Do millennials' personalities and smartphone use result in materialism? The mediating role of addiction

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Do millennials' personalities and smartphone use result in materialism? The mediating role of addiction

Christine Nya-Ling Tan

Abstract

Purpose – *This paper aims to use the five-factor model's (FFM: emotional instability, introversion, openness to experience, agreeableness and conscientiousness) personality traits and the need for arousal to explain millennials' habitual and addictive smartphone use and resultant materialistic inclinations. The study also test the mediating role of addictive use in the relationship between habitual use and materialism.*

Design/methodology/approach – *Participants' self-reported data (*n *= 705) from a sample of millennials were gathered using a cross-sectional survey approach conducted in Malaysia and studied using structural equation modelling with partial least squares (PLS-SEM).*

Findings – *The results discover that emotional instability, openness to experience, agreeableness and need for arousal have a significant influence on habitual smartphone use. Conversely, introversion and conscientiousness have no significant impact on habitual use. Fascinatingly, millennials' habitual use positively influences their materialism. Furthermore, addictive smartphone use positively affects materialism and mediates the relationship between habitual use and materialism.*

Originality/value – *The FFM, a prominent personality trait model, has been used in numerous studies to predict usage intention. However, the particular dimension of the FFM personality traits that drive habitual and addictive smartphone use to trigger materialistic tendencies among millennials needs to be exposed in an emerging market context. The results emphasise the need to consider this demographic's personalities when attempting to comprehend how habitual use and materialism occur. This study also provides practitioners with helpful information in creating targeted interventions to encourage healthy smartphone use behaviours and reduce possible adverse effects related to addictive smartphone use and materialistic attitudes.*

Keywords *Five-factor model, Materialism, Habitual use, Addictive use, Smartphones, Millennials*

Paper type *Research paper*

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1. Introduction

The emergence of digital technology, especially smartphones, has fundamentally altered how humans interact, communicate and connect with their surroundings. Millennials, known as the "iGen" generation – born between 1981 and 1996 (The Edge Markets, 2019), have been the forerunners of this digital revolution, adopting smartphones as an essential part of everyday life. Yet, this age group's increased use of such devices has prompted worries that such technologies may harm their behaviour and materialistic impulses, which resulted in diminished well-being, unstable finances, strained interpersonal ties, proneness to depression and experiencing little life happiness (Darrat *et al.*, 2023; Geng *et al.*, 2023; Pangestu and Karnadi, 2020; Pupelis and Šeinauskienė, 2023; Saini and Yadav, 2023).

For both scholars and practitioners, "materialism" – which is the notion that material possessions are essential in one's life (Richins and Dawson, 1992) – has garnered a

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great deal of interest and attention as it is imperative to have a greater awareness of the contributing factors that lead to and maintain these individuals' worldly inclinations. Also, it is found that millennials with a high level of materialism, who are frequently referred to as "materialistic", think that material possessions are essential in forming their identity and way of life (Belk, 1985). Thus, this view has formed the basis of their perceptions of what they seek in life (Lučić *et al.*, 2021). Henceforth, materialism will ultimately impact millennials' post-purchase satisfaction and how they see and assess merchandise (Richins, 2004) comprising luxurious goods (Rindfleisch *et al.*, 2009). Moreover, materialism has been linked to several detrimental effects, including reduced subjective well-being (Kasser *et al.*, 2014), life satisfaction (Tsang, 2002), financial instability (Chatterjee *et al.*, 2019) and tense interpersonal interactions (Shrum *et al.*, 2014).

Compared to earlier generations, millennials display distinctive traits and characteristics that make them unique from their predecessors as they were raised during rapid technological development, globalisation and shifting societal values. Likewise, technological advances, including smartphones, have become integral to millennials' lives as they have grown up in the digital age. In Festinger's (1954) social comparison theory (SCT), the author describes the connection between media use and materialism, pointing out that users often make self-comparisons with the "idealised images portrayed" in media. Millennials looked to friends, celebrities and companies on social media platforms for advice on fashion choices (Ruane and Wallace, 2013). Using this information, they decide what to buy and how to show themselves in the best possible light on social media sites (Chu *et al.*, 2016). With this, the constant access to their smartphones and the urge to compare might result in more millennials using social media as it gives them access to similar friends and others. Therefore, materialism results from millennials' inclination to measure themselves against others using their smartphones' social media apps (Chu *et al.*, 2016).

Moreover, based on research conducted by Otero-López and Villardefrancos (2013), certain personality qualities, such as extraversion and neuroticism, may be linked to dispositions towards materialism. For instance, those with high extraversion may be more likely to seek social approval through material items. In contrast, people with high neuroticism may look to material belongings to cope with their bad feelings. While these personality characteristics may not be the primary causes of materialism, they can influence how it manifests. Unfortunately, there is little grasp of millennials' materialistic inclinations based on their personality traits, desires and smartphone use (Long *et al.*, 2021). Therefore, this research proposes and empirically tests the five-factor model (FFM) on smartphone use to comprehensively understand millennials' propensity towards materialism. Thus, this research thoroughly created a model (Figure 1) to examine the predictors of habitual smartphone use by probing the FFM personality traits and the need for arousal to foster materialistic tendencies among millennials. Moreover, this study will explore the mediating effect of millennials' addictive smartphone use. As a result, the following three questions will be addressed explicitly in this study:

