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Introducing gadget love and subjective knowledge into the theory of planned behavior to understand intention to adopt smart-connected products

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Abstract

Rapid adoption of new technology-based products is a key factor of business performance. The present study addresses the determinants of the intention to adopt personal trackers as an example of smart connected product. The aim of this research is to show whether their adoption is motivated merely by rational factors coming from the theory of planned behavior framework or by a combination of rational, cognitive (subjective knowledge) and emotional (gadget love) factors.

The results of an online survey (N=360), in which data were analyzed using structural equation modeling, confirm that gadget love, subjective knowledge, and subjective norm positively influence the intention to adopt smart connected products, but contrary to expectations, the effect of subjective knowledge is direct.

Keywords: Gadget Love; Smart Connected Products; Subjective Knowledge; Theory of Planned Behavior.

Intégrer la passion des gadgets et la connaissance subjective dans la théorie du comportement planifié pour comprendre l'intention d'adopter les objets connectés

Résumé

L'adoption rapide de nouveaux produits technologiques est un facteur clé de la performance des entreprises. La présente étude porte sur les déterminants de l'intention d'adopter un objet connecté permettant d'enregistrer des données personnelles que nous appellerons traceurs individuels. L'objectif de cette recherche est de montrer si leur adoption est motivée uniquement par des facteurs rationnels issus du cadre de la théorie du comportement planifié ou par une combinaison de facteurs rationnels, cognitifs (connaissance subjective) et émotionnels (passion des gadgets).

Les résultats d'une étude en ligne (N=360), dont les données ont été analysées à l'aide d'équations structurelles, confirment que la passion des gadgets, la connaissance subjective et la norme subjective influencent positivement l'intention d'adopter l'objet connecté retenu pour

l'étude, mais contrairement aux attentes, l'effet de la connaissance subjective est direct.

Mots clés : Passion des gadgets, Objets connectés, Connaissance subjective, Théorie du comportement planifiée

Rapid adoption by consumers of new products is a key factor of business performance. Morris *et al.* (2003) reported that nearly half of the products entering the market fail each year. New technological products are not immune to the risk of market failure. Even though new technology-based products (NTP) are part of everyday life in the 21st century, persuading the majority of consumers to accept and adopt any particular NTP remains difficult (Bruner & Kumar, 2007). Despite the extensive literature investigating consumer adoption of NTP, examples of failure abound (Philips LaserDisk, 1978; Samsung's Galaxy Fold, 2019). This phenomenon has not spared smart connected products, with some bitter failures, such as Google's connected glasses (2013-2014). For smart connected products manufacturers, understanding the drivers of NTP adoption is therefore crucial.

To address consumer requirements adequately and thereby boost adoption, firms need knowledge about consumer predispositions toward NTP. Several theoretical models are widely documented in the literature. The theory of planned behavior (TPB) (Ajzen, 1991) has provided a useful lens for looking at NTP adoption and recent findings conclude that the TPB framework outperforms other well-established theoretical models (Giovanis *et al.*, 2019; Hasan, Lowe & Petrovici, 2019).

Both the literature on NTP adoption and the different theoretical frameworks used so far give little emphasis to emotions. Ajzen (1991) promoted the TPB as a model reflecting rational and reasoned decision-making. Since then, the literature has stressed the great importance of emotions: they influence consumer choices (Bagozzi, Gopinath & Nyer, 1999) and could bias consumers' judgments and behaviors (Hegner, Fenko & Teravest, 2017). Recently, Aboulnasr & Tran (2020) gave support to an influence of emotional brand attachment on consumers' evaluation of NTP, a result encouraging further studies linking emotional attachment and behavioral intention regarding NTP. Products can trigger emotions such as anger, frustration, pleasure and delight (Bagozzi, Gopinath & Nyer, 1999). Emotions could play an important role in the context of NTP, as they evolve with users' experiences and may encourage "a more or less stable attachment between new technology and its users" (Lehtonen, 2003: 383) and create bonds between users and NTP (Verganti, 2006). Gadget love (Bruner & Kumar, 2007) is a kind of emotional product attachment (Mugge, Schifferstein & Schoormans, 2010). Adding this emotional factor to the TPB framework is a promising alternative to explore the mechanisms behind consumer intentions to adopt smart connected products.

Since Brucks (1985) made a clear distinction between subjective and objective knowledge, "knowing what the consumer knows" has become an important issue for both researchers and

practitioners (Vigar-Ellis, Pitt & Berthon, 2015). Nevertheless, the consumer knowledge is not included in most theoretical models explaining the adoption of NTP (Hegner, Fenko & Teravest, 2017). Some consumers may perceive NTP as complex merely because they are unfamiliar with them. Subjective knowledge is therefore of interest for gaining insight into the drivers of NTP adoption.

This paper try to answer the following research question: does adding an emotional (gadget love) and a cognitive (subjective knowledge) factor into the TPB framework provide a better understanding of consumer intention to adopt NTP?

Expected contributions are both theoretical and managerial. From a theoretical standpoint, our research echoes Verhoef's *et al.* (2017: 5) call for deeper insight into the adoption of Internet of Things: "How will consumers adopt Internet of Things (fast or slow) and what is driving that adoption?" Our research is among the first to consider the simultaneous addition of both an emotional and a cognitive factor into the TPB framework to help understand the adoption of smart connected products further. In addition, the present study contributes to the field of research into emotional attachment to NTP.

