

# ANTECEDENTS INFLUENCING CONTINUANCE USAGE INTENTION OF WEARABLE ACTIVITY DEVICES

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## ABSTRACT

*The quest for a healthy lifestyle has increased the popularity of wearable activity devices (WAD) among the masses. However, despite the numerous benefits of WAD, most people (50 percent) stop using it within two weeks of their usage. This presents a concern that needs to be addressed to promote WAD usage for healthy living. This current study attempts to understand the factors affecting the continued usage intention of WAD among users. So, to understand the drivers of continued usage, a sample population with continuous usage of WAD for more than six months is considered for the study. The proposed framework includes the factors: self-quantification, gamification, feedback, and commitment. Structural equation modeling is conducted to establish the model validity and predictability. Results indicate that the model satisfies all the model fit-indices and is adequate to predict the continued usage intention of WAD users.*

**Keywords:** Wearable Activity Devices, Self-Quantification, Gamification, Feedback, Commitment.

## INTRODUCTION

Healthy lifestyle has become a priority in the current pandemic situation and building immunity is being considered as an effective tool to fight the Covid 19 pandemic (Lotfi et al., 2021; Yazdanpanah et al., 2020). It is suggested that apart from having balanced diet, exercise and activities are crucial for building immunity. Wearable activity devices (WAD) have proved to be handy in improving activities and in countering sedentary lifestyle. Recent years have seen a surge in wearable activity devices adoption around the globe. 68.9 billion US Dollars were spent in 2020 on wearable activity devices (Rimol, 2021). This industry is expected to become an 81.5 billion US Dollar by the end of the year 2021 (Rimol, 2021). Wearable activity devices has amassed a considerable attention of the masses as these devices are not only convenient to wear but are also very effective tool in monitoring one's own activities (Lunney et al., 2016). The data provided by WAD can be further analysed by an individual to assess the present health condition and set their own goals to achieve the required level of activities.

WAD comes with several features such as step counting, heart beat tracking, sleep pattern analysis, calories spent, etc. (Lunney et al., 2016; Stragier et al., 2016) which not only provides vital information to quantify health but also acts as a motivation to do better in terms of health.

Despite the numerous benefits of WAD almost 50 per cent of the users stop using these devices within two weeks of their usage (Endeavour Partners (2014) report). This presents a concern that needs to be addressed to promote continuous usage of WAD in order to promote health. The current study is an attempt to address the above issue by considering the sample of users who have an experience of using WAD for six or more than six months. In this study based on the experience of users, only those factors are considered which are identified to play a role in promoting the continued usage of WAD. The proposed framework considers the factors: gamification, self-quantification, feedback and commitment and their impact on intention to continued usage of WAD.

## **Hypotheses Development and Research Model**

### **Self-quantification (SQ)**

Self-quantification can be described as the process of self-regulation by an individual to regulate their own behaviour by monitoring their own activities (Bandura, 1991; Michie et al., 2011; Stragier et al., 2016). It includes setting goals and standards, planning and scheduling activities to reach the targeted behaviour (Bandura, 1991; Stragier et al., 2016). Self-quantification is observed to posit a positive impact on behavioural intention (Stragier et al., 2016).

### **Gamification (GM)**

Gamification refers to creating a gaming like experience where an individual feels motivated and target seems achievable imparting a sense of achievement and mastery (Ryan, et al., 2006). Gamification uses positive reinforcement among individual to instigate action towards achieving better results (Palfai & Macdonald, 2007; Nelson et al., 2016). WAD even provides badges or levels or both for physical activities which can further be shared on social groups creating a sense of competition and improving motivation (Nelson et al., 2016). Gamification is observed to have a positive impact on behavioural intention of users (Palfai & Macdonald, 2007).

### **Feedback (FB)**

WAD is equipped with biosensors, collects data of one's activities which is then feed-back to the users providing essential data of present condition of the user (Chittaro and Sioni, 2014). Feedback further acts as a catalyst to enhance empowerment among individual's improving their determination towards their goals (Nelson et al., 2016). With the help of feedback mechanism an individual feels confident in setting and achieving their goals (Nelson et al., 2016). In some advanced WAD analytical tools provide further health analysis and helps an individual to have better understanding and control over their activities. Feedback is observed to posit a positive impact on behavioural intention of users (Nelson et al., 2016).