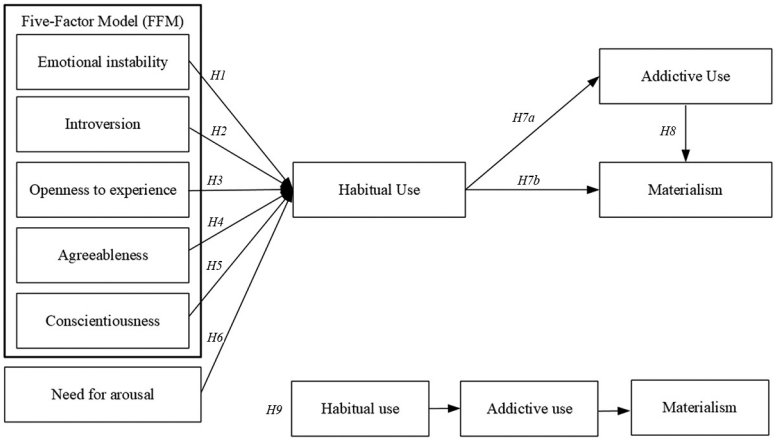
RQ1. Do the FFM personality traits (emotional instability, introversion, openness to experience, agreeableness and conscientiousness) and need for arousal influence millennials' habitual smartphone use?

RQ2. Does habitual smartphone use influence millennials' materialism?

RQ3. Does addictive smartphone use mediate the relationship between habitual use and millennials' materialism?

This study is organised as follows: The FFM model with the creation of the hypotheses is explained in Section 2. The methodology is justified in Section 3. The process of data analysis is presented in Section 4. The theoretical contributions and practical implications

Figure 1 Research model



Source: Author's own work

are described in Sections 5 and 6. Lastly, the final section discussed the limitations and potential future study directions.

2. Literature review

2.1 The Five-Factor model

The five-factor model, commonly identified as the Big Five, is a prominent set of five personality qualities that depicts the many facets of human personality (Digman, 1990; Goldberg, 1993), such as emotional instability, introversion, openness to experience, agreeableness and conscientiousness. This framework defines a person's characteristics that reliably set them apart from one another based on their fundamental propensities to think, feel and act in particular ways (Ones, 2005). Although some studies have explored how the FFM relate to materialism, the focus has primarily been on materialism among consumers (Kaur and Anand, 2018; Lučić *et al.*, 2021; Tarka and Harnish, 2023). Till now, the relationship between personality and materialism has been tested but not with the mediating effects of habitual and addictive smartphone use. By investigating Malaysian millennials in this context, this research can show how these variables interact with materialism, smartphone use and consumers' personality traits and behaviours in reaction to Malaysia's economic shifts.

2.1.1 Emotional instability. Individuals with high levels of emotional instability will use their smartphones as a coping technique for emotional control (Fortes *et al.*, 2021). Subsequently, smartphone use among millennials will become habitual because it offers an escape or diversion from unpleasant feelings by allowing them to engage in activities that bring about positive emotions through a sense of belonging (Park and Park, 2014), as well as the acceptance from others (Fortes *et al.*, 2021) that these devices provide. Quite often, these individuals are more likely to feel bad when they are away from their smartphones, which might increase their dependence on and connection to them (Gao *et al.*, 2022), consequently encouraging habitual use. Therefore, emotional instability is expected to have a favourable, solid impact on habitual use among millennials, which leads to the formulation of the following hypothesis:

H1. Emotional instability has a significant positive influence on millennials' habitual smartphone use.

2.1.2 Introversion. Introverted individuals prefer quiet pursuits and may feel more at ease in online social settings (Cain, 2012). These days, smartphones provide a simple opportunity for introverts, including millennials, to engage in social activities and fulfil their need for connection without coping with the challenges of face-to-face interactions (Turel and Serenko, 2010). With smartphones, this demographic group can manage social interactions, join online communities and freely express themselves. Subsequently, they boost habitual smartphone use as they navigate social situations, find comfort and engage in activities that meet their likes and needs. Hence, in this study, it is postulated that:

H2. Introversion has a significant positive influence on millennials' habitual smartphone use.

2.1.3 Openness to experience. As discovered by McCrae (1996), individuals open to new experiences are more likely to be curious and courageous and are exposed to a wide range of concepts, emotions and activities. Undoubtedly, smartphones can offer millennials access to creating new opportunities for self-expression, exploration and creativity (Erdem and Uzun, 2022; Sfeir *et al.*, 2023). Furthermore, past studies have shown that smartphones offer a platform for self-expression, for instance, via social media, that encourages self-actualisation and personal growth connected to openness (Livingstone, 2008; Talbot and Briggs, 2022; Voss *et al.*, 2023). As such, an increase in openness to experience will likely increase millennials' habitual smartphone use as they seek out and embrace these opportunities provided by their devices (Tovar *et al.*, 2023). As a result, the following proposition was developed:

H3. Openness to experience has a significant positive influence on millennials' habitual smartphone use.

2.1.4 Agreeableness. One of the FFM's personality traits, agreeableness, is characterised by an individual's friendliness, cooperation and desire to maintain strong social bonds (Graziano and Eisenberg, 1997). As smartphones are prevalent as a social engagement and communication tool, this technology has made it easier for outgoing and gregarious millennials to communicate with their loved ones and connect with others (Hillyer, 2021). Seemingly, this age group are more inclined to use social media and smartphone messaging apps by promptly responding to communications to foster a positive social atmosphere (Kircaburun *et al.*, 2020), which enables them to encourage, support and empathise with others, consistent with their prosocial tendencies (Shrum *et al.*, 2014). Therefore, it has been found that an increase in agreeableness is anticipated to lead to a rise in habitual smartphone use as millennials with pleasant personalities value social connections and use smartphones to develop and preserve beneficial relationships (Chang *et al.*, 2016). Consequently, a hypothesis was created as below:

H4. Agreeableness have a significant positive influence on millennials' habitual smartphone use.

