The role of uses and gratification theory and technology acceptance model in the adoption and usage of wearable technology

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Abstract
The growth of wearable products has had a multifaced impact on society, touching various aspects of our lives, from health and technology to fashion and privacy. Devices such as smartwatches, display glasses, wristbands, and headbands have been rapidly propagated to mainstream usage, due to their capability for both leisure or fitness and medical data tracking. **t**he study utilized the Technology Acceptance Model to investigate the motivations (gratifications) driving students to embrace wearable technologies and their subsequent utilization of these technologies. The research employed a cross-sectional design, gathering data from a convenience sample of 261 participants (48 males and 213 females), whose ages ranged from 18 to 29 years (M=21.73, SD=3.70). Data collection involved administering two structured questionnaires: the Technology Acceptance Model and the Gratifications of Wearables Technology. The study's findings indicate significant correlations between several factors. Specifically, both Perceived Ease of Use (r=.279, p<.01) and Perceived Usefulness (r=.386, p<.01) are positively associated with Actual System Use. Additionally, Perceived Ease of Use displays a positive correlation with the Accessibility scale of Gratifications of Wearables Technology (r=.380, p<.01), while Perceived Usefulness exhibits positive correlations with all scales of Gratifications of Wearables Technology, including Health (r=.427, p<.01), Accessibility (r=.522, p<.01), and Status (r=.262, p<.01). The outlook for the wearable industry suggests that significant transformations are on the horizon in the coming years, with wearables becoming increasingly prevalent in mainstream usage. This study not only delves into the practical implications but also outlines potential avenues for future research in this field.

Keywords: TAM, explorative study, motivation, ease of use, usefulness.

1. Introduction
Over the past few years, the wearable products industry has experienced exponential growth. Devices like smartwatches, display glasses, wristbands, headbands, and even brain machines have swiftly integrated into mainstream use, driven by their versatility in both leisure and fitness, as well as their capacity for medical data tracking [1, 2]. Wearable technology has permeated various sectors, starting from the medical, healthcare, and fitness, to the fashion industries [3, 4, 5].

As mentioned by Celik and colleagues [6] wearable technology encompasses a diverse range of devices. Given their broad categorization, it is crucial to establish a clear definition of wearable technology for the scope of this study. In this research, wearable technology is defined as any device worn by the user that incorporates data collection capabilities or motion sensors. These devices may be worn on the wrist, ear, and feet, or even embedded in shoes, clothing, or body (insertions and smart tattoos).

Sharma and Biros [7] characterized wearables as “a subset of IoT that encompasses 'things' capable of being integrated into clothing or worn as accessories on the body”.

Furthermore, in the conceptualization of Seneviratne and colleagues [8], “wearables can continuously sense, collect, and upload physiological data, offering opportunities to enhance the quality of life beyond what can be easily achieved with smartphones alone.

Additionally, wearables enable users to conveniently and naturally perform various micro-tasks, such as checking incoming text messages and accessing urgent information, in contrast to smartphones often carried in pockets or bags”.

According to other authors, such as Wright and Keith [9], wearable technology and devices are electronics seamlessly integrated into clothing and accessories that can be comfortably worn on the body. These devices furnish users (and other stakeholders) with information about their habits, activity levels, and various physiological data [10].

1.1. Technology Acceptance Model

The literature extensively discusses the interaction between humans and technology, with one of the widely recognized models being the Technology Acceptance Model (TAM) developed by Davis in 1986 [11, 12]. The Technology Acceptance Model (TAM) originated from the Theory of Reasoned Action (TRA) [13], a social psychological theory aimed at understanding the motivations underlying various behaviors. TAM was developed specifically to assess the attributes of “computer-based information systems” and investigate how these attributes influence their adoption [14].

TAM stands out as the most widely accepted theory for elucidating an individual's acceptance of information systems [15]. Scholars emphasize that TAM's widespread acceptance is rooted in its robust theoretical foundation and practical effectiveness [16].

Illustrated in Figure 1, this model posits that an individual's acceptance of technology is influenced by two key variables: perceived usefulness and perceived ease of use [17].

