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Gamified Money: Exploring the Effectiveness of Gamification in Mobile Payment Adoption among the Silver Generation in China

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Abstract

Purpose - This study investigates the use of gamification in promoting the silver generation's adoption of mobile payment technology through the gamified cultural practice of gifting red packets. It considers the effectiveness of using gamification in a cultural context to promote technology acceptance among older adults. This crossover between digital technology and cultural traditions brings unique gaming elements to the adoption of technology.

Design/methodology/approach – Drawing upon Technology Acceptance Model (TAM) and prospect theory, a research model is evaluated using structural equation modeling. Data were collected via survey from elderly consumers who are current users of WeChat but are yet to use its mobile payment functions.

Findings - The results reveal the perceived effectiveness of gamification is determined by the perceived enjoyment of the game and contributes to users' attitude development, directly and through its perceived usefulness. Perceived risks were identified as a barrier to converting positive attitude into adoption intention.

Research implications - The findings contribute to the conceptualization and understanding of the effectiveness of gamification in technology adoption, specifically among the silver generation.

Originality/value - In contrast with previous gamification studies on gamified experience, this study introduces a new conceptualization of the perceived effectiveness of gamification and its measurement. This study validates game engagement as being effective in encouraging seniors to adopt a technology. In an era of an aging population where digitization is a norm, improving the digital literacy and digital inclusion of elders by encouraging them to adopt technology is essential to developing a more accessible and inclusive social environment.

Keywords: Digital inclusion; Gamification; Mobile payment; Perceived risks; Silver generation; Red packet.

1. Introduction

The ubiquity of smartphone adoption has led to the development of associated functions augmenting daily activities. Mobile payment is one such application which has digitized the payment method of individuals' day-to-day transactions (Diniz *et al.*, 2016; Liébana-Cabanillas *et al.*, 2018; Masamila *et al.*, 2010). Although consumers are benefiting from the ease and convenience of using this new payment mode, not all members of society have accepted and adopted it (Diniz *et al.*, 2011; Kim *et al.*, 2016; de Luna *et al.*, 2019). As with the use of most electronic gadgets and technologies, the adoption rate of mobile payment among the silver generation (i.e. adults aged 50 and above) remains low, compared to the rest of the population (Choudrie *et al.*, 2014; Mullin, 2018). While research acknowledges that advanced technology has been shown to play an important role in assisting older adults with their daily living and quality of life, a major challenge remains in integrating the appropriate use of such technologies into their lives (Choudrie *et al.*, 2014; Kim *et al.*, 2016; Lien and Cao, 2014). This challenge is exacerbated as mobile payment technologies and their interfaces continue to evolve and the digital inclusion gap continues to widen. To make new technologies usable and useful for older adults, it is important to examine the complex patterns involved in technology acceptance and use among this population. Although technology acceptance has been widely studied, research on how to accelerate the digital inclusion of the senior population efficiently remains scarce (Benson *et al.*, 2018; Wang and Sun, 2016). The existing literature issues urgent calls to identify the group-specific factors that influence the silver generation's adoption of mobile technology (Comunello *et al.*, 2017).

In recent years, in order to encourage greater customer usage of and engagement in mobile payment technology, there has been a growing trend to develop business applications that are integrated with game features. Referred to as gamification, this appeals to user experience and creates active participation and adoption (Prestopnik and Crowston, 2011; Prestopnik *et al.*, 2017). Gamification was initially implemented widely in technologies that involve health and well-being monitoring (e.g. gerontechnology) to encourage users' engagement (Hamari and Koivisto, 2015; Johnson *et al.*, 2016). Gamification is also increasingly being used in the financial sector to promote its services (Baptista and Oliveira, 2017). Although mobile payment has become commonplace in recent years, the application and effectiveness of gamification in facilitating mobile payment adoption has not been fully explored. In addition, gamification research is often associated with the younger generations (Wang and Sun, 2016; Skinner *et al.*, 2018). The current, and limited, research into technology acceptance by older adults has not yet considered the issue of gamification in promoting technology acceptance to any great extent (Benson *et al.*, 2018).

