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AN EXPLORATIVE STUDY ON USERS' MOTIVATION AND ADOPTION OF WEARABLES TECHNOLOGIES USING THE TECHNOLOGY ACCEPTANCE MODEL (TAM)

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Abstract

During the last decade, the growth of wearable products such as smartwatches, display glasses, smart tattoos, wrist-bands, and headbands has been increasing and propagated rapidly to mainstream usage, due to their capability for both leisure or fitness and medical data tracking (Celik, Salama, & Eltawil, 2020; Nam & Lee, 2020). Following Wright and Keith's (2014) conceptualization, wearable technology and wearable devices are phrases that describe electronics that are integrated into clothing and other accessories that can be worn comfortably on the body. The study is based on a cross-sectional design, data being collected from a convenience sample of 261 participants (48 males, 213 females), aged between 18 and 29 years old (M=21.73, SD=3.70) through the following structured questionnaires: Technology Acceptance Model (Davis, 1989) and Gratifications of Wearables Technology (Travers, 2015). The study applied the Technology Acceptance Model (TAM) to explore the motivation (gratifications) of students in the adoption of wearables technologies and actual usage of wearables technologies. The results of the study suggest that both Perceived Ease of Use ($r=.279$, $p<.01$) and Perceived Usefulness ($r=.386$, $p<.01$) correlate with Actual System Use. Moreover, Perceived Ease of Use positively correlates with Accessibility scale of Gratifications of Wearables Technology ($r=.380$, $p<.01$), and Perceived Usefulness positively correlate with all scales of Gratifications of Wearables Technology – Health ($r=.427$, $p<.01$), Accessibility ($r=.522$, $p<.01$) and Status ($r=.262$, $p<.01$). The reality is that the interest in wearables is growing fast, during the last few years, a large variety of wearables has been offered to the market (Seneviratne et al., 2017). A forecast of the wearable industry shows that it will most likely experience important changes within the next few years, wearables being more and more present in mainstream usage. Practical implications of the recent study are discussed as well as some directions for future research in the area.

Keywords: *TAM, wearables, technology, internet of bodies, motivation.*

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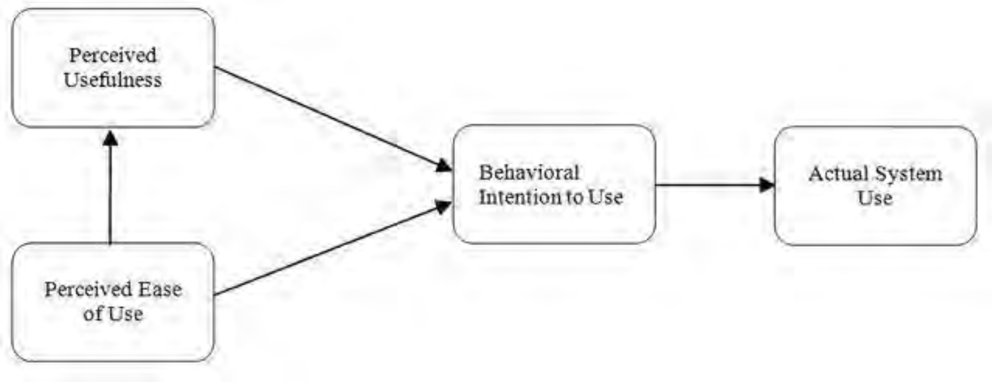
1. Introduction

The interaction between humans and technology was well documented in the literature. One of the most well-known models is the so-called Technology Acceptance Model (TAM) developed by Davis in 1986 (1986, 1989). TAM is the most agreed theory for describing an individual's acceptance of information systems (Lee, Kozar, & Larsen, 2003). Scholars state that the wide acceptance of TAM is based on the fact that the model has both a sound theoretical assumption and practical effectiveness (Chuttur, 2009). This model (Figure 1) assumes that an individual's technology acceptance is determined by two major variables: perceived usefulness and perceived ease of use (Marangunić & Granić, 2015).

Even though TAM has been tested widely with different samples in different situations and proved to be a valid and reliable model explaining information system acceptance and use (Mathieson, 1991; Davis & Venkatesh, 1996), many extensions to the TAM have been proposed and tested (Venkatesh & Davis, 2000; Henderson & Divett, 2003; Lu, Yu, Liu, & Yao, 2003; Lai & Zainal, 2015; Lai, 2016), reaching as much as five new versions, leading up to the Unified Theory of Acceptance and Use of Technology (UTAUT). The UTAUT has four predictors of users' behavioral intention: performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh, Morris, Davis, & Davis, 2003).