Davis [18] proposes that the combined influence of Perceived Ease of Use and Perceived Usefulness directly shapes an individual's attitudes toward utilizing a specific technology.

During the last decade, 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, and its simplicity of specification within structural equation modeling frameworks [19, 20].

Shroff, Deneen, and Ng [21] described that by manipulating these two variables, technology systems developers can have better control over users' beliefs about a specific system and so can better predict their behavioral intention and actual usage of the system.

Bogozzi [22] has stated that the TAM is too simple and leaves out important variables.

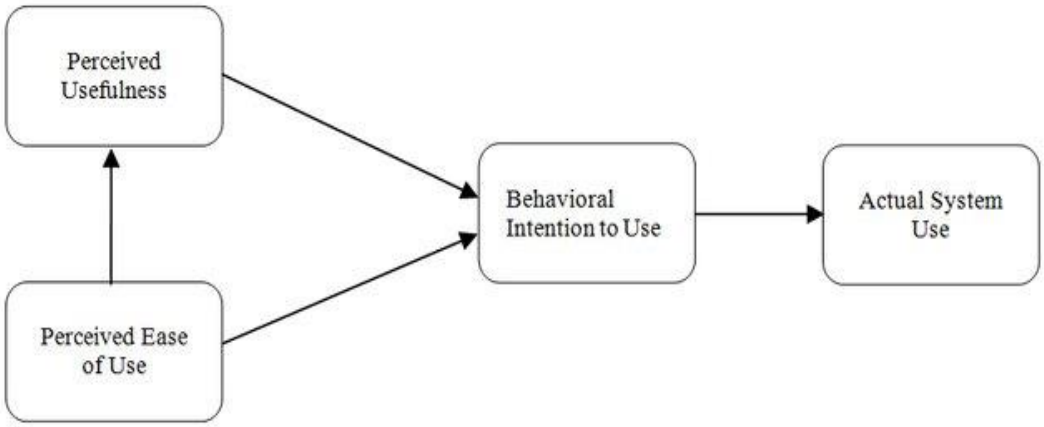

Fig. 1. The earliest technology acceptance model
Source: Davis, 1989

Thus, Mugo and colleagues [23] stated that both perceived ease of use and perceived usefulness are influenced by two categories of variables: internal and external variables.

Internal variables consist of factors such as the attitude of the user, their pedagogical beliefs, and level of competency, whereas external variables include those external barriers faced by users during utilization.

With few exceptions such as Venkatesh [24], technology acceptance models make use of predictors that are exclusively cognitive, relating the adoption and actual behavior of new technology to attitudes, beliefs, and perceptions [25, 26].

Considering that a significant number of individuals acquire wearable devices due to their popularity, yet many stop using them shortly after obtaining the device underscores the importance of this study, which concentrates on gratifications and actual usage.

1.2. Uses and Gratification Theory

In the realm of communication research, the Uses and Gratifications theory is frequently employed to identify the motives driving the utilization of a specific medium [27].

According to Katz and colleagues [28], the Uses and Gratifications theory explores both social and psychological needs that drive the use of media, focusing on the anticipated gratifications that users expect to derive from using that particular media.

Gratifications can be categorized as either instrumental or ritualized [29]. Instrumental use emphasizes utility gratifications, driven by the intention to achieve a specific end-goal. [30, 31]. In contrast, ritualized use places greater emphasis on the process rather than the end-goal. Individuals engaging in ritualized use of media seek gratifications such as relaxation and entertainment [32, 33]. Ritualized gratifications are often associated with process gratifications, while instrumental gratifications are more likely linked to content gratifications [34].

Furthermore, the Uses and Gratifications theory posits that individuals are proactive and will choose the most suitable media outlet to best satisfy their gratifications [35]. Instead of passively consuming media, they actively seek out specific media with deliberate intentions.