To address these knowledge gaps, this study considers technology use specifically and investigates the effectiveness of gamification in influencing the silver generation's adoption of mobile payment technology. China is one of the largest aging societies in the world and is also experiencing the rapid spread of mobile payment (United Nations, 2018). Commercial research suggests that in 2019 about half the world's digital mobile payments were made in China, predominantly through the mobile payment apps Alipay and WeChat Pay (PwC, 2019). These leading service providers of mobile payment applications have embedded and gamified the cultural practice of gifting red packets (*hongbao,* which are monetary gifts placed in red envelopes) to facilitate the penetration of mobile payment in the country. This provides an important context in which to answer the research questions.

The objective of this study is threefold. First, the study assesses the effects of determinants related to the adoption and use of mobile payment among older adults. Second, the study examines the effectiveness of 'gamified money', underpinned by the concept of gamification in the augmentation of the adoption and usage of mobile payment among the silver generation. Third, by incorporating a context-specific technology resistance factor, this study also explores senior adults' trade-off decisions in relation to mobile payment technology adoption. Referencing the technology adoption model (TAM) (Davis *et al.*,1989) and prospect theory (Kahneman and Tversky, 1979), this study contributes to the advancement of knowledge on the mechanism of how gamification can encourage the use of mobile payment and/or the latest technologies among the silver generation. Understanding the effects of gamification on mobile payment adoption further contributes to the development of the conceptualization of gamification, particularly its effectiveness from a user's perspective. The study also sheds light on how to facilitate digital inclusion in an aging society through the digitalization of cultural traditions and the implementation of gaming elements in technology applications. The remaining sections of the paper are structured as follows. The paper first contextualizes the application of gamification in mobile payment technology within the research context. Drawing upon prior research on technology adoption and gamification, Section 3 develops the theoretical framework and Section 4 outlines the hypotheses. Section 5 explains the methodology and the data collection and analysis processes. Section 6 presents the analysis and results and Section 7 discusses the findings, the theoretical contributions and the practical implications of the research. The paper concludes with the limitations and suggestions for future research opportunities.

2. Background: mobile payment and gamification among the silver generation in China

2.1 Technology adoption among different generations

Existing research shows notable differences in the usage of technologies between younger and older generations (Chung *et al.*, 2010; Metallo and Agrifoglio, 2015; Vodanovich *et al.*, 2010). Studies within the information technology literature highlight how generational differences shape the entire process of technology acceptance and adoption (Burton-Jones and Hubona, 2006; Chung *et al.*, 2010; Ha *et al.*, 2007; Morris and Venkatesh, 2000). The motivations behind technology use, cognitive processes on learning how to use technologies, and the ways in which how technology designs are being perceived, are often the focus of investigations into technology adoption when comparing different generations (Fox and Connolly, 2018; Helsper, 2010; Norton and Bass, 1987; Selwyn, 2004; Vallespín *et al.*, 2017). Such differences across generations highlight that the mechanism of technology adoption is generation-specific; technology developers need to design distinctive technology penetration strategies targeting at different consumer age cohorts (Birnholtz, 2010; Glynn *et al.*, 2012; Tilvawala *et al.*, 2011; Vodanovich *et al.*, 2010). Understanding that technology-usage behavior differs between generations provides practical implications to encourage the uptake of technology among different consumer age groups.

As mentioned earlier, the silver generation in this study refers to the population over the age of 50 (European Commission, 2018; Griesel, 2018). Referencing Prensky's (2001) generational categories, members of the silver generation, who have had to adopt digital technology later in life, are termed 'digital immigrants'. Growing up surrounded by and immersed in digital technology, Generation Y (those born after 1980) and Generation Z (born after 1995) constitute a distinctive group of 'digital natives' (Priporas *et al.*, 2017; Zhang *et al.*, 2017). Adoption and usage patterns of digital technology when comparing the silver and younger generations are vastly different due to their varying lifestyles and priorities. Digital natives are generally early adopters of new technologies and are often digitally savvy (Kim and Yang, 2016). Having been socialized in a technological environment that facilitates familiarity with digital services, they are often substantial users of mobile services (Hoffmann *et al.*, 2014; Kumar and Lim, 2008). Digital immigrants, conversely, grew up having to adopt digital technology and are often skeptical toward the latest technologies (Wang *et al.*, 2018). They experienced digitization at a later stage in their adult lives and may lack the technological fluency of digital natives. They are generally more averse to new technologies and/or are passive users of digital technology (Hoffmann *et al.*, 2014). However, the digital divide revealed during the recent outbreaks of COVID-19 highlights the importance and long-term implications of the inclusion of the elderly in societal progress (Conger and Griffith, 2020; Gallagher, 2020; Kominers, 2020).