From a managerial perspective, developers and marketers in firms that produce smart connected products expect rapid adoption of their products. In the face of consumer skepticism, practitioners need more knowledge about consumer's predispositions toward NTP.

1. Theoretical framework and research model

1.1 Adoption of new technology-based products

Understanding consumer adoption of NTP draws primarily on conceptual models developed in psychology and information systems. The most-cited models are the theory of reasoned action (Ajzen & Fishbein 1974) and the theory of planned behavior (Ajzen, 1991), which together provide the conceptual basis for the technology acceptance model. A recent systematic literature review confirms the relevance of the TPB framework to various emerging technologies (Koul & Eydgahi, 2017; Viot *et al.*, 2021) and the conclusions of recent studies have favored the TPB when considering consumer intention to adopt NTP (Giovanis *et al.*, 2019; Hasan, Lowe & Petrovici, 2019).

According to the TPB, the more favorable the attitude and subjective norm, and the greater the perceived behavioral control, the stronger an individual's intention to perform the behavior under consideration should be (Ajzen, 1991). Several studies give support to Ajzen's hypotheses in the context of NTP adoption (Giovanis *et al.*, 2019; Hasan, Lowe & Petrovici,

2019; Song, Junghwan & Kwangmin, 2017; Lee, Le & Garrett, 2013; Xiao *et al.*, 2011; Shih & Fang, 2004). Even though the literature concludes that the TPB provides a relevant framework for understanding the adoption of NPT, it also points to gaps: the TPB under considers emotional and cognitive factors. We propose to fill this void by extending the TPB in two ways: the addition of an emotional and cognitive factor.

The TPB framework emerged in the late 1980s, when the literature on consumer decision-making process did not give emotions the importance that they have acquired in recent years. Ajzen (1991) stated that an individual's decision to perform a behavior is a thoughtful action: individuals rely on salient information or beliefs to make a decision. Bagozzi, Gopinath & Nyer (1999) then challenged this rational view of consumer decision-making, highlighting the influence of emotions on cognitive processes and goal-directed behavior. The TPB framework raises criticism as emotions may bias consumer judgments and behavior (Hegner, Fenko & Teravest, 2017). This limit seems particularly relevant in the context of NTP since emotions create a link between users and technological products (Vergandi, 2006).

Subjective knowledge, “a consumer’s perception of the amount of information they have stored in their memory” (Flynn & Goldsmith, 1999: 59), may be of prime interest in NTP adoption. Product knowledge helps consumers evaluate product attributes and can act as a behavioral belief as well as a control belief, influencing attitude toward the behavior and perceived behavioral control respectively. Successfully introduced in the TPB framework (Li *et al.*, 2018; Xiao *et al.*, 2011), this cognitive variable is a key driver of NTP adoption (Fu & Elliott, 2013). In our extended TPB framework, the influence of subjective knowledge is indirect, mediated by attitude and perceived behavioral control, whereas the influence of gadget love on the behavioral intention is direct. The influence of subjective norm, attitude and perceived behavioral control on behavioral intention is consistent with the initial model of the TPB.

1.2 Linking subjective knowledge to the TPB

Subjective knowledge influences consumer behavior (Brucks, 1985). Reinhardt, Hietschold & Gurtneret (2019) identified “knowledge acquisition” as an adoption trigger of new products that led non-adopters to become adopters. In the NTP context, subjective knowledge is crucial because what an individual thinks he/she knows helps him/her evaluate product attributes (Fu & Elliott, 2013). Some studies confirm the influence of subjective knowledge on attitude toward behavior and perceived behavioral control in varied situations: waste reduction in BtoB context (Li *et al.*, 2018) or risky credit behavior (Xiao *et al.*, 2011). According to the TPB, an individual's beliefs influence his/her attitude toward a given behavior and perceived behavioral

control. Subjective knowledge is part of beliefs that can contribute to the formation of attitude and perceived behavioral control. Hence, subjective knowledge of NTP should positively influence the attitude toward adoption intention, as well as the perceived behavioral control.

H1: Subjective knowledge of NTP positively influences the attitude toward adoption intention.

H2: Subjective knowledge of NTP positively influences perceived behavioral control.

Ajzen (1991) defined attitude as “the degree to which a person has a favorable/ unfavorable evaluation of the behavior.” Rosenberg & Hovland (1960) conceptualized attitude as a multidimensional construct including affective, behavioral and cognitive components. However, Ajzen’s (1991: 191) definition mainly refers to a cognitive dimension: “Attitudes develop reasonably from the beliefs people hold about the object of the attitude.” According to Ajzen, attitude depends on the perceived consequences of the behavior and refers to stable judgments that encourage individuals to engage in it. Individuals with a favorable attitude toward a specific behavior are more likely to perform this behavior. Some studies concluded that attitude predicts the intention to adopt different technological objects or services: mobile banking (Zhang & Mao, 2020; Giovanis *et al.*, 2019), marketplaces (Hasan, Lowe & Petrovici, 2019), smart products (Song, Junghwan & Kwangmin, 2017), and internet stock trading (Ramayah & Gopi, 2009). From these results, we argue that attitude toward NTP adoption influences the intention of adopting them favorably.