Figure 1. The earliest technology acceptance model. (Davis, 1989).



The TAM model and its revised forms have gained considerable prominence, particularly due to its transferability to various contexts and samples, its potential to explain variance in the intention to use or the use of technology (King & He, 2006; Marangunić & Granić, 2015).

Furthermore, Mugo and colleagues (2017) stated that the two dimensions of TAM, namely perceived ease of use and perceived usefulness, are both influenced by two other categories of variables: internal and external variables. Internal variables consist of factors such as the attitude of the user, their beliefs, and level of competency, whereas external variables include mainly external barriers faced by users during utilization (organizational, technological, and social barriers). Moreover, other scholars pointed out that those two important variables (perceived usefulness and perceived ease of use) are often accompanied by external variables explaining variation in perceived usefulness and ease of use such as subjective norms, self-efficacy, and facilitating conditions (Abdullah & Ward, 2016).

In the last few years, the industry of wearable products grows exponentially, devices such as smartwatches, display glasses, wrist-bands, and headbands being rapidly propagated into mainstream usage, due to their capability for both leisure or fitness and medical data tracking (Celik, Salama, & Eltawil, 2020; Nam & Lee, 2020). Wearable technology has spread through a large array of areas including medical, healthcare, fitness, and even fashion industries (Dunne, 2010; Gepperth, 2012; Perry et al., 2017).

Sharma and Biros (2019) defined wearables as "a subset of IoT that includes 'things 'that can be incorporated into clothing or worn on the body as accessories" (p. 35). In Seneviratne and colleagues' (2017) conceptualization, "wearables can sense, collect, and upload physiological data in a 24x7 manner, providing opportunities to improve quality of life in a way not easily achievable with smartphones alone. Wearables can also help users perform many other useful micro-tasks, such as checking incoming text messages and viewing urgent information, much more conveniently and naturally than possible with a smartphone, which is often carried in pockets or bags" (Seneviratne *et al*., 2017, p. 2573).

Other authors, (Wright & Keith, 2014) defined wearable technology and wearable devices as electronics that are integrated into clothing and other accessories that can be worn comfortably on the body. Those kinds of devices provide users (and other stakeholders) with information regarding their habits, activity levels, and different physiological data (Motti & Caine, 2014).

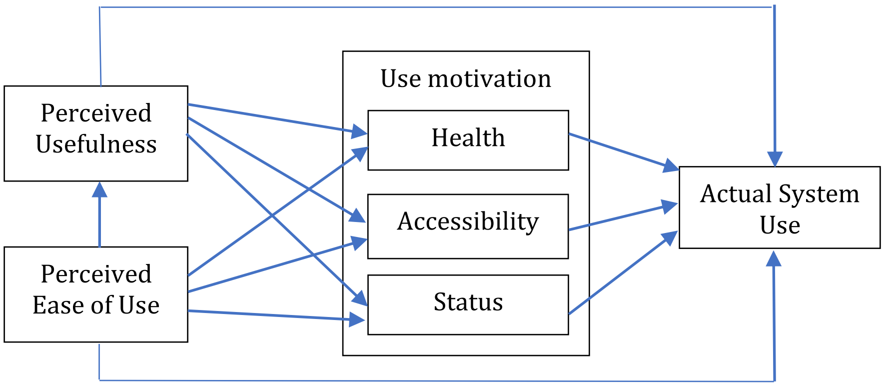
This study aims to adopt this model as the theoretical framework for investigating the user motivation and adoption of wearable technology among students. Following the original model, we propose the following research questions (Figure 2):

RQ1: What relations can be observed between perceived usefulness and user motivation/gratification in the adoption of wearables technology?

RQ2: What relations can be observed between perceived ease of use and user motivation/gratification in the adoption of wearables technology?

RQ3: What relations can be observed between user motivation/gratification in the adoption of wearables technology and actual system usage?

Figure 2. Conceptual framework.



2. Methods

The sample consisted of 261 students (48 males, 213 females). The age range of the participants was from 18 to 29 years (M=21,73, SD=3,70). For data collection, a purposive convenience sampling technique was used. A self-reported data collection technique was employed. Before completion, the purpose of the study was briefly explained to the participants and informed consent was obtained. All participants were ensured about the confidentiality of the data and that it would be only used for research purposes. They were invited to fill in a set of questionnaires compiling the following measures: Gratifications of Wearables Technology (Travers, 2015) and Technology Acceptance Model (Davis, 1989).