Studies suggest that older people tend to be resistant to change and typically maintain the habits, behavior and lifestyle they are accustomed to following (Deng *et al*., 2014; Nikou, 2015). Consequently, the elderly might not be comfortable with the use of newer technologies and thus reluctant to engage with them. This is labeled 'technology anxiety' (Lim and Lee, 2010; Nikou, 2015) or 'technophobia' (Di Giacomo *et al*., 2019) in the literature and is a common phenomenon among the silver generation. The phenomenon often plays a crucial role in the perceptions of mobile technology adoption among the older generation (Lorenz and Oppermann, 2009; Pedlow *et al*., 2010; Seto *et al*., 2010). With their distinctive user habits and daily routines, digital immigrants give different meanings to mobile technology than do digital natives who grew up in a more recent technological environment (Nikou, 2015; Oksman, 2006). Although a focus on traditional technology adoption and acceptance models provides important information, due to the physical and functional challenges experienced by older people, there is insufficient insight into the dynamics of their mobile payment technology adoption (Nikou, 2015). Studies on the adoption of mobile payment technology (e.g. Rodrigues, Costa and Oliveira, 2016; Rodrigues, Oliveira and Costa, 2016) suggest that gamification is one such relevant determinant. However, most gamified systems are conceptualized for a younger audience and do not account for perceptions of game elements among the aged (Altmeyer *et al*., 2018; Wang and Sun, 2016; Skinner *et al*., 2018). Studies also reveal that the use of game elements in non-game contexts resonates well with older adults and potentially influences their technology adoption decision (Altmeyer *et al*., 2018; Chesham *et al*., 2017). The literature recognizes the differences between the silver and younger generations in terms of technology adoption and highlights the limited knowledge of the effects of gamification among the older generation. Therefore, this study seeks to conceptualize a theoretical model to inform the design of gamified applications that are inclusive of the elderly and that they will find user friendly, thereby encouraging their extended use of mobile technology (e.g. mobile payment).

Additionally, with their growing spending power, older adults as a group represent a large part of the general consumer economy, termed the 'silver economy' (European Commission, 2018; Kumar and Lim, 2008). The silver generation is one of the main economic powers in the current market yet financial technology (fintech), as a facilitator of modern consumption, has not tapped fully into this consumer segment (Chaouali and Souiden, 2019).

The spending power of the silver generation is estimated to reach US$15 trillion in 2020 globally (Barclays, 2019; European Commission, 2018). With its potential spending power, attention needs to be paid to the silver generation to better understand its perceptions of and behavioral patterns in the adoption of financial technologies, thereby accelerating their technology-driven consumption and digital inclusion (Filho *et al.*, 2019; Taipale, 2016). This will not only help fintech service providers tailor their services and embed them seamlessly into the lives of the aging population but will also close the digital divide by encompassing the silver generation in the digitized world.

2.2 Mobile payment and its use among the elderly

In contemporary research on technology, mobile payment is conceptualized by de Luna *et al.* (2019, p. 932) as "a type of financial process of a private or business nature, in which an electronic mobile communication device is used to initiate, authorize and carry out a financial transaction". With the introduction of mobile payment technology via Alipay and WeChat Pay, China became one of the world's fastest-growing cashless societies. Smart payments are now commonplace in Chinese cities and some vendors have even refused to accept cash (Wildau and Jia, 2019). The push for a cashless society has brought into sharp focus the inability of the older generation to adapt to mobile payment technology. Although digital technology has already been suggested as a valuable tool for enriching the lives of older people (Wang and Sun, 2016), studies have shown that older users are often less willing and more hesitant to adopt new technology (Benson *et al.*, 2018; Fernández-Ardèvol, 2011; Kim *et al.*, 2016; Wang and Sun, 2016). It is, therefore, of great interest to understand the use and adoption of mobile payment technology among this age cohort.