## Commitment (CM)

Commitment was defined in organizational setting as an employee's psychological bonding with the employing organization (Klein & Park, 2015). In the current context of health setting, commitment can be defined as the individuals psychological bonding with the self-set-goal which an individual intends to achieve (Blickem et al., 2011; Nelson et al., 2016). Commitment is observed to have a positive impact on behavioural intention of users (Bansal et al., 2004).

Based on the above discussions following hypotheses are proposed.

H1: SQ positively influences users' commitment towards use of WAD.

H2: SQ positively influences users' intention to continued usage of WAD.

H3: GM positively influences users' commitment towards use of WAD.

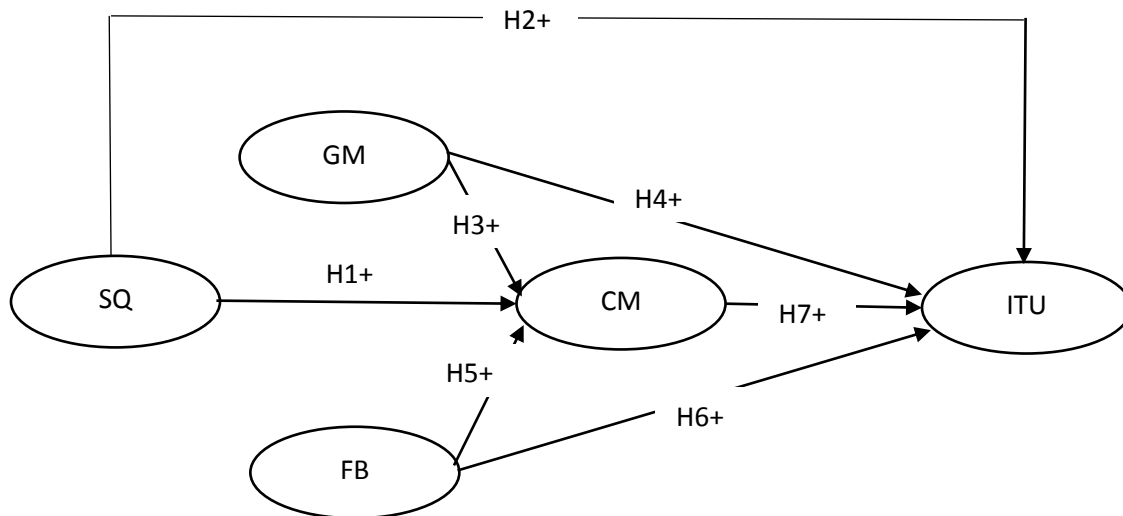
H4: GM positively influences users' intention to continued usage of WAD.

H5: FB positively influences users' commitment towards use of WAD.

H6: FB positively influences users' intention to continued usage of WAD.

H7: CM positively influences users' intention to continued usage of WAD.

Based on the above developed hypotheses, the proposed conceptual framework is as shown in Figure 1.



**Figure 1**  
**PROPOSED RESEARCH FRAMEWORK**

## METHODOLOGY

## Sampling

Participants of the current study comprised of members of various online fitness communities. People who were having continuous experience of using WAD for six or more than six months were included for the study. The structured questionnaire was prepared and administered online through dedicated form links and emails. The samples comprised from various nationalities that is: India, Sri Lanka, Malaysia, Brazil, Germany, South Africa, USA and Australia. 280 people agreed to responds to the questionnaire and 263 usable responses were received.

## Measures

Seven-point Likert type scale was considered for the study (ranging from 1=strongly disagree to 7=strongly agree). Standardized and validated scales from previous researches was adapted for the current study. Four items of gamification: happiness, points allocation, motivation and activity coverage were adapted from past researches (Nelson et al., 2016; Witt, Scheiner, & Robra-Bissantz (2011)). Three items of self-quantification: monitoring progress, follow up workouts and achieving goal were adapted from previous researches (Stragier et al., 2016). Four items of feedback: accurate information, health information, effectiveness and reliability were adapted from the past researches (Nelson et al., 2016). Further, items of commitment: regularity, frequent usage, emotional attachment and personal meaning were adapted (Meyer & Allen, 1991). Finally, four items of intention: regularity, frequent use, access in present and access in future were adapted from previous research (Chauhan et al., 2019).