2.1.5 Conscientious. Conscientious individuals exhibit self-control, organisation and a goal-oriented mindset (Digman, 1990), and they typically desire to succeed and accomplish goals in their jobs, studies and other areas (Javaras *et al.*, 2019). Because highly conscientious individuals, particularly millennials, frequently use their smartphones to boost productivity and manage and facilitate their tasks effectively, they rely on their phones, which consist of ample productivity and task management apps to assist them in being more efficient and prolific in performing their duties. In addition, as self-regulatory behaviour among millennials is more prevalent among conscientious millennials (Ferreira, 2018), they tend to use tools for habit tracking, goal setting and time management to ensure they follow through on their commitments (Azar *et al.*, 2013). Subsequently, these individuals with conscientious personalities aim to optimise productivity and incorporate smartphone use

into their organised and goal-driven existence. Thus, an increase in conscientiousness among millennials is likely to increase ingrained habitual smartphone use. With this, the following proposition is put forth:

H5. Conscientious has a significant positive on millennials' habitual smartphone use.

2.2 Need for arousal

This term refers to a person's desire for spur and excitement (Mowen and Spears, 1999). Smartphones' capacity to excite, supply novelty and stimulate the senses allows those with solid arousal desires to maintain optimal arousal levels (Zuckerman, 2015). Evidently, smartphones provide a variety of interactive features, including social networking sites, gaming apps and multimedia content (Throuvala *et al.*, 2019) that can satiate the needs and provide the necessary stimulation to millennials (David *et al.*, 2015). Furthermore, these devices offer them access to a virtual world where they may escape the monotony of everyday life and partake in fun and pleasurable activities (Wang *et al.*, 2014). Due to this, millennials with strong desires for arousal are likelier to practise habitual smartphone use to quench their needs for excitement. Therefore, this study posits the following hypothesis:

H6. Need for arousal has a significant positive influence on millennials' habitual smartphone use.

2.3 Habitual smartphone use and addictive smartphone use

Habitual smartphone use is the regular, automatic use of smartphones motivated by situational cues and environmental triggers, including a strong impulse to check their smartphones unintentionally. In fact, using a smartphone for quick gratification activities like social media scrolling or gaming can trigger the brain to release dopamine through operant conditioning, rewarding the behaviour and making the individual continue using it more (Flayelle *et al.*, 2023). Without conscious thought, these habits or behavioural acts can have dire repercussions (LaRose *et al.*, 2003; Wood and Neal, 2007) on the individuals' performance, physical, psychological, social and other facets of life (Tan *et al.*, 2022). These actions may foster smartphone addiction due to the fear of losing out, social comparison and the need for approval via likes and comments (Brailovskaia *et al.*, 2020), gradually raising how frequently and intensely millennials use their smartphones, leading to addictive smartphone use. Such excessive engagement and reinforcing processes of frequent smartphone use would lead to increased addictive use. Therefore, in this study, it is hypothesised that:

H7a. Habitual smartphone use has a significant positive influence on millennials' addictive smartphone use.

2.4 Habitual smartphone use and materialism

It is essential to recognise that while materialism refers to the value millennials place on owning and acquiring material riches, belongings, appearance and prestige (Inseng Duh *et al.*, 2021), habitual smartphone use refers to individuals' usage patterns and actions related to their smartphones (Servidio, 2021). This understanding is crucial when examining how smartphone habits affect materialism as, by reviewing this correlation, this study can better understand the effects of millennials' tendencies towards materialism. Due to the growing use of smartphones, millennials are exposed to various social media posts and advertisements that promote materialism and consumption (Chu *et al.*, 2013; Dinh and Lee, 2022; Duan and Dholakia, 2015). Such smartphones' accessibility and ease make it easier for millennials to engage in impulsive purchases

and online shopping, which feeds more materialistic desires (Djafarova and Bowes, 2021; Thomas *et al.*, 2020). As a result of continually being exposed to images of desirable items and lifestyles, they may desire possessions and feel that owning material things is necessary for happiness and self-worth (Lee and Ahn, 2016; Segev *et al.*, 2015). Furthermore, a common smartphone habit among millennials is to use social media platforms and apps for social comparison, where they judge one another's possessions and achievements (Sharma *et al.*, 2022). Several researchers (Kim *et al.*, 2021; Ruan *et al.*, 2023; Yurchisin and Johnson, 2004) highlighted that this would encourage materialistic desires as they compare themselves to others to gain social approval and reputation. The distinction between online and offline identities may be blurred due to widespread smartphone use, making tangible assets necessary for maintaining one's image and self-presentation (Bischoff *et al.*, 2019). As smartphone use among millennials increases, their self-worth and the material possessions that smartphones represent and flaunt enhance their propensity for materialism. Hence, these factors might affect millennials' desire for material items and reinforce their materialistic beliefs (Lee *et al.*, 2014). As a result, this study hypothesised that:

H7b. Habitual smartphone use has a significant positive influence on millennials' materialism.

2.5 Addictive smartphone use and materialism

Addictive use, according to O'Guinn and Faber (1989), is caused by an uncontrollable urge or desire to obtain, use or experience a feeling, drug, or activity. This urge or desire drives individuals to engage in acts that will eventually cause them harm (Hirschman, 1980). Due to the potential that using smartphones excessively and compulsively is a tactic for acquiring fulfilment and social acceptance through material objects, millennials who struggle with smartphone addiction may rely on their devices for social connection and self-esteem boosting (Koç and Turan, 2021; Yuchang *et al.*, 2017). It is found that millennials who spend more time on virtual exchanges and online platforms tend to be exposed to many materialistic messages, including advertisements and product placements, that would encourage the notion that possessing material items makes them happy (Chu *et al.*, 2016). Addictive smartphone use can encourage impulsive buying and fuel materialistic impulses, as millennials seek immediate pleasure and excitement through online shopping (Agrawal, 2023) by seeking acceptance and happiness through material possessions. Accordingly, it is hypothesised that:

H8. Addictive smartphone use has a significant positive influence on millennials' materialism.