H3: Attitude toward adoption of NTP positively influences NTP adoption intention.

As Ajzen (1991: 184) stated, “People’s behavior is strongly influenced by their confidence in their ability to perform it”. Perceived behavioral control refers to the perceived ease or difficulty of performing a behavior and denotes a subjective degree of control over the performance of a behavior (Ajzen, 1991). In the context of NTP, previous experiences, anticipated obstacles and resources, such as controllability, autonomy, and computer anxiety, may influence an individual’s perceived behavioral control (Song, Junghwan & Kwangmin, 2017). The more individuals believe they have control over the behavior; the more they are likely to engage in it. Thus, a strong perceived behavioral control of NTP should lead to higher adoption intention (Giovanis *et al.*, 2019; Hasan, Lowe, & Petrovici, 2019; Song, Junghwan, & Kwangmin, 2017; Gao & Bai, 2014; Ramayah & Gopi, 2009). Consistent with previous literature, we expect a positive relationship between perceived control and behavioral intention.

H4: The perceived behavioral control positively influences NTP adoption intention.

Subjective knowledge is one of the beliefs that can influence an individual's attitude and perceived control which in turn influence the behavioral intention. For this reason and following recent findings (Li *et al.*, 2018), the present study opts for an indirect effect of subjective knowledge on the behavioral intention: both behavioral attitude and perceived behavioral control regarding NTP should mediate the influence of NTP-related knowledge on the intention to adopt them.

H5: The attitude toward using NTP (H5_a) and the perceived control on NTP (H5_b) mediate the influence of subjective knowledge of NTP on behavioral intention.

Subjective norm, defined as “the perceived social pressure to perform or not to perform the behavior” (Ajzen, 1991: 188) is a normative beliefs reflecting the likelihood that important individuals or reference groups will approve and/or disapprove of a given behavior (Ajzen, 1991). The social context plays an important role in NTP adoption decisions (Gao & Bai, 2014), particularly at an early stage of diffusion. Since potential users lack feedback regarding the use of NTP, they place a high value on the beliefs of significant others (Zhang & Mao, 2020; Giovanis *et al.*, 2019; Hasan *et al.*, 2019). Thus, subjective norm should influence the intention of adopting NTP favorably.

H6: Subjective norm positively influences NTP adoption intention.

1.3 Introducing Gadget love into the TPB

During the past two decades, marketing research has investigated the concept of love and established that such a feeling may exist from a consumer's perspective when the object is a possession or a brand (Batra, Ahuvia & Bagozzi, 2012). The study of love in marketing relies on two main frameworks: the interpersonal theory of love and para-social relationship paradigms (Ahuvia, 2005). In the consumer behavior literature, the focus is merely on brand love rather than on product love. However, the evocation of a feeling of love between consumers and material possessions (Shimp & Madden, 1988; Ahuvia, 1993) predates the concept of brand love (Fournier, 1998; Carroll & Ahuvia, 2006). Shimp & Madden (1988) considered that consumers form relations with consumption objects and that love provides a useful metaphor for characterizing consumer-object relations. Ahuvia (1993) performed the first major empirical study transposing the theory of interpersonal love from psychology to consumer research.

The concept of product love is experiencing renewed interest with recent studies confirming that consumer develops strong emotional bonds with tangible objects (Dong *et al.*, 2018; Lastovicka & Sirianni, 2011). The recent literature on gadget love also illustrates this craze for

the consumer-object relationship (Ahn & Seo, 2018; Bruner & Kumar, 2007; Jain, Sharma & Singh, 2018; Shoham & Pesämaa, 2013; Thakur, Angriawanb & Summey, 2016). If the expression ‘gadget love’ originates from the 1960's (McLuhan, 1964), its definition is quite recent: gadget love is “the attachment individuals have toward advanced electronic items and how such an attachment relates to actual use” (Shoham & Pesämaa, 2013: 247). Gadget lovers’ motivation stems from the product itself rather than from social considerations. Consequently, gadget love should be a key determinant of NTP adoption in that this emotional attachment is a more enduring element than extrinsic factors, such as socially motivated innovation (Bruner & Kumar, 2007).

The literature emphasizes that the emotional attachment to tangible objects results from repeated experience and interactions between the consumer and the product (Mugge, Schifferstein & Schoormans, 2010; Dong *et al.*, 2018). NTP would present favorable conditions for the development of an affective relationship, because individuals who are fond of NTP generally possess several of them and interact regularly with them. Repeated experience and interactions with advanced electronic items could lead to an emotional attachment to the entire NTP category.

According to Bruner and Kumar (2007), gadget lovers are likely to be motivated to buy NTP, while consumers with little gadget interest will probably refrain from buying them. Some studies confirm the positive influence of gadget love on effective behavior (Jain, Sharma & Singh, 2018; Shoham & Pesämaa, 2013), and on behavioral intentions related to new technologies (Ahn & Seo, 2018; Thakur, Angriawanb & Summey, 2016, Bruner & Kumar, 2007). Gadget lovers are more likely to be stimulated and excited by the attributes of high technologies and, therefore, consumers who love gadgets are more likely to display positive behavioral intention toward new technologies. Therefore, gadget love should directly influence the intention to adopt NTP.