Several studies have identified that individuals tend to prioritize perceived ease of use and perceived usefulness differently, depending on the specific gratifications they seek from that particular technology. In a study conducted by Park [36] on the adoption of computer-based voice over Internet Protocol (VoIP) phone services, it was found that individuals utilizing VoIP services for entertainment and communication placed less emphasis on perceived usefulness compared to those employing it for other purposes.

Moreover, previous studies [37] have observed that individuals pursuing varied gratifications from a technology tend to hold distinct perceptions regarding both ease of use and usefulness. In their study from 2013, Joo and Sang [38]observed that individuals seeking instrumental gratifications for smartphone use demonstrated higher perceptions of usefulness compared to ease of use. This suggests that when individuals use a smartphone for instrumental purposes, they tend to perceive the device as more useful than easy to use.

Conversely, those seeking ritualized use for smartphones tended to have higher perceptions of ease of use than perceived usefulness.

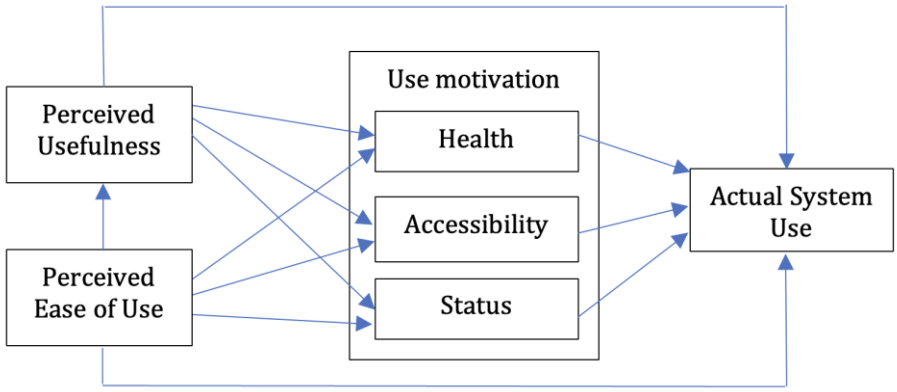

Fig. 2. Conceptual framework

This study aims to adopt the Technology Acceptance Model and Use and Gratification Theory as the theoretical framework for investigating the user motivation and adoption of wearable technology among students. Following the initial model, we put forth the following research questions (Figure 2):

- RQ1: What relations can be observed between perceived usefulness and user motivation/gratification in the adoption of wearable technology?
- RQ2: What relations can be observed between perceived ease of use and user motivation/gratification in the adoption of wearable technology?

- RQ3: What relations can be observed between user motivation/gratification in the adoption of wearable technology and actual system usage?
- RQ4: What relations can be observed between actual system usage and perceived usefulness?
- RQ5: What relations can be observed between actual system usage and perceived ease of use?

2. Methods

The sample comprised 261 students, with 48 males and 213 females. Participants' ages ranged from 18 to 29 years (M=21.73, SD=3.70). We employed a purposive convenience sampling technique for data collection, using a self-reported method. Before completion, participants received a brief explanation of the study's purpose, and informed consent was obtained. Assurance of data confidentiality for research purposes was provided.

Participants were invited to complete a set of questionnaires, including the Gratifications of Wearables Technology [39]and the Technology Acceptance Model [40].

The Gratifications of Wearables Technology [41] questionnaire consists of 60 items structured across three dimensions: health, accessibility, and status. Each item used a 5-point Likert Scale, with responses ranging from 1 (strongly disagree) to 5 (strongly agree).

The composite score demonstrated excellent internal consistency with a coefficient of α=.96, and subscales showed strong alpha scores: health α=.96, accessibility α=.87, and status α=.93.

The Technology Acceptance Model [42]comprises 12 items, covering two dimensions: perceived usefulness and perceived ease of use. Responses were provided on a seven-point Likert scale, ranging from 1 (Extremely unlikely) to 7 (Extremely likely). The internal consistency coefficients (Cronbach's Alpha) for these scales were α=0.79 for perceived ease of use and α=0.75 for perceived usefulness.