2.6 Addictive smartphone use: a mediator

Millennials who unconsciously and regularly use their smartphones are more prone to exhibit addictive traits, promoting the adoption of materialistic beliefs and practices (Lee *et al.*, 2018). As millennials become increasingly dependent on their smartphones and engage in addictive use, such as excessive checking, social media browsing and online shopping (Derks *et al.*, 2015), they are more likely to have heightened materialistic urges (Handa and Ahuja, 2020). In this study, addictive smartphone use mediates the association between habitual smartphone use and materialism because it strengthens millennials' habitual use of smartphones and promotes materialistic beliefs and actions. As a result, the following hypothesis has been put forth:

H9. Addictive smartphone use mediates the relationship between habitual smartphone use and materialism.

Figure 1 depicts the research model of this study.

3. Methodology

3.1 Sampling procedure

A cross-sectional quantitative research methodology was used to achieve the research objective of the current study. Data gathered involved a self-administered survey questionnaire, which was disseminated in Malaysia to millennials using an online questionnaire survey; the link was shared on several social media sites and forums to collect sufficient information. Malaysian millennials were chosen as the targeted population as they demonstrate certain personality traits and behaviours that may impact their smartphone use and propensity to materialism (Mun *et al.*, 2017). These millennials may have unique cultural and societal factors influencing their personality traits and smartphone usage patterns. Malaysian millennials are part of a global trend of increasing smartphone use as they are likely to be heavy smartphone users (A-Qader *et al.*, 2016). Understanding their behaviour can provide insights into the broader impact of technology on society. The respondents had to be Malaysian citizens between the ages of 27 and 42 (i.e. millennials), whereby the purposive sampling approach was employed to guarantee that survey respondents provided accurate responses. To eliminate participants who were ineligible, two filter questions were added to the questionnaire at the outset: firstly, the respondents had used their smartphones for purchasing in the previous six months; secondly, the participants would need to state the name of the app they had used to shop within the past six months. Thus, those who did not fulfil the two prerequisites cannot continue answering the questionnaire. All the data will be anonymous, and their replies will be treated as private and confidential to prevent social desirability bias.

A total of 717 replies were gathered, and 12 straight-lining responses were eliminated using the case-by-case procedure. Of the 705 still valid responses, the majority (65.5%) of respondents were females between the ages of 27 and 30 (53.6%) from Chinese ethnicity (45.7%), with 82.8% having mobile data plans. A majority of them (32.1%) subscribed to Hotlink (Maxis) as their mobile network operator, spending 1 to 5 h a day (43.3%) and checking their email several times a week (26.8%). At the same time, a majority of them spent several times a day using search engines (66.1%), social network sites (69.9%), chat/instant messaging (85.7%) and video streaming (46.5%). As for online shopping, 33% spent less than once a week compared to online gaming, with 37% not keen on doing so (Table 1).

3.2 Measures

This study adapted previously used scales that had been validated to guarantee the validity of the used constructs. As a result, a panel of five people pre-tested the survey and minor adjustments were made in response to the feedback received. Before the actual survey, a pilot test involving 30 smartphone users was carried out. Table 2 consists of a comprehensive list of the constructs, items and sources that have been adapted for this study. Respondents were asked to rate their agreement or disagreement with the statements on a seven-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree).

4. Data analysis

4.1 Common method bias

When data are gathered using the same technique at a particular point in time, common method bias (CMB) can be a problem of concern as it may exaggerate estimates of the associations between two constructs, which can induce bias in the estimations between

Table 1 Respondent profile

Category	*Item*	*Frequency (n = 705)*	*%*
Gender	Male	243	34.5
	Female	462	65.5
Age	27 to 30	378	53.6
	31 to 34	116	16.5
	35 to 38	129	18.3
	39 to 42	82	11.6
Ethnicity	Malay	266	37.7
	Chinese	322	45.7
	Indians	72	10.2
	Others	45	6.4
Do you have a mobile (data) plan?	Yes	584	82.8
	No	121	17.2
Currently, which mobile network operator are you subscribing to?	Hotlink (maxis)	226	32.1
	Digi	185	26.2
	Yes	9	1.3
	Celcom	162	23.0
	U mobile	79	11.2
	Unifi mobile	4	0.6
	Others	40	5.7
Generally, how much time do you spend on your smartphone in a day?	Less than 1 h	23	3.3
	1–5 h	305	43.3
	6–10 h	190	27.0
	11–15 h	100	14.2
	16–20 h	54	7.7
	More than 20 h	33	4.7
How often do you use email (e.g. Gmail)?	Not at all	25	3.5
	Less than once a week	86	12.2
	Once a week	102	14.5
	Several times a week	189	26.8
	Once a day	139	19.7
	Several times a day	164	23.3
How often do you use search engines (e.g. Google)?	Not at all	9	1.3
	Less than once a week	23	3.3
	Once a week	22	3.1
	Several times a week	106	15.0
	Once a day	79	11.2
	Several times a day	466	66.1
How often do you use social network sites (e.g. Facebook)?	Not at all	38	5.4
	Less than once a week	30	4.3
	Once a week	21	3.0
	Several times a week	51	7.2
	Once a day	72	10.2
	Several times a day	493	69.9
How often do you use chat/instant messaging (e.g. WhatsApp, WeChat)?	Not at all	4	0.6
	Less than once a week	24	3.4
	Once a week	13	1.8
	Several times a week	31	4.4
	Once a day	29	4.1
	Several times a day	604	85.7
How often do you use video streaming (e.g. YouTube)?	Not at all	70	9.9
	Less than once a week	62	8.8
	Once a week	29	4.1
	Several times a week	130	18.4
	Once a day	86	12.2
	Several times a day	328	46.5
How often do you use online shopping?	Not at all	198	28.1
	Less than once a week	233	33.0

