **and** will take you approximately ***15*** minutes to complete. The data will be used ***for a statistical analysis***.

Your participation in this study is entirely voluntary and you can withdraw at any time.

We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a breach is always possible. To the best of our ability your answers in this study will remain confidential. We will minimize any risks by ***not collecting any data that is too specific and would help to identify one certain individual.***

The collected data will be stored locally on one password protected device and will only be examined by the researcher and first and second examiner of the University of Twente.

The lottery of the 50 € Amazon Voucher will be conducted using a random number generator. All Email addresses collected for the lottery will be deleted immediately after the winner has been determined.

Study contact details for further information: c.streichan@student.utwente.nl

1. **Do you agree to participate in this survey?**

GENERAL

IMPORTANT INFORMATION:

In the context of this study the term fitness tracker system refers to a wearable device that is synced to a smartphone (app) and/or a cloud service for long-term data tracking.

2. **Do you currently use a fitness tracker or a smart watch with fitness tracking capabilities (tracking, for example, distance walked or run, calorie consumption, or heartbeat)?**

DEMOGRAPHICS

1. **What is your gender?**

- Female
- Male
- Prefer not to answer

2. **How old are you?**

- _____

3. **What is your highest degree of education?**

- Haupt-/Mittelschulabschluss
- Mittlere Reife
- (Fach-)Abitur etc.
- Hochschulabschluss
- None completed

4. **How often do you participate in any sport activities?**

- Not at all
- 1-2 times a week
- 3-4 times a week
- 5-6 times a week
- More than 6 times
- Prefer not to answer

5. **Which brand is the provider of your current fitness tracker system?**

- Apple
- Fitbit
- Jawbone
- Garmin
- Polar
- Samsung
- Xiaomi
- Runtastic
- Suunto
- Other: _____

6. **How long have you been using your fitness tracker system?**

- Less than half a year
- 6 to 12 months
- More than 12 months
- Prefer not to answer

7. **Did you purchase your fitness tracker system yourself?**

- Yes
- No
- Prefer not to answer

8. **What do you use your fitness tracker system mostly for?**

- Tracking of daily activity
- Tracking of sport activity
- Tracking step count
- Keeping track of calories

- Monitoring health
- Monitoring my sleep
- As an Accessory
- As a gadget
- Other: _____

DEPENDENT VARIABLE
Intention to continue using FTE's

1. I intend to continue using my fitness tracker system in the future.
2. Sometimes I think about stopping to use my fitness tracker system.
3. I plan to continue to use my fitness tracker system frequently.
4. I will use my fitness tracker system to track my next training.
5. I will not hesitate to continue using my fitness tracker system.

Likert-scale for each statement: 1 (strongly disagree) to 7 (strongly agree)

INDEPENDENT VARIABLEs
UTAUT2
Performance Expectancy (Venkatesh, Thong, and Xu, 2012)

6. Using my fitness tracker system helps me to accomplish my fitness goals.
7. Using my fitness tracker system motivates me to achieve my fitness goals.
8. Using my fitness tracker system motivates me to stay fit.
9. Using my fitness tracker system helps me to avoid health problems.

Likert-scale for each statement: 1 (strongly disagree) to 7 (strongly agree)

Effort expectancy (Venkatesh, Thong, and Xu, 2012)

10. Using my fitness tracker system is easy.
11. Using my fitness tracker system is not complicated.
12. My interaction with my fitness tracker system is not difficult.
13. I find my fitness tracker system is easy to use.

Likert-scale for each statement: 1 (strongly disagree) to 7 (strongly agree)

Injunctive social norms (Venkatesh, Thong, and Xu, 2012)

14. People who are important to me would recommend the continuous use of my fitness tracker system.
15. People who influence my behavior recommend that I should continue using my fitness tracker system.
16. People whose opinions I value advise me to use my fitness tracker system.

Likert-scale for each statement: 1 (strongly disagree) to 7 (strongly agree)

Descriptive social norms (Original)

17. Most users of this fitness tracker system recommend its use.
18. This fitness tracker system is currently used by a lot of people.
19. A lot of my favorite sport influencers use a fitness tracker system.
20. This fitness tracker system is popular where I live.
21. A lot of people I know use this fitness tracker system.

Likert-scale for each statement: 1 (strongly disagree) to 7 (strongly agree)

Facilitating conditions (Venkatesh, Thong, and Xu, 2012)

22. I have the resources necessary to use my fitness tracker system.
23. I have the knowledge necessary to use my fitness tracker system.
24. I can get help from others when I have difficulties using my fitness tracker system.
25. My fitness tracker ecosystem is compatible with other technologies I use.

Likert-scale for each statement: 1 (strongly disagree) to 7 (strongly agree)

Habit (Venkatesh, Thong, and Xu, 2012)

26. The use of my fitness tracker system has become a habit for me.
27. I consider it natural to use my fitness tracker system.
28. I do not have to think when I am using my fitness tracker system.

Likert-scale for each statement: 1 (strongly disagree) to 7 (strongly agree)

Perceived privacy risk (Zhou, 2012)

29. I believe providing my fitness tracker system with my personal information would involve many unexpected problems.
30. I believe it would be risky to disclose my personal information to my fitness tracker system.
31. I expect there would be a high potential for loss in disclosing my personal information to my service provider.

Likert-scale for each statement: 1 (strongly disagree) to 7 (strongly agree)

Health Valuation (Beldad & Hegener, 2017)

32. I value my health more than anything else.
33. Staying healthy is very important for me.
34. I will do everything I can to stay healthy.

Likert-scale for each statement: 1 (strongly disagree) to 7 (strongly agree)

Satisfaction (Original)

35. I am satisfied with the results I get from using my fitness tracker system.
36. In general, I am satisfied with the features of my fitness tracker system.
37. This fitness tracker system has not failed me in achieving my goals.
38. I am happy with this fitness tracker system.

Likert-scale for each statement: 1 (strongly disagree) to 7 (strongly agree)

If you wish to take part in the lottery of the 50 € Amazon Voucher, please fill in your Email address below.

E-Mail: _____