H7: Gadget love positively influences the intention to adopt NTP.

2. Empirical study

2.1 Product choice

Smart connected products are part of NTP: they incorporate information technologies through the presence of embedded sensors, processors, software and connectivity (Porter & Heppelmann, 2014); they collect, analyze, diffuse data, and are able to active actions having an effect on physical reality (Hsu & Lin, 2016). Smart connected product adoption still raises

questions. Despite optimistic predictions (more than 74 billion worldwide by 2025, Statista, 2019), only a few categories of smart connected products are successful, such as personal trackers, connected watches and smart speakers. Studies so far have placed greater emphasis on the barriers (Mani & Chouk, 2018) rather than on the drivers of adoption. Smart connected products remain ambivalent in the consumer's mind: three in four French consumers consider that they tend to improve their everyday life, but two in three estimate they are pointless (BVA, 2018). Consumers' ambiguous attitudes denote a lack of clear understanding of the mechanisms driving smart connected product acceptance and encourage new studies. We choose the category of personal trackers (fitness trackers and smart watches) because they target both men and women and are among the most popular smart connected products. Personal trackers also comply with the recommendations of Hasan *et al.* (2019: 66) regarding the relevance of the TPB: "they need to be relatively new to consumers but common enough that consumers have heard about them and even potentially used them".

2.2 Sample and data collection

We collected data online on a convenient sample of young people from GenZ (N=360; 63% females; 19.1 years old, sd=2.1: per month revenue <1500 € for 97% of respondents). The use of convenience samples to reach young consumers is common in research on new products adoption (Jain, Sharma & Singh, 2019) and emotional attachment (Fernandez & Moreira, 2019; Hegner, Fenko & Teravest, 2017). Respondents received an e-mail containing a link to one of the two versions of the questionnaire with different orders of questions (to control *ex-ante* common method bias).

After a definition of smart connected products, the survey started with questions on attitude, subjective norm, and perceived control. Respondents then answered a set of questions about gadget love and their subjective knowledge of smart connected products. Participants should then indicate the number of smart connected objects they owned. One participant in three reported possessing at least one smart connected product besides a smartphone, tablet and computer, with no distinction between men and women ($\chi^2=2.36$; df=1; p =.125).

2.3 Measurement

We used existing measurement scales of attitude, subjective norm, perceived control (Shih & Fang, 2004), gadget love (Bruner & Kumar, 2007), and subjective knowledge (Flynn & Goldsmith, 1999), after back-translation into French. We added two *ad hoc* items measuring behavioral intention. Respondents gave their agreement level on a seven-point Likert scale, from 1 (totally disagree) to 7 (totally agree). Descriptors for constructs are included in Table 1.

Table 1. Means, standard deviation and correlations

| | Means (sd) all | Means (sd) men | Means (sd) women | T-value (df= 358) | Correlations | | | | | | |
|---------------------------------|-------------------|-------------------|---------------------|----------------------|--------------|---------|---------|---------|----------|----|--|
| | | | | | SK | SN | GL | PBC | Attitude | BI | |
| 1. Subjective knowledge | 3.64(1.01) | 3.99(1.00) | 3.44(0.96) | 5.20*** | 1 | | | | | | |
| 2. Subjective norm | 3.82(0.95) | 3.86(1.01) | 3.79(0.92) | 0.64 | 0.415** | 1 | | | | | |
| 3. Gadget love | 3.53(1.18) | 3.99(1.11) | 3.26(1.14) | 5.96*** | 0.496** | 0.196* | 1 | | | | |
| 4. Perceived behavioral control | 4.84(0.80) | 5.01(0.85) | 4.74(0.91) | 2.70** | 0.483** | 0.200* | 0.240** | 1 | | | |
| 5. Attitude | 4.79(0.90) | 4.80(0.98) | 4.90(0.85) | 0.11 | 0.548** | 0.277** | 0.272** | 0.640* | 1 | | |
| 6. Behavioral intention | 2.68(1.56) | 2.69(1.61) | 2.67(1.53) | 0.16 | 0.174* | 0.237** | 0.197** | 0.030ns | 0.153* | 1 | |

Note: ** p<.01; * p<.05; ns: non significant

3. Results

3.1 Measurement model

We used principal component analyses (PCA) to assess the reliability and validity of measurement scales. The KMO and Bartlett tests attested that PCA could be run (Table 2). In addition, all the constructs showed good reliability: Cronbach's alpha ranged from .74 to .88 (Table 2). As the data originated from the same sample, we performed a *post-hoc* common bias variance test. The Harman's one-factor test, frequently used in marketing research, can "detect biasing levels of common variance under conditions commonly found in survey-based marketing research" (Fuller *et al.*, 2016). The first principal component accounted for 27.1% of the variance, a percentage well below the recommended cutoff of 50% (Podsakoff & Organ, 1986).

We then performed confirmatory factor analyses with AMOS 25 and the maximum likelihood method. A bootstrap provided a confidence interval and probability for each estimated parameter. Fit indices were within the optimum norm, except for the attitude scale (Table 2). Since behavioral intention was a two-item construct, we constrained the parameters to .7 to enable statistical identification (Hair, Babin & Krey, 2017). Composite reliability ranged from .82 to .89. The average variance extracted (AVE), computed to control for convergent validity (Fornell & Larcker, 1981), was above .5, ranging from .59 to .78 (Table 2). Therefore, the measurement scales satisfied the conditions of composite, convergent, and discriminant validity. In addition, loadings were all significant ($p < .01$).