(*continued*)

Table 1

Category	*Item*	*Frequency (n = 705)*	*%*
How often do you use online gaming?	Once a week	76	10.8
	Several times a week	94	13.3
	Once a day	44	6.2
	Several times a day	60	8.5
	Not at all	261	37.0
	Less than once a week	102	14.5
	Once a week	56	7.9
	Several times a week	96	13.6
	Once a day	56	7.9
	Several times a day	134	19.0

Source: Author's own work

variables, producing incorrect findings (MacKenzie and Podsakoff, 2012). Therefore, it is crucial to determine whether CMB poses a substantial threat to the reliability of this study's findings. First, the full-collinearity test was conducted, which calls for regressing a dummy dependent variable created using random numbers on the independent and dependent variables in this study (Kock, 2015). The findings indicated no indication of CMB as none of the variance inflated factor (VIF) values exceeded the advised value of 5, ideally 3.3 (Kock and Hadaya, 2018). Thus, it may be concluded that the CMB had no detrimental impact on the outcomes of this study.

4.2 Measurement model

Hair *et al.* (2019) assert that reliability, convergent validity and discriminant validity should be used to assess the measurement model's quality. Table 3 shows no reliability problem, as shown by Cronbach's alpha and composite reliability values, which were all higher than the advised value of 0.7 (Benitez *et al.*, 2020). The average variance extracted (AVE) and factor loadings were then used to evaluate convergent validity. All factor loadings and all AVEs were more than 0.6 and 0.5, respectively, as shown in Table 3. Chew *et al.* (2019) indicated that values of the variables in factor loading that are less than 0.6 should be avoided, while values over 0.6 are acceptable. Four items (i.e. INT2, INT3, INT4 and OIE1) were eliminated due to their low outer loading (below 0.6). Thus, convergent validity was reached. This research applied the Heterotrait–Monotrait ratio (HTMT) criteria to determine discriminant validity based on the multitrait-multimethod matrix, as the Fornell–Larcker criterion is not a reliable way to identify the absence of discriminant validity (Henseler *et al.*, 2015). Subsequently, all the HTMT ratio values were much below the cutoff of 0.85, and the confidence intervals were not more than 1, as indicated in Table 4 (Henseler *et al.*, 2015), indicating that discriminant validity was not an issue.

4.3 Structural model

After inspecting the measurement model's validity and reliability, the structural model's evaluation was examined, examining the hypothesised relationships. The VIF values were checked to ensure no multicollinearity concerns before evaluating the importance of the theoretical impacts (Benitez *et al.*, 2020). The findings showed that none of the VIF values exceeded the crucial limit of 5, as critical collinearity concerns among the indicators of formatively measured constructs are indicated by VIF values of 5 or above (Hair *et al.*, 2019). The significance of path coefficients was then tested using a bootstrapping approach with 10,000 re-samples (Streukens and Leroi-Werelds, 2016). Table 5 displays

Table 2 Constructs, items and sources

Construct	*Item*	*Source*
Emotional instability	EMI1: I am moody more than others	Mowen (2000)
	EMI2: I am temperamental	
	EMI3: I am touchy	
	EMI4: My emotions go way up and down	
	EMI5: I am testy more than others	
Introversion	INT1: I prefer to be alone rather than in a large group	Mowen (2000)
	INT2: I am shy	
	INT3: I am quiet when with people	
	INT4: I am bashful when with people	
Openness to experience	OIE1: I frequently feel highly creative	Mowen (2000)
	OIE2: I am imaginative	
	OIE3: I am more original than others	
Agreeableness	AGR1: I am kind to others	Mowen (2000)
	AGR2: I am tender-hearted with others	
	AGR3: I am sympatheti	
Conscientious	CON1: I am orderly	Mowen (2000)
	CON2: I am precise	
	CON3: I am organized	
	CON4: I am efficient	
Need for arousal	NFA1: I am drawn to experiences with an element of danger	Mowen (2000)
	NFA2: I like the new and different more than the tried and true	
	NFA3: I seek an adrenaline rush	
	NFA4: I enjoy taking risks more than others	
Habitual use	HAU1: Smartphone usage is part of my daily routines	Limayem *et al.* (2003)
	HAU2: Checking my smartphone is becoming a habit	
	HAU3: I use my smartphone automatically	
	HAU4: It's a habit to use my smartphone	
	HAU5: My smartphone is part of my life	
	HAU6: When I need to complete a certain task, I will use my smartphone since it is an obvious choice	
Addictive use	ADU1: I get agitated when my smartphone is not in sight	Roberts *et al.* (2014)
	ADU2: I get nervous when my phone's battery is almost exhausted	
	ADU3: I spend more time than I should on my smartphone	
	ADU4: I find that I am spending more and more time on my smartphone	
Materialism	MAT1: I enjoy buying expensive things	Mowen (2000)
	MAT2: I enjoy owning luxurious things	
	MAT3: Acquiring valuable things is important to me	
	MAT4: I like to own nice things more than most people	
	MAT5: Possessions are important to my happiness	