Gratifications of Wearables Technology (Travers, 2015) is a questionnaire that comprises 60 items structured on 3 dimensions: health, accessibility, and status. Each item consisted of a 5-point Likert Scale with different statements that inquire the extent to which the respondent agrees or disagrees. A response of 1 indicated strongly disagree and a 5 indicated strongly agree. The internal consistency coefficient of the composite score was α=.96 with excellent alpha scores for all subscales: health α=.96, accessibility α=.87, and status α=.93.

Technology Acceptance Model (Davis, 1989), consists of 12 items, covering two dimensions: perceived usefulness and perceived ease of use. The answers are distributed on a seven-options Likert scale from 1 (Extremely unlikely) to 7 (Extremely likely). The internal consistency coefficient (Cronbach's Alpha) of those scales was 0.79 for perceived ease of use and 0.75 for perceived usefulness.

3. Results

After collection, the data were analyzed using SPSS 26.0 version software. The analysis of Skewness and Kurtosis coefficients showed a normal distribution of data, therefore, to answer to the proposed RQ, the Pearson correlation was used.

Means, standard deviations, and bivariate correlations for all the study variables are presented in Table 1. As can be observed, a series of positive relationships between the selected variables have been identified. Specifically, to answer to our first research question (RQ1: What relations can be observed between perceived usefulness (PUSE) and user motivation/gratification in the adoption of wearables technology?), the correlation between PEU, PUSE and Health, Accessibility and Status were calculated. As can be observed from Table 1, PUSE positively correlates with all motivation/gratification scales (Health r=.427, p<0.01; Accessibility r=.522, p<0.01; Status r=.262, p<0.01). Therefore, individuals who sought wearable technology for instrumental, action-oriented purposes, such as staying connected and informed or monitoring their health and sleeping patterns, had greater perceptions of usefulness. These findings are in line with Joo and Sang's (2013) examination of smartphone use, indicating that this correlation can be extrapolated to almost all wearables' technologies.

The second research question (RQ2: What relations can be observed between perceived ease of use (PEU) and user motivation/gratification in the adoption of wearables technology?) PEU positively correlate with Accessibility (r=.380, p<0.01) but not with Health and Status (p>0.05). Those results point to the fact that people might adopt wearable technologies for health or status reasons regardless how easy it is to operate them.

Regarding the last research question (RQ3: What relations can be observed between user motivation/gratification in the adoption of wearables technology and actual system usage?), the results showed positive correlations between Health ($r=.205$, $p<0.01$), Accessibility ($r=.199$, $p<0.01$) and actual system use. The Status subscale of motivation/gratification did not significantly correlate with actual system use ($p>0.05$), despite the aim of a series of advertising campaigns that market these devices as the "long-awaited" innovations of the future, positioning them as novel status symbols.

Table 1. Descriptive statistics and inter-correlations of the study variables.

	Mean	SD	1	2	3	4	5
1. PEU	3.83	.80	-				
2. PUSE	3.53	.84	.502**	-			
3. Health	2.86	1.07	.119	.427**	-		
4. Accessibility	3.81	.78	.380**	.522**	.303**	-	
5. Status	2.66	.92	-.077	.262**	.540**	.471**	-
6. ASU	2.16	1.28	.279**	.386**	.205**	.199**	.261

n=261, **p<0.01

4. Conclusions

Current findings are supported by previous studies that highlighted positive correlations between PEU, PU, attitude and motivation for use and actual system usage (Davis, 1986, 1989). Numerous studies have found that those seeking different gratifications of a technology will also have different perceptions of ease of use and usefulness (Ishii, 2006; Leung & Wei, 2000).

One of the most well-known meta-analyses conducted by King and He (2006) also confirmed the importance of perceived benefits in technology acceptance. As technology advances, it will become more crucial that new innovations remain simple to use and navigate.

Despite the valuable findings of this study, it is not without limitations. One of the main weaknesses of this study was the use of a cross-sectional design, which does not allow for an assessment of the cause-effect relation. Also, another limitation, common to many studies, is related to the fact the questionnaires were self-reported, and the tendency is to investigate and report attitudes, rather than behaviors (Hughes et al., 2018). Another issue to be considered when evaluating the results is the small sample, which makes the results difficult to generalize, and that most respondents of this study were young (18-29 years old). It has been known that younger individuals are the primary users of wearable devices, therefore older consumers who might be not so familiar with those technologies should be considered for future studies.

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