Table 2: Measurement model

| Construct | Exploratory factor analyses | | Confirmatory factor analyses | |
|-------------------------------------|-----------------------------|--|------------------------------|---|
| Attitude | | | | |
| ATT1_inv | .747 | $\alpha = .74$; EV=67% KMO=.641 Bartlett: $\chi^2=275$; df=1; p<.001 | .72** | CR=.82; AVE=.61 RMSEA=.044; CFI=.998 $\chi^2=1.684$; df=1; p<.001; $\chi^2/df=1.68$ |
| ATT2 | .878 | | .88** | |
| ATT3 | .819 | | .73** | |
| Perceived behavioral control | | | | |
| PBC1 | .803 | $\alpha = .82$; EV=66% KMO=.775 Bartlett: $\chi^2= 661.7$; df=6; p<.001 | .69** | CR= .84; AVE= .59 RMSEA=.064; CFI=.997 $\chi^2=2.48$; df=1; p=.115; χ^2/df =2.48 |
| PBC2 | .770 | | .74** | |
| PBC3 | .848 | | .77** | |
| PBC4 | .816 | | .81** | |
| Subjective norm | | | | |
| SN2 | .847 | $\alpha = .86$; EV=70% KMO=.792 Bartlett: $\chi^2=661$; df=6; p<.001 | .72** | CR= .89; AVE= .67 RMSEA=.062; CFI=.99 $\chi^2=2.068$; df=1; p=.150; χ^2/df =2.07 |
| SN3 | .832 | | .80** | |
| SN5 | .804 | | .87** | |
| SN6 | .871 | | .88** | |
| Subjective knowledge | | | | |
| SK1 | .800 | | .64** | CR=.84; AVE=.64 |

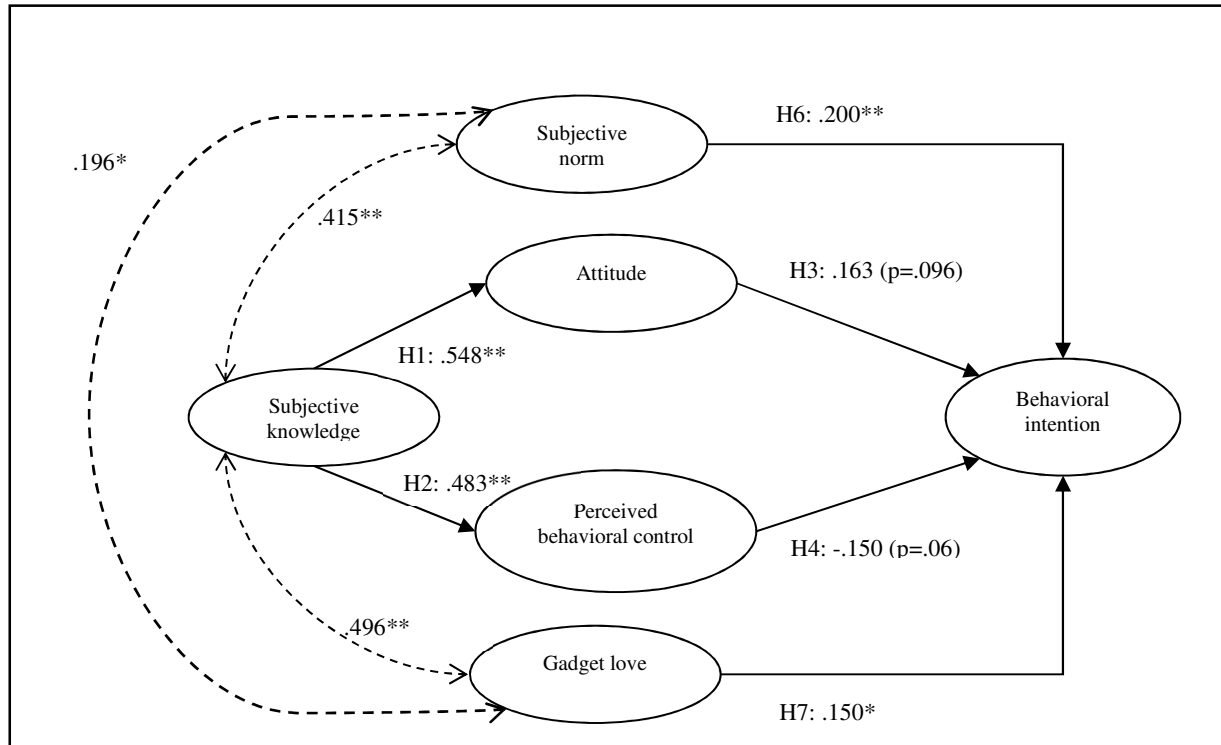
| | | | | |
|-----------------------------|------|--|---|--|
| SK3 | .883 | $\alpha=.83$; EV=75% | .84** | RMSEA=.0; CFI=1 $\chi^2=.95$; df=1; p=.329; χ^2/df =.95 |
| SK4 | .909 | KMO=.680 Bartlett: $\chi^2=454$; df=3; p<.001 | .90** | |
| Gadget love | | | | |
| GL1 | .830 | $\alpha=.86$; EV=65% | .81** | CR=.85; AVE=.54 RMSEA=.03; CFI=.998 $\chi^2=5.51$; df=4; p=.239; χ^2/df =1.38 |
| GL2 | .816 | KMO= .825 Bartlett: $\chi^2=852$; df=10; p<.001 | .67** | |
| GL3 | .833 | | .70** | |
| GL4 | .830 | | .81** | |
| GL5 | .708 | | .66** | |
| Behavioral intention | | | | |
| BI1 | .944 | $\alpha=.88$; EV=89% | Not available (2-item latent construct) | |
| BI2 | .944 | KMO= 0.5; $\chi^2=340$; p<.001 | | |