Source: Author's own work

the complete findings of the structural model. It was discovered that emotional instability ($\beta = 0.147$, $p < 0.001$) strongly influences habits, supporting *H1*. Moreover, the effect of openness to experience ($\beta = -0.089$, $p < 0.05$), agreeableness ($\beta = 0.161$, $p < 0.001$) and need for arousal ($\beta = 0.081$, $p < 0.05$) have a significant influence on habits; thus, *H3*, *H4* and *H6* were supported. However, introversion ($\beta = 0.021$, $p < 0.05$) and conscientiousness ($\beta = 0.036$, $p < 0.05$) were found to have no significant effect on habits; hence *H2* and *H5* were not supported. Next, both *H7a* and *H7b* are supported, i.e. habits have significant positive influences on addictive use ($\beta = 0.559$, $p < 0.001$) and materialism ($\beta = 0.106$, $p < 0.05$). Habits are indicated to have the most substantial positive influence on addictive use compared to materialism. Lastly, it is found that addictive use ($\beta = 0.176$, $p < 0.001$) has a strong positive effect on materialism, thus supporting *H8*. Also included in Table 5 are the effect sizes (f^2) for each path coefficient. The bias-corrected confidence intervals of the indirect effect were evaluated (LB: 0.051; UB: 0.142) (Nitzl *et al.*, 2016) to

Table 3 Measurement model

Construct	*Item*	*Loading*	*Cronbach's alpha*	*Composite reliability*	*Average variance extracted (AVE)*
Emotional instability	EMI1	0.763	0.834	0.865	0.593
	EMI2	0.687			
	EMI3	0.782			
	EMI4	0.846			
	EMI5	0.763			
Introversion	INT1	1.000	–	–	–
Openness to experience	OIE2	0.817	0.709	0.810	0.766
	OIE3	0.930			
Agreeableness	AGR1	0.836	0.850	0.873	0.767
	AGR2	0.839			
	AGR3	0.908			
Conscientious	CON1	0.615	0.824	0.91	0.651
	CON2	0.807			
	CON3	0.870			
	CON4	0.803			
Need for arousal	NFA1	0.717	0.833	0.860	0.642
	NFA2	0.810			
	NFA3	0.892			
	NFA4	0.892			
Habitual use	HAU1	0.910	0.919	0.923	0.717
	HAU2	0.851			
	HAU3	0.708			
	HAU4	0.798			
	HAU5	0.802			
	HAU6	0.883			
Addictive use	ADU1	0.875	0.861	0.867	0.706
	ADU2	0.747			
	ADU3	0.817			
	ADU4	0.799			
Materialism	MAT1	0.836	0.845	0.855	0.618
	MAT2	0.726			
	MAT3	0.763			
	MAT4	0.687			
	MAT5	0.782			

Note: Items INT2, INT3, INT4 and OIE1 were deleted
Source: Author's own work

determine the mediating effect of addictive use. Neither value (LB or UB) crossed the zero line (Table 6). Consequently, it may be said that *H9* was supported.

In addition, the results for the coefficient of determination (R^2) for addictive use, habits and materialism ranged between 0.063 and 0.313 (Table 7), indicating substantial, moderate or weak in-sample explanatory power (Cohen, 1988). Using the PLSpredict method, the model's out-of-sample explanatory power was also evaluated (Shmueli *et al.*, 2019). A Q^2 predict value larger than zero shows the PLS-path model has predictive significance. The Q^2 value in PLSpredict evaluates the prediction errors of the PLS-path model against simple mean predictions. According to the findings, addictive use, habits and materialism had Q^2 predicted values of 0.041, 0.044 and 0.032 (Table 7), which were higher than zero. Next, the prediction errors produced by the PLS-SEM and linear regression models (LM) were contrasted. As shown in Table 7, except for ADU4, MAT1, MAT2, MAT3, MAT4 and MAT5, both the RMSE and MAE values of the majority indicators of creation in the PLS-path model were smaller than in the linear regression model, implying medium predictive power.

Table 4 HTMT

Construct	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1. Addictive use									
2. Agreeableness	0.119 [0.052, 0.195]								
3. Conscientious	0.079 [0.040, 0.109]	0.570 [0.500, 0.632]							
4. Emotional instability	0.282 [0.208, 0.353]	0.137 [0.078, 0.204]	0.109 [0.060, 0.175]						
5. Habits	0.625 [0.572, 0.673]	0.202 [0.127, 0.280]	0.130 [0.068, 0.202]	0.177 [0.113, 0.245]					
6. Introversion	0.100 [0.038, 0.167]	0.052 [0.017, 0.115]	0.074 [0.030, 0.144]	0.315 [0.246, 0.378]	0.069 [0.023, 0.133]				
7. Materialism	0.275 [0.200, 0.347]	0.231 [0.152, 0.309]	0.284 [0.203, 0.364]	0.274 [0.199, 0.350]	0.230 [0.159, 0.298]	0.189 [0.118, 0.259]			
8. Need for arousal	0.074 [0.038, 0.114]	0.392 [0.310, 0.466]	0.367 [0.288, 0.444]	0.176 [0.117, 0.233]	0.122 [0.068, 0.182]	0.119 [0.052, 0.192]	0.431 [0.360, 0.500]		
9. Openness to experience	0.060 [0.022, 0.078]	0.573 [0.498, 0.640]	0.466 [0.382, 0.540]	0.254 [0.160, 0.342]	0.073 [0.036, 0.117]	0.207 [0.124, 0.288]	0.310 [0.216, 0.395]	0.567 [0.493, 0.637]	