Of the two dominant mobile payment providers in China, WeChat Pay is currently the leading service provider, drawing over 900 million monthly active users in China. Its smart payment is an extended function of the WeChat application, developed initially by Tencent in 2011 for messaging and social media purposes (Jacobs, 2018). A recent report suggests that members of the silver generation in China are now the most frequent users of WeChat, although the conversion rate (from WeChat to WeChat Pay) is lower compared to other age groups (Yuan, 2018). Given this unique background, this study investigates the Chinese silver generation's adoption of mobile payment and uses WeChat Pay as the context of its examination.

2.3 Gamified money – WeChat red packet

Before WeChat Pay came to be widely used, Alipay was China's largest mobile payment application (Wu *et al.*, 2017). In order to compete with Alipay, Tencent needed to grow its user base by developing a 'killer app' to convert existing WeChat users to WeChat Pay users and to cultivate user habits and stickiness to WeChat Pay. Tencent found an answer in the introduction of digital red packet. The gifting of a red packet is a traditional Chinese custom of sending a monetary gift in a red envelope, usually from older to younger family members and friends, particularly during Chinese New Year and important celebrations (e.g. birthdays and weddings). A red packet symbolizes prosperity and good luck and the Chinese enjoy receiving and sending them to family and friends (Che and Ip, 2017). WeChat recognized this and seized the opportunity to develop a digitized red packet and embed it in their application, which enabled the delivery of virtual money through WeChat Pay launched in 2014, the WeChat digital red packet is a game that involves grabbing and/or exchanging red packets among users and organizations/companies. This game has not only encouraged the take-up of WeChat Pay, but has also fueled growth in the social functions promoted by WeChat (e.g. the engagement of digital red packet triggered messaging and social media interaction on WeChat) (Che and Ip, 2017).

As a result of the implementation of red packet games, Tencent experienced a huge spike in subscriptions to WeChat Pay (Holmes *et al.*, 2015). Since WeChat users are only able to send or receive red packets by linking a bank account to their WeChat red packet account, red packet games facilitate the user in becoming fully equipped for the use of WeChat Pay. The introduction of the WeChat digital red packet has resulted in hundreds of millions of new users signing up to WeChat Pay, including the silver generation, among whom the rate of adoption of new technology had previously been low (Choudrie *et al.*, 2014; Choudrie *et al.*2018).

WeChat's digital red packet not only embraces traditional culture, but also embodies an important element of Chinese relationships within a social network environment (Che and Ip, 2017). However, the most noteworthy innovation is the use of a game to catalyze the popularization of mobile payment. Although technologies and games are commonly seen as the domain of young people, the concept of 'gamified money' has seemingly transcended conventional barriers to the use of modern technology among older adults (Wang and Sun, 2016). Given the above context and practical observations, this study seeks to examine the effectiveness of gamification in the adoption of mobile payment technology among elderly Chinese, specifically through the application of the red packet game and WeChat Pay.