Note: EV: explained variance; CR=composite reliability; df: degree of freedom; AVE: average variance extracted.

3.2 Test of the research model

In the specified model, estimated with Amos software, the latent constructs of subjective knowledge and gadget love were correlated ($\beta=.495^{**}$; $p=.009$) as were gadget love and subjective norms ($\beta=.196^*$; $p=.013$), and subjective knowledge and subjective norm ($\beta=.415^{**}$; $p=.010$) (Figure 2). The research model, using covariance-based structural equation modelling, had a good fit: $\chi^2=378.6$, $\chi^2/df=2.12$, $p < .001$, RMSEA= .056, CFI=.945, SRMR=.0795).

Figure 1: Results for direct effects



Subjective knowledge positively influenced both attitude ($\lambda=.548^{**}$) and perceived behavioral control ($\lambda=.483^*$), giving support to H1 and H2 (Table 3). The effect of attitude on behavioral intention was not significant as well as the link between perceived behavioral control and the behavioral intention, leading to the rejection of H3 and H4. Both subjective norm and gadget love explained the intention to adopt NTP, giving support to H6 and H7.

Table 3: Test of the model

| | Paths | | Estimate | Lower | Upper | P |
|------------------------------------|-------|---------------------------|----------|-------|-------|------|
| Attitude (ATT) | ← | Subjective knowledge (SK) | .548** | .411 | .650 | .008 |
| Perceived behavioral control (PBC) | ← | SK | .483* | .359 | .582 | .012 |
| Behavioral intention (BI) | ← | ATT | .163 | .003 | .347 | .096 |
| BI | ← | Gadget love (GL) | .149* | .061 | .281 | .019 |
| BI | ← | Subjective norm (SN) | .200** | .084 | .305 | .007 |
| BI | ← | PBC | -.150 | -.288 | -.032 | .060 |
| SN5 | ← | SN | .709* | .635 | .768 | .015 |
| SN3 | ← | SN | .786* | .732 | .827 | .018 |
| SN2 | ← | SN | .770* | .702 | .831 | .014 |
| SN6 | ← | SN | .844* | .785 | .884 | .023 |
| ATT3 | ← | ATT | .761** | .677 | .834 | .007 |
| ATT2 | ← | ATT | .831* | .739 | .893 | .019 |
| ATT1-inv | ← | ATT | .515* | .369 | .619 | .019 |
| PBC3 | ← | PBC | .770* | .719 | .823 | .012 |
| PBC2 | ← | PBC | .748** | .687 | .813 | .007 |
| PBC1 | ← | PBC | .693* | .574 | .753 | .034 |
| PBC4 | ← | PBC | .797* | .720 | .876 | .013 |
| INTEN4 | ← | BI | .881* | .845 | .907 | .019 |
| INTEN3 | ← | BI | .889* | .842 | .918 | .020 |
| SK1 | ← | SK | .633* | .557 | .690 | .013 |
| SK4 | ← | SK | .878* | .842 | .910 | .012 |
| SK3 | ← | SK | .847* | .810 | .875 | .019 |
| GL5 | ← | GL | .659* | .570 | .723 | .014 |
| GL4 | ← | GL | .795* | .734 | .837 | .015 |

| | Paths | | Estimate | Lower | Upper | P |
|-----|-------|----|----------|-------|-------|------|
| GL3 | ← | GL | .700* | .625 | .761 | .013 |
| GL2 | ← | GL | .685* | .613 | .740 | .014 |
| GL1 | ← | GL | .820** | .765 | .871 | .009 |

Note: Lower/ Upper: lower/upper bound on the bias-corrected confidence interval.

3.3 Test for mediation

Hypotheses H5_a and H5_b assumed an indirect effect of subjective knowledge on the intention to adopt NTP. We used Process V3 for SPSS (model: 4) to test parallel multiple mediations. A bootstrap procedure based on 5,000 bootstrap samples provided confidence intervals and probabilities for direct, indirect and total effects of subjective knowledge on behavioral intention. The results revealed that the direct effect of subjective knowledge on the behavioral intention was significant and positive (Table 4). Contrary to expectations, the results gave no support for the indirect effects of subjective knowledge on intention to adopt NTP, through either attitude or perceived behavioral control, leading to the rejection of hypotheses H5_a and H5_b.