3. Results

Table 1 displays the means, standard deviations, and bivariate correlations for all variables under investigation. To address our initial research question (RQ1: What relations can be observed between perceived usefulness (PUSE) and user motivation/gratification in the adoption of wearable technology?), we computed the correlations between PUSE, Health, Accessibility, and Status. The results, as presented in Table 1, reveal a positive correlation between PUSE and all motivation/gratification scales (Health r=.427, p<0.01; Accessibility r=.522, p<0.01; Status r=.262, p<0.01). This implies that individuals seeking wearable technology for practical, action-oriented purposes, such as staying informed, connected, or monitoring health and sleep patterns, perceive greater usefulness. These findings align with Joo and Sang's [43] investigation of smartphone use, suggesting that this correlation can be extended to almost all wearable technologies.

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

Source: Author own work

To answer the second research question (RQ2: What relations can be observed between perceived ease of use (PEU) and user motivation/gratification in the adoption of wearable technology?) the correlations between PEU and Health, Accessibility, and Status were computed. The data analysis reveals a positive correlation between PEU and Accessibility ($r=.380$, $p<0.01$), while no significant correlation was found between PEU and Health or Status ($p>0.05$). These findings suggest that individuals may embrace wearable technologies for health or status reasons irrespective of the ease with which they can operate them.

In addressing the third research question (RQ3: What relations can be observed between user motivation/gratification in the adoption of wearable technology and actual system usage (ASU)?), the results indicate 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 does not exhibit a significant correlation with actual system use ($p>0.05$). This is noteworthy given the advertising campaigns positioning these devices as highly anticipated innovations and novel status symbols of the future.

Starting from the TAM theory which posits that perceived usefulness and perceived ease of use are two cognitive belief dimensions that shape users' attitudes, which in turn determines intention to use and actual use, we have calculated the correlation between actual system usage and perceived usefulness and perceived ease of use, thus answering to the last two research questions (RQ4: What relations can be observed between actual system usage and perceived usefulness?; RQ5: What relations can be observed between actual system usage and perceived ease of use?). Therefore, Perceived Ease of Use, the degree to which a person believes that using technology will be free from effort [44] ($r=.279$, $p<.01$), and Perceived Usefulness, the extent to which a consumer believes that using wearable technology increases personal efficiency ($r=.386$, $p<.01$) are positively associated with Actual System Use. Expanding upon the established TAM model, the current results validate that attitudes toward using the technology, leading to adoption intention, are indeed influenced by perceived usefulness and perceived ease of use.

4. Conclusions

The fulfillment of gratifications through wearable technology influenced perceptions of ease of use, usefulness, and attitudes toward usage. Individuals who sought wearable technology for practical purposes, such as gathering information about their health and sleeping patterns, held higher perceptions of usefulness. Similarly, those who sought wearable technology for ritualized use perceived their devices to be easier to use.

The current findings align with prior research that emphasized positive correlations among perceived ease of use (PEU), perceived usefulness (PU), attitude, motivation for use, and actual system usage [45, 46]. Various studies have also revealed that individuals seeking different gratifications from a technology tend to perceive differences in ease of use and usefulness [47, 48].

Furthermore, in this research context, both perceived ease of use and perceived usefulness emerged as noteworthy and positive predictors of individuals' attitudes toward adopting wearable technology. A notable meta-analysis by King and He [49] further corroborated the significance of perceived benefits in technology acceptance. As technology progresses, the imperative for innovations to maintain simplicity in usage and navigation becomes increasingly crucial.

Despite the valuable insights provided by this study, it is not without limitations. One primary weakness lies in the use of a cross-sectional design, which precludes the assessment of cause-and-effect relationships. Additionally, the reliance on self-reported questionnaires, a common limitation in many studies, tends to focus on investigating and reporting attitudes rather than behaviors. The small sample size poses another limitation, making it challenging to generalize the results, especially considering that a majority of respondents were young (18-29 years old). Moreover, it's conceivable that individuals who opted to participate may have possessed a specific interest in the topic, introducing a slight potential for voluntary response bias [50]. Given that younger individuals predominantly use wearable devices, future studies should consider including older consumers who may be less familiar with such technologies.

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