3. Theoretical background

3.1 Technology acceptance model (TAM)

Among the various theoretical perspectives used to explore technology adoption, Davis *et al.*'s (1989) technology acceptance model (TAM) is regarded as the most widely acknowledged and influential theoretical model of behavior (Huang *et al.*, 2019; Kim and Crowston, 2011; Muñoz-Leiva *et al.*, 2017). TAM has been used in studies on gamified technologies (Rodrigues *et al.*, 2017; Wang and Sun, 2016; Zheng, 2019) and technology adoption among the elderly (Wu *et al.*, 2017). Those studies suggest that TAM-based models can be used to understand the adoption of innovative technology among the elderly. The central tenet of TAM is the mechanism of individuals' perceptions regarding the usefulness and ease of use of a technology in forming subsequent attitudes and behaviors (Davis *et al.*, 1989). However, in recent decades, critical voices have suggested modernizing and contextualizing how TAM is used to understand individuals' technology adoption behaviors in an increasingly digitized world (Hossain and Prybutok, 2008; Stockless, 2018). First, recent research on TAM suggests that modern trends and techniques (e.g. gamification) that assist technology adoption need to be considered and included when examining adoption behaviors (Rodrigues, Costa and Oliveira, 2016). Second, scholars argue that although TAM is a robust and influential model in which empirical results in general lean toward a positive relationship between attitude and behavioral intention, there remain mixed outcomes in terms of research findings (Chen and Chan, 2011; Wang and Sun, 2016). This suggests a gap between attitude and intention, whereby a favorable attitude does not always lead to stronger adoption intention. Factors that deter individuals from adopting technology need to be taken into account (Shin, 2013; Shin and Kim, 2015). Based on these considerations, TAM is used here as a loose theoretical foundation on which to advance a conceptual model by integrating the main determining variables in TAM and the context-specific elements associated with the silver generation's adoption of gamified mobile payment technology. Therefore, the proposed theoretical model considers the role of gamification in the adoption process and perceived risks as a specific barrier to fintech among the elderly.

3.2 Gamification

Conceptualization of gamification

Gamification, a term coined in 2008, refers to the use of game design elements in non-game contexts (Deterding *et al.*, 2011). Although this definition has been widely cited by scholars, it has been criticized for its design-centric perspective (Huotari and Hamari, 2012). Huotari and Hamari (2017) thus incorporate service marketing theory and conceptualize gamification as "a process of enhancing a service with affordances for gameful experiences in order to support users' overall value creation" (p. 25). Their definition emphasizes the goal and value of gamification, which lie in the experiences it creates rather than the approaches used in designing the game elements. Klapztein and Cipolla (2016) indicate that there are similarities between the fields of game studies and service marketing and that "both can be understood from a point of view where game design elements can be described as services and games as service systems" (p. 570). More recently, in line with Landers' view (2019), Leclercq *et al.* (2020) advance the conceptualization of gamification by suggesting a user-centered approach. Landers *et al.* claim that the study of gamification should be undertaken to understand "how to best influence human behavior, attitudes, and other states with designed interventions derived from games" (Landers *et al.*, 2018, p. 318), an area to which this study seeks to contribute. Table 1 summarizes key studies on the conceptualization of gamification.

[Insert Table 1 here]

Contextualization of gamification

When gamification was initially applied in marketing and information system designs, the empirical research focused predominantly on a few selected sectors in which technology had conventionally been associated with enhancing provision, such as education/learning, health/exercise and crowdsourcing (Koivisto and Hamari, 2019). In recent years, empirical research started to explore the impact of gamification on shaping individuals' perceptions toward the gamified objects and facilitating related behavioral changes across various contexts through different applications and designs (Cardador *et al.*, 2017; Landers *et al.*, 2020). For example, gamification was found to improve consumers' innovative product adoption (e.g. Müller-Stewens *et al.*, 2017); trigger favorable responses to smartphone marketing techniques, such as advertising and loyalty schemes (e.g. Hwang and Choi, 2020; Högberg *et al.*, 2019; Jang *et al.*, 2018); and reduce energy consumption (e.g. Günther *et al.*, 2020). In addition, other research revealed that the application of gamification had shaped individuals' behavior through fintech, such as improvements in financial management through the facilitation of customer engagement in e-banking usage (e.g. Bayuk and Altobello, 2019; Rodrigues, Costa and Oliveira, 2016; Rodrigues, Oliveira and Costa, 2016).

The above research sums up the popular application of gamification as a strategy in aiding the penetration of fintech and highlights the important role of social inclusivity in gamification designs, particularly in an aging society. Critical scholars have raised an important point, in that business should not adopt gamification for its own sake (Lucassen and Jansen, 2014; Poncin *et al.*, 2017). Most of the gaming elements applied in 'non-game' contexts have been adopted directly from gaming design (such as points, scores, badges and medals), which lacks diversity and contextual distinctiveness (Koivisto and Hamari, 2019). The contextualization of money gamified through digital red packets in this study not only represents a unique gaming element with a cultural context, but its popularity also confirms the successful integration of gamification and further extends the sector to the application of gamification in fintech. This research, therefore, looks specifically at the gaming elements and features of gamification that facilitate individuals' engagement behavior with technology that could enrich their lives.