Table 4: Test of parallel mediations

| | β | Standard error | Lower | Upper | T-value |
|---------------------------------|---------|----------------|--------|-------|---------|
| Total effect | .199*** | .098 | .097 | .300 | 3.835 |
| Total indirect effect | .017 | .028 | -.038 | .072 | |
| M1 Attitude | .046 | .024 | -.0002 | .093 | |
| M2 Perceived behavioral control | -.029 | .027 | -.081 | .022 | |

Note: ***: $p < 001$

4. Discussion

Despite recent developments, much remains to be understood about smart connected product adoption by consumers. The current study aims to delve into different underlying determinants of intention to adopt smart connected products.

4.1 Theoretical contributions

The present study is one of the rare studies to add simultaneously cognitive and affective variables into the TPB framework. From a theoretical standpoint, our findings confirm that adding an emotional factor into the TPB framework to explain NTP adoption is relevant. The results also confirm that gadget love, an emotional attachment to NTP in general, positively

influences the intention to adopt a specific NTP (a personal tracker). Ajzen (1991) asserted that the individual's decision to perform a behavior is essentially a thoughtful action. Our study shows that, in the case of NTP, the decision to adopt a behavior is not just a thoughtful action. Decisions also rely on an emotional connection expressing the consumer's attachment to a category of product. This conclusion is congruent with other recent findings showing that brand love, another form of emotional attachment, influences the consumer's evaluation of NTP (Aboulnasr & Tran, 2020). Emotional attachment therefore plays an important role in the adoption of NTP. The role of emotional attachment turns out to be central at different stages of the consumer's decision-making process, from product evaluation through to the intention to adopt the product.

The role of subjective knowledge is more ambiguous. Although our findings support a strong effect of subjective knowledge on attitude and perceived behavioral control, they deny an indirect effect on behavioral intention. Our results rather conclude on a direct relationship between subjective knowledge and adoption intention. Several arguments could explain this unexpected result. First, the way subjective knowledge influences behavioral intention could be context dependent and vary according to the behavior under consideration. Li *et al.* (2018) concluded on an indirect effect for socially responsible behaviors. Our findings suggest that the effect is direct for smart connected products as was the case for risky financial behaviors (Xiao *et al.*, 2011). A second explanation could stem from the chosen conception of consumer knowledge. In our study we used the subjective facet of consumer's knowledge. Individuals are generally reluctant to acknowledge their ignorance on a given subject. Consumers' self-assessment of their knowledge of smart connected products could thus be overestimated. In the sample, the self-reported level of knowledge was above average (3.64 standard deviation: 1.01) and significantly higher ($t: 5.2, p < .01$) for men (3.99) than for women (3.44). This measurement bias could then lead to inconsistent results.

Two counterintuitive findings, the non-significant effects of both attitude and perceived behavioral control, require further discussion. First, Ajzen (1991: 188) asserted that: "the relative importance of attitude, subjective norm, and perceived behavioral control in the prediction of intention is expected to vary across behaviors and situations". Furthermore, in certain situations, only one variable of the TPB may be relevant (Ajzen, 1991). Second, the explanatory power of the TPB variables could evolve depending on whether the behavior under consideration is a first-time adoption (intention to use a product not yet used) or the intention to continue using a product already adopted. For first-time adopters, the opinion of friends and

family (subjective norm) may be a major factor predicting adoption, while the role of perceived control may be secondary. In contrast, when individuals are already using NTP, the role of the subjective norm may become secondary, whereas perceived control may become prominent. Previous research shows that the drivers of new technology adoption can change over time through increased knowledge of the technology once effectively adopted (Karahanna, Straub & Chervany, 1999). A recent study investigating the continuous intention to use personal trackers confirmed a significant effect of perceived behavioral control, but failed to validate the influence of the subjective norm (Jain, Sharma, & Singh, 2018).

Our findings do not challenge the relevance of the TPB model in general, however, they point to a context-specific relevance in terms of the variables that form this framework. The findings also highlight the interest of adding emotional and cognitive variables, because depending on the context, their explanatory power can counterbalance the weak explanatory power of some TPB variables.

4.2 Managerial contributions

The findings are of great interest to professionals, and particularly to those in charge of NTP development and marketing. One of the most important findings is that manufacturers and marketers need to position, develop and advertise smart connected products in a way that makes them emotionally appealing to consumers. Regarding the intention to adopt smart connected products, emotional factors outweigh rational ones including consumer knowledge and perceived control. Marketers who are in charge of the promotion of such products may feel reassured that accumulated knowledge about these technological products is not a prerequisite for their adoption by consumers. Subjective knowledge may improve the intention to adopt smart connected products, but there is another more easily accessible lever: the creation of an emotional link between the consumer and the connected product. Enabling the consumer to customize the appearance (different colors, materials, shapes) of personal trackers could make it easier to create such a link. Marketers also need to offer a genuine user experience to the consumer and adapt their messages to the consumer journey. Quite aside from the rational considerations, the first stage could engage the consumer in a shopping experience with an emotional dimension (by offering mass customization, for example). The second stage could emphasize the experience of owning the product while developing an emotional attachment with it. The objective is, over and above designing a personal tracker that generates pleasant emotions, then to position it as a product that an individual can love and that close friends will envy. Once the item purchased, allowing those who have bought it to share their experience via

Instagram, Facebook or TikTok would strengthen this emotional bond. This user-generated content will help convince reluctant consumers.