Source: Author's own work

Table 5 Structural model

Hypothesis		Path coefficient	Standard error	t-value	BCCI [5%, 95%]	p-value	Effect size (f^2)	Decision
H1	Emotional instability → Habitual use	0.147	0.036	4.070	[0.084, 0.203]	0.000	0.021	Supported
H2	Introversion → Habitual use	0.021	0.040	0.537	[0.039, 0.091]	0.295	0.000	Not supported
H3	Openness to experience → Habitual use	0.089	0.048	1.836	[0.186, 0.028]	0.033	0.006	Supported
H4	Agreeableness → Habitual use	0.161	0.051	3.187	[0.081, 0.254]	0.001	0.019	Supported
H5	Conscientious → Habitual use	0.036	0.044	0.807	[0.040, 0.103]	0.210	0.001	Not supported
H6	Need for arousal → Habitual use	0.081	0.042	1.907	[0.010, 0.140]	0.028	0.006	Supported
H7a	Habitual use → Addictive use	0.559	0.028	19.961	[0.509, 0.602]	0.000	0.455	Supported
H7b	Habitual use → Materialism	0.106	0.047	2.278	[0.029, 0.181]	0.011	0.008	Supported
H8	Addictive use → Materialism	0.176	0.048	3.703	[0.092, 0.249]	0.000	0.023	Supported

Source: Author's own work

Table 6 Mediating effects

	Hypothesis	Indirect effect	BCCI [5%, 95%]	Standard error	t-value	p-value	Decision
H9	Habitual use → Addictive use → Materialism	0.095	[0.051, 0.142]	0.098	3.532	0.000	Supported

Source: Author's own work

5. Discussion

5.1 Theoretical implications

This study use the FFM's personality traits and the need for arousal to determine millennials' habitual smartphone use in fostering their materialistic tendencies, which is essential for expanding theoretical knowledge and practical applications. It discovered that *H1* is consistent with past researchers (Fortes *et al.*, 2021; Gao *et al.*, 2022; Park and Park, 2014) who suggest that Malaysian millennials, who experience unpleasant emotional states like tension and anxiety, use their smartphones more frequently to escape, find comfort or reduce emotions of isolation or distress. It highlights that Millennials, enduring unfavourable feelings and heavily relying on their phones, have unfortunately established a habitual loop of behaviour as they rely heavily on their phones for uplifting activities, such as socialising and entertainment.

The statistical analysis results, however, did not support *H2*, indicating that introversion does not significantly influence habitual smartphone use. A conceivable justification is that introverted millennials often prefer isolation, reflection and less stimulus from the outside world (Hazari and Sethna, 2023). This generation may use smartphones less frequently due to their natural propensity for low levels of social involvement. Moreover, they use their devices for specific purposes like remaining informed, finishing tasks or having one-on-one conversations less likely to be extensive (Lissitsa and Kol, 2021). Even with the rising ubiquity of smartphones, which has changed their social relations, introverted millennials use smartphones more selectively and value interpersonal ties and face-to-face encounters above virtual interactions because of their personality. Therefore, because introverted millennials are less driven to use their smartphones for social purposes constantly and are more conscious of their smartphone use, they may use them in ways that align with their introverted tendencies.

Following that, it was discovered that openness to experience substantially negatively influences millennials' habitual smartphone use (*H3*). This result indicated that millennials

Table 7 Predictive power assessment

Construct	Q^2 *predict*	R^2					
Addictive use	0.041	0.313					
Habits	0.044	0.065					
Materialism	0.032	0.063					
		PLS		LM		PLS-LM	
Item	Q^2 predict	RMSE	MAE	RMSE	MAE	RMSE	MAE
Addictive use							
ADU1	0.022	1.650	1.328	1.672	1.351	−0.022	−0.023
ADU2	0.021	1.665	1.343	1.677	1.344	−0.012	−0.001
ADU3	0.034	1.572	1.261	1.579	1.243	−0.007	0.018
ADU4	0.038	1.605	1.308	1.605	1.297	0.000	0.011
Habits							
HAB1	0.031	1.336	1.103	1.344	1.102	−0.008	0.001
HAB2	0.041	1.292	1.031	1.297	1.030	−0.005	0.001
HAB3	0.037	1.359	1.109	1.360	1.101	−0.001	0.008
HAB4	0.034	1.396	1.138	1.404	1.139	−0.008	−0.001
HAB5	0.017	1.529	1.261	1.546	1.283	−0.017	−0.022
HAB6	0.027	1.523	1.241	1.536	1.243	−0.013	−0.002
Materialism							
MAT1	0.016	1.681	1.401	1.627	1.298	0.054	0.103
MAT2	0.022	1.786	1.508	1.680	1.372	0.106	0.136
MAT3	0.022	1.746	1.446	1.665	1.338	0.081	0.108
MAT4	0.020	1.672	1.393	1.605	1.302	0.067	0.091
MAT5	0.019	1.672	1.358	1.593	1.273	0.079	0.085

Source: Author's own work

with high levels of openness might find fulfilment in other activities, i.e. engaging with others not dependent on smartphone use, as they value various experiences and intellectual engagement (Erdem and Uzun, 2022). This finding emphasises the necessity of considering millennials' multiple needs and preferences with different levels of openness when investigating smartphone use among this generation and the role of personality traits in influencing technology use behaviours.

Next, the finding showed the results for *H4* (Hillyer, 2021; Kircaburun *et al.*, 2020), that a smartphones offer this generation of users immediate access to social support networks, empowering them to freely share their feelings and experiences through text, photographs and videos, which further encourages social support and emotional expression, thus enabling them to be more responsive and reachable via their smartphones.

Surprisingly, this research demonstrates that conscientiousness does not significantly influence millennials' habitual smartphone use (*H5*). One explanation is that millennials with high conscientiousness tend to be organised and disciplined, so they may use smartphones to regulate their usage habits. Those who exhibit high conscientiousness may be better able to control their impulses, making them less likely to engage in excessive smartphone use or form bad habits that can affect their daily obligations and duties.

Consequently, it was found that *H6* is supported, i.e. the need for arousal significantly influences millennials' habitual smartphone use. This finding proves that smartphones provide a platform for millennials to satisfy their desire for arousal due to the multifunctionality and the variety of activities these gadgets provide (Zhitomirsky-Geffet and Blau, 2016). Smartphones present millennials engaging in virtual and online experiences, including interactive games and movies. These can capture and interest those with strong sensation-seeking inclinations that engender their enthusiasm and instant fulfilment.

In addition, the significant result of *H7a* has revealed that high habitual smartphone use influences greater addictive smartphone use among millennials. This finding coincides with prior research (Brailovskaia *et al.*, 2020; Flayelle *et al.*, 2023), which proves that millennials' habitual smartphone use has been deeply embedded in their daily routines due to the widespread use and integration of these devices into their lives. As a result, habitual use in seeking social incentives, entertainment and information availability has reinforced addictive smartphone use among this generation.

Next, *H7b*'s significant finding has disclosed that habitual smartphone use significantly influences millennials' materialism. These findings are in agreement with previous studies (Dinh and Lee, 2022; Ruan *et al.*, 2023; Sharma *et al.*, 2022), which suggest that constant exposure to digital advertising and marketing from social media and online shopping sites encourages habitual smartphone use, thus promoting materialistic beliefs and wants. The increased use of social media platforms also enables social comparison, leading millennials to adopt worldly attitudes and aspirations in response to the perceived lifestyles of others. Additionally, the habit-forming nature of smartphone use reinforces materialistic tendencies by associating the acquisition and display of expensive objects with pleasurable feelings and rewards. Due to continual exposure to commercial messages and possibilities, millennials increasingly rely on smartphones as their central purchasing method.

Besides, this study also supports *H8*, which agrees with earlier research (Agrawal, 2023; Koç and Turan, 2021; Yuchang *et al.*, 2017). A persistent pattern of seeking rapid satisfaction through acquiring material items and experiences is created by the addictive nature of smartphone use, as millennials are motivated to satisfy their wants and desires in the virtual world. Additionally, millennials addicted to smartphones engage in conspicuous consumption to preserve their online persona because materialistic displays on social media generate a feeling of social acceptance and identity.

This study also uncovered that *H9* is supported: addictive smartphone use fully mediates the relationship between habitual smartphone use and materialism (Handa and Ahuja, 2020; Lee *et al.*, 2018). This outcome showed that addictive smartphone use among millennials is a potent mediating factor in this relationship; as millennials use their smartphones compulsively, a feedback loop of frequent reinforcement is created, increasing their exposure to consumerism and materialistic content. Due to the ubiquitous effect of addictive smartphone use, the growing purchase of material items becomes firmly ingrained in their everyday life.

5.2 Practical implications

This study has also provided several practical implications for practitioners. Firstly, mental health professionals need to comprehend how emotional instability affects frequent smartphone usage. Smartphone users, particularly millennials who experience high levels of emotional instability, may use their smartphones excessively as a coping technique to control their emotions, seeking solace and distraction online and through social media. These practitioners can create mindfulness-based therapies and emotional regulation techniques to help people with emotional instability properly regulate their smartphone use.

Secondly, marketers and app developers must understand how openness to experience affects millennials' habitual smartphone use. It is found that millennials are more open to experimenting with new features and apps, which makes them early adopters of new technology and boosts their engagement with mobile apps. As a result, marketers may use creative and original advertising efforts to target this demographic and, at the same time, construct personalised and socially focused ads to resonate with these users.

Thirdly, mental health professionals must understand the connection between habitual smartphone use and addictive use. Due to frequent and automatic smartphone usage, addiction towards smartphones may eventually emerge as millennials increasingly depend on their devices to satisfy their needs and desires. Therefore, to prevent continuous addictive behaviours, these professionals should be aware of the possible drawbacks of addictive use and integrate treatments that encourage thoughtful and balanced smartphone use.

Lastly, as smartphone addiction may impact consumers' behaviours, particularly millennials, digital marketers should exercise caution and adjust marketing methods accordingly by adopting policies to encourage ethical smartphone use and spreading knowledge about the possible drawbacks of overconsumption that will lessen the effect of addictive smartphone use on materialistic impulses.

6. Conclusion, limitations and future recommendations

The study's results have explained the notable interrelationships between millennials' personality traits (FFM), need for arousal, habitual smartphone use and materialism through the mediating role of addictive smartphone use, given how important smartphones have become to millennials' everyday lives. Despite this research offering insightful findings on these interrelations, certain limitations should be addressed to improve future research. Firstly, this study's primary demographic emphasis on millennials may have limited the findings' applicability to individuals of other ages or cultural backgrounds. Future studies may examine the associations between personality characteristics and smartphone use across generations and populations to acquire a deeper understanding. Secondly, because the study's research methodology was cross-sectional, future research should investigate the temporal correlations between these factors over time; therefore, longitudinal studies can be considered. Thirdly, this study concentrated on a particular set of FFM's personality characteristics, leaving the potential to investigate additional personality qualities, such as self-esteem and perceived control, that may affect smartphone use and materialism. Lastly, the current study did not examine other possible moderating or mediating factors. Future research may look into aspects of the person-environment fit model, such as strain, or relevant contextual factors, such as hedonic use, to further comprehend the underlying mechanisms.

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