## RESULTS

### Normality and common method bias

The measurement model comprised of 19 observed and 5 latent variables. Herman's single factor test was done to check the common method bias, the variance explained by the single factor came out to be less than 50 per cent, hence it can be concluded that the data is independent of common method bias (Chauhan et al., 2019). For assessing normality, Mahalanobis distance was computed and it was observed that 93.2 per cent of the values lied between two sigma levels and hence it can be concluded that the data is normally distributed (Chatterjee et al., 2019).

### Reliability and Validity

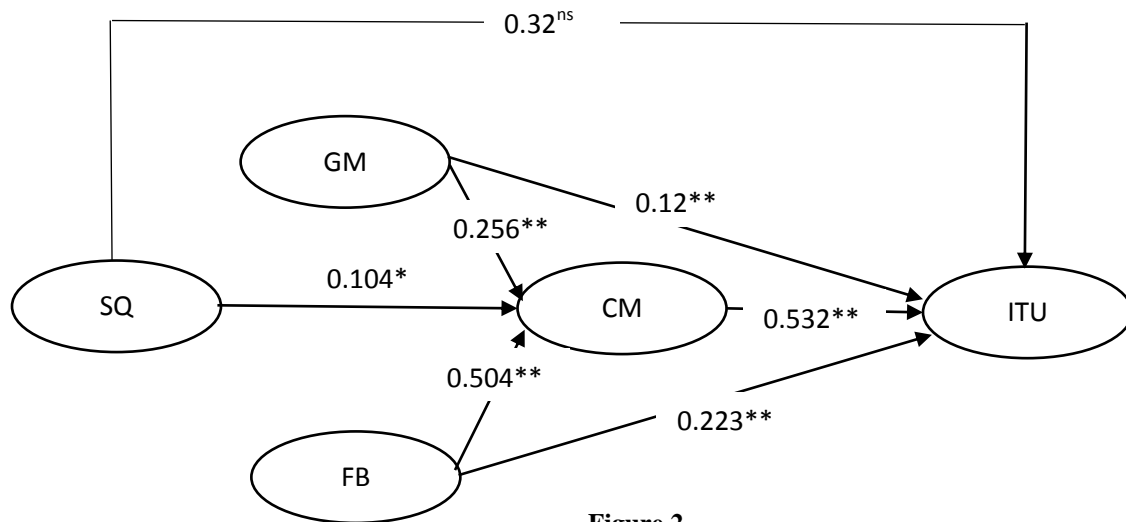
In order to establish the reliability and validity of the scales confirmatory factor analysis was conducted. Reliability of construct was established through composite reliability and inter item reliability using Chronbach's alpha test which was well above the limit of 0.7 (Table 2) (Srivastava et al., 2018). For convergent validity, factor loadings (Table 1) and average variance extracted (Table 2) was analysed which were above the limit of 0.6 and 0.5 and hence convergent validity is established (Hair et al., 1998).

<b>Item Code</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
GM1	0.860				
GM2	0.821				
GM3	0.809				
GM4	0.797				
SQ1		0.878			
SQ2		0.828			
SQ3		0.820			
SQ4		0.799			
FB1			0.879		
FB2			0.824		
FB3			0.802		
FB4			0.792		
CM1				0.917	
CM2				0.845	
CM3				0.841	
CM4				0.642	
ITU1					0.910
ITU2					0.903
ITU3					0.865
ITU4					0.501

<b>Constructs</b>	<b>GM</b>	<b>SQ</b>	<b>FB</b>	<b>CM</b>	<b>ITU</b>	<b>CR</b>	<b>AVE</b>
<b>GM</b>	1.000					0.876	0.797
<b>SQ</b>	0.424 (0.179)	1.000				0.877	0.799
<b>FB</b>	0.166 (0.027)	0.236 (0.055)	1.000			0.867	0.786
<b>CM</b>	0.278 (0.077)	0.148 (0.021)	0.254 (0.064)	1.000		0.874	0.790
<b>ITU</b>	0.213 (0.045)	0.092 (0.008)	0.234 (0.056)	0.224 (0.050)	1.000	0.870	0.779
<b>Cronbach's Alpha</b>	0.874	0.875	0.865	0.862	0.852		
<b>Model Fit Indices</b>	$\chi^2=221.392$ ; $\chi^2/DF= 2.172$ , $p < 0.001$ , GFI= 0.901, TLI = 0.914, CFI =0.927, IFI = 0.928, RMSEA =0.05						

### Measurement Model and Hypothesis Testing

SEM (Structural Equation Modelling) was conducted in order to evaluate the measurement model; AMOS 24 version was used. Model fit indices show adequate model fit where:  $\chi^2 = 221.392$ ,  $\chi^2/df = 2.172$ , GFI = 0.901 (acceptable as it is  $>0.9$ ; Bagozzi & Yi, 1988), TLI = 0.914 (acceptable as it is  $>0.9$ ; Bagozzi & Yi, 1988), CFI = 0.927 (acceptable as it is  $>0.9$ ; Bentler, 1989, 1990), IFI = 0.928 (acceptable as it is  $>0.9$ ; Chauhan et al., 2019), RMSEA = 0.05 (acceptable as it is  $<0.08$ ; Hair et al., 1998). The structural model is as shown in Figure 2.



**Figure 2**  
**STRUCTURAL MODEL**

The hypotheses test results are as depicted in Table 3. All the hypotheses except H2 are significant. H3, H4, H5, H6 and H7 are significant at 0.01 significance level while H1 is significant at 0.1 significance level.

Table 3 PATH RELATIONSHIP OF SEM			
Hypothesis	Structural path	Standardized coefficient (p-value)	Relationship
H1	SQ -> CM	0.104* (0.024)	Supported
H2	SQ -> ITU	0.032 <sup>ns</sup> (0.342)	Not-Supported
H3	GM -> CM	0.256** (0.000)	Supported
H4	GM -> ITU	0.120** (0.002)	Supported
H5	FB -> CM	0.504** (0.000)	Supported
H6	FB -> ITU	0.223** (0.003)	Supported
H7	CM -> ITU	0.532** (0.000)	Supported

Note: \*p<0.1\*\*p<0.01; p<sup>ns</sup> = not-significant

## DISCUSSION AND CONCLUSION

This study attempts to understand continued usage intention of wearable activity devices. The results support the proposed model and almost all the factors play a significant role in wearable activity devices adoption except self-quantification impact on intention to continued usage of WAD. From the analysis it is clear that commitment with the highest coefficient value is the most impactful factor having a direct impact on intention to continued usage, it is a bonding of the user with self-defined health goals which the user wants to achieve followed. Further, it is observed that feedback with the coefficient value of 0.504 play a significant role in formation of commitment which acts a tool to provide a measure to the user to track the progress in terms of health-related activities. Feedback acts as a catalyst both for commitment and intention to continued usage by providing a measure of fitness activities. Further, gamification

provides a sense of achievement and competition stimulating both commitment and intention to continued usage of WAD. Even though self-quantification does not have a direct significant impact on intention to use but impacts formation of commitment by assisting the user in setting goal, planning and scheduling activities to reach the targeted behaviour.

This study provides a crucial insight to policy makers and marketers to understand the behaviour of the users in order to motivate them to continued usage of WAD and hence promoting smart health.

### Appendix 1 (Items and Measures)

#### Gamification (GM)

- GM1: Gaining higher percentages of activity and sleep makes me happy.  
 GM2: The allocation of percentage points was comprehensible.  
 GM3: Gaining points increased my motivation to introduce further effort.  
 GM4: The increase of my percentage in the activity counter increases my motivation.

#### Self-Quantification (SQ)

- SQ1: I use WAD to standardize and plan my workouts.  
 SQ2: I use WAD to monitor my progress.  
 SQ3: I use WAD to follow up my workouts.  
 SQ4: I use WAD to help me achieve my goals.

#### Feedback (FB)

- FB1: I feel confident that WAD feedback mechanism gives accurate information.  
 FB2: A considerable amount of useful feedback information about my health is available through WAD.  
 FB3: I believe that the feedback mechanism in the WAD is effective.  
 FB4: I believe that the feedback mechanism of the WAD is reliable and dependable.

#### Commitment (CM)

- CM1: I would be very happy to spend the rest of my life achieving my health goals.  
 CM2: I feel a strong sense of “belonging” to my health goals.  
 CM3: I do feel “emotionally attached” to my health goals.  
 CM4: My health goals have a great deal of personal meaning for me.

#### Intention to Continued Use (ITU)

- ITU1: I will continue using WAD on a regular basis in the future  
 ITU2: I will continue frequent usage of WAD in the future  
 ITU3: Assuming I have continued access to the WAD, I intend to use it  
 ITU4: Given that I have continued access to the WAD, I predict that I would use it

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