Furthermore, the direct influence of subjective knowledge on the intention to adopt a connected personal tracker should help marketers in their communication strategy. The greater the subjective knowledge, the greater the intention to adopt a personal tracker. Brand communication, advertising as well as brand-generated content, should strengthen the feeling that personal trackers are user-friendly. Communication can focus on practical features, such as personalized training programs, tracking and recording of individual performance. Brand communication should also highlight the relevance of personal trackers in everyday life. Since the subjective norm (the opinion of people who are important to the consumer) predicts the intention to adopt a personal tracker, the use of social network influencers seems to be particularly appropriate as a communication strategy. Asking a popular influencer to present the product, for example, can be effective in demonstrating its usefulness and ease of use. Marketers can also ask an influencer to highlight the possibility of encouraging a friend to reach a milestone (e.g., number of steps per day) and sharing the performance achieved in his/her friends' circle. In a recent study exploring the influence of advertising on the attitude toward using a connected watch, Baudier *et al.* (2021) confirm that social media advertising can influence brand-experience and induce an emotional response.

At a broader management level, the use of smart connected products in the workplace also raises questions. Research studies focusing on the adoption of information technologies in a professional context are still scarce (Bavaresco *et al.*, 2021). Since smart connected products are also invading the workplace (access badges, trackers, clothing, shoes that can control the weight carried, connected cushion that monitors posture, etc.), studying the rational and emotional acceptance factors is of managerial interest. Smart-connected products used in companies refers frequently to issues of safety at work (access control to buildings, security and technical management of buildings, preventive maintenance of machines, geolocation and monitoring of physical and physiological constants of employees in highly strenuous jobs, etc.). Yet some employees are reluctant to use them, as they also perceive them as an intrusion into their private lives and as constant surveillance. While intended to manage certain risks, they could generate new ones: vulnerability and leakage of confidential personal data, ethical risks on social relations between the employees and their employer, etc. The IoT deployment in the workplace needs to consider change management in order to facilitate their adoption.

4.3 Limitations and avenues for future research

Although the present study provides valuable insights and implications, they are subject to certain limitations. First, replication with a larger and more socio-demographically representative sample would allow testing for the interaction effects of individual characteristics such as age, gender, income, or education. Broadening the study of smart connected products acceptance in other contexts, such as the workplace, is another promising avenue.

Second, based on the features of smart connected products - they collect and share personal data - future research should consider users' concern for their privacy. Consumers today seek greater privacy protection (Hsu & Lin, 2016). "Balancing security and privacy in the digital workplace" is also a challenge for human resources managers (Miller & Wells, 2007). Privacy is an issue for an increasing number of NTP as they become more connected. In their quest for performance (market success, workers productivity, etc.), product developers, marketers, human resources managers need to know whether privacy concerns could hinder their adoption. In future studies, a brief document could describe the product functionalities (what the product can do), the nature of data the connected product can collect and transfer, the third parties to whom data could be transferred (developers, commercial partners, employer, etc.), and the user's capacity to control the sharing of collected data.

Lastly, the dependent variable in the present study is the intention to adopt smart connected products and not the effective usage. The literature has shown that the intention to perform a behavior does not systematically predict the adoption of that behavior (Friedmann & Bruller, 2018). The influence of certain variables, such as attitude and perceived control, could be more significant if the model included the effective use of NTP. However, as consumer surveys frequently rely on self-reporting, the risk of bias is high in terms of the sincerity of responses. In an internal company context, it would be easier to know how well employees are adopting professional smart connected products.

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Appendix: Measurement scales

Subjective norm (SN)

SN2. Most people who are important to me would think that using SCP* is a good idea.

SN3. Most people who are important to me would think I should use SCP.

SN5. My family who are important to me would think that using SCP is a good idea.

SN6. My family who are important to me would think I should use SCP.

*SCP: Smart Connected Products

Perceived behavioral control (PBC)

PBC1. I would be able to operate SCP.

PBC2. I have the resources to use SCP.

PBC3. I have the knowledge to use SCP.

PBC4. I have the ability to use SCP.

Attitude (ATT)

ATT1. I feel using SCP is a foolish idea (-).

ATT2. I feel using SCP is a good idea.

ATT3. I like to use SCP.

Behavioral intention (BI)

BI1. I intend to use a bracelet or a smart connected-watch collecting data on my physical activity (distance, steps...).

BI2. I intend to use a bracelet or a smart connected-watch collecting data on my health condition.

Gadget Love (GL)

GL1. Old or new, playing with technological products brings me a lot of enjoyment.

GL2. Some people find it irritating, but I enjoy figuring out how to get technological goods and services to work.

GL3. Even if they aren't the newest things on the market, learning how to operate technological products is interesting to me.

GL4. Despite their age, I love to play around with technological gadgets.

GL5. If I was alone for several hours, I could entertain myself easily if I had lots of gadgets to play with.

GL6. It is easy for me to spend a lot of time playing around with almost any kind of technological devices.*

GL7. Others may not understand it, but it's kind of a thrill to play with products that have high-tech components.*

Subjective knowledge (SK)

SK1. According to you, which is your level of knowledge of SCPs?

SK2. Compared with an average individual, would you say that your level of knowledge on SCP is...*

SK3. SCPs are familiar to me.

SK4. I know very well SCPs.

* *Items discarded from analyses*