Perceived effectiveness of gamification

Koivisto and Hamari (2019) conduct a systematic literature review of gamification studies and revealed that the prime focus in the examination of gamification centers around its impact on human behavior. Considering that the underpinning purpose of gamification is to influence motivations and behavior (Huotari and Hamari, 2017), this focus is intuitively understandable. Although studies on gamification have recognized that games improve the user's experience, learning process and enjoyment, which, in turn, facilitates the adoption of digital technology, significantly less attention has been paid to issues and aspects that precede the effects of gamification (Koivisto and Hamari, 2019). As Koivisto and Hamari (2019) suggest, it is important to understand the effectiveness of gamification from the user's perspective; research into the effectiveness and adoption of gamification should consider the role of the user and the way in which the user perceives gamification, which is highly dependent on the user's attributes. For instance, the gamification of a health service might be perceived differently from the gamification of a learning service when comparing younger and older people. Hamari (2013) also suggests in an earlier study that the context of gamification (i.e. the environment in which the gamification takes place), as well as the specific activity that users are encouraged to perform, should also be taken into consideration to better understand the effectiveness and adoption of gamification. To address this knowledge gap, this study considers the widely popular yet unique context of gamified money to conceptualize and understand the effectiveness of gamification in enhancing technology adoption among the silver generation.

Drawing upon previous development of gamification in technology adoption research (see Table 1), this study conceptualizes the perceived effectiveness of gamification as a determinant that precedes the technology adoption process. In other words, the perceived effectiveness of gamification refers to the extent to which users perceive that gaming elements facilitate their involvement and engagement with the technology (Hamari and Koivisto, 2015). This aspect is important in understanding the antecedents of the effective implementation of gamification and the mechanism of technology adoption through gamification. It represents users' direct perception, through participation, of the gamified element. An understanding of this relationship reflects the perceived association between a game and an intention to adopt the technology and elucidates the determinant of the success of the phenomenon.

3.3 Prospect theory

Reflecting upon the criticism of TAM mentioned earlier (see Section 3.1), there is no doubt that mobile payment offers several advantages (e.g. convenience and time saving) for users compared to traditional (cash) payments; however, the technology is not always readily accepted and adopted by users, particularly among older adults, due to concerns associated with such technologies (Benson *et al.*, 2018; Wang and Sun, 2016). Against this background, prospect theory, used here to supplement TAM, offers a holistic theoretical view that explains the individual decision making that weighs both the 'gains' and 'losses' of a target behavior (Kahneman and Tversky, 1979). The central proposition of prospect theory in behavioral studies highlights that behavioral tendency is a result of the integrative evaluation of benefits and costs (Chiu *et al.*, 2014; Chung and Koo, 2015). As mentioned previously, TAM focuses on the effects of positive perceptions of a technology (i.e. its usefulness and ease of use) on its adoption. However, from the perspective of prospect theory, a user's adoption intention is not only indicated by the 'gains' (i.e. the perceived effectiveness of gamification, usefulness and ease of use), but also shaped by potential 'losses' (e.g. risk and complexity). These negative perceptions toward technology in explaining adoption behavior should, therefore, also be considered when employing TAM (Featherman and Paulou, 2003; Lee, 2009). This implies that individuals assess the costs and benefits of a target behavior to inform their behavioral tendency (Chiu *et al.*, 2012). It has also been suggested that the attitude-intention relationship should take context-specific factors into consideration (Chen and Chan, 2011; Wang and Sun, 2016), such as older adults' psychosocial characteristics, habits and abilities associated with new technology. In this respect, extending TAM through the inclusion of potential users' psychological evaluation of costs and benefits of technology adoption would be necessary. Drawing on prospect theory would provide further insights into the explanation of the variation in the attitude-behavior relation, which is currently under-researched (Shin, 2013; Shin and Kim, 2015).

Studies on user acceptance and/or resistance to mobile payment also confirm that behavioral tendency is shaped by both positive and negative perceptions that individuals draw from such technology (de Luna *et al.*, 2019; Liébana-Cabanillas *et al.*, 2014b; Qasim and Abu-Shanab, 2016; Schierz *et al.*, 2010). Although TAM-based research tends to emphasize the impact of the perceived benefits of technology adoption (e.g. perceived ease of use, perceived usefulness, compatibility and trialability), researchers have also recently examined the barriers (i.e. losses/costs) to adoption, including perceived complexity (Al-Jabri and Sohail, 2012; Naicker and Van Der Merwe, 2018), lack of relative advantage (Crosno and Cui, 2014; Mehrtens *et al.*, 2001), inability to trial (Patsiotis *et al.*, 2012, 2013) and lack of human interaction (Kaufman-Scarborough and Lindquist, 2002; Rotchanakitumnuai and Speece, 2003). Nevertheless, in line with prospect theory, the most significant barrier that consumers face, particularly in fintech adoption, is perceived risks (Chen, 2008; Liébana-Cabanillas *et al.*, 2014a, b; Liébana-Cabanillas and Lara-Rubio, 2017).

3.4 Perceived risks

The concept of perceived risks was introduced by Bauer (1960) through the analysis of two factors: first, uncertainty arising from lack of knowledge regarding the possible outcome of a certain transaction; and second, the possible negative consequences derived from a purchase transaction. Any user behavior could be associated with particular risks if the consequences of a particular behavior cannot be properly assessed beforehand (Bauer, 1967). Studies have revealed that perceived risks negatively influence the intention to adopt smart technologies (Ma et al., 2016; Wang and Sun, 2016), e-commerce (Crespo and Del Bosque, 2010; Herrero and San Martín, 2012) and mobile payment systems (Chen, 2008; Liébana-Cabanillas et al., 2014a, b; Liébana-Cabanillas and Lara-Rubio, 2017) among elderly people (Kim et al., 2016; Ma et al., 2016; Wang and Sun, 2016). As digital immigrants (Loos, 2012; Prensky, 2001), senior adults demonstrate risk avoidance more prominently than their younger counterparts due to the former's perceived uncertainty and possible adverse consequences pertaining to and resulting from technological innovation (Kim et al., 2016; Liébana-Cabanillas et al., 2014a, b).

Perceived risk is attracting special attention in fintech adoption as financial technology takes over the control of financial resources from humans to resources being managed virtually (Caffaro *et al.*, 2018; Paliwoda *et al.*, 2007). Consumers' trust (or lack of) in the reliability of fintech also contributes to their perceptions of risk (Xu *et al.*, 2017). In the existing literature, perceived risk appears to be a recurrent negative factor examined in most of the mobile payment acceptance literature (Dahlberg *et al.*, 2015; Wu, Liu and Huang, 2016). TAM fails to capture the effects of negative evaluative beliefs on technology adoption. More importantly, supported by prospect theory, perceived risks could be seen as the major 'losses' that individuals consider when it comes to behavioral choice in the adoption of fintech (Yang *et al.*, 2015). Therefore, we highlight the significance of perceived risks in shaping elderly users' adoption intention of mobile payment.

4. Development of the hypotheses and the conceptual model

Based on the theorization and conceptualization discussed above, TAM can now be extended by using gamification as a facilitator and perceived risks as a barrier in the silver generation's adoption process of mobile payment. Figure 1 shows the conceptualized model developed from the postulated relationships. The following sections first rationalize the hypotheses drawn from the antecedents introduced in this study, and then explain the hypothesized effect of these antecedents in the extended TAM.

[Insert Figure 1 here]

4.1 Effects of perceived enjoyment on the perceived effectiveness of gamification

Prior to gamification, research dedicated to TAM extension highlighted that the enjoyment and playfulness that technology potentially imparts to individuals facilitate the adoption of the technology itself (Chen *et al.*, 2002; Moon and Kim, 2001). In gamification, the pleasantness of the gaming experience is the main benchmark for measuring the success of applying gamification (Koivisto and Hamari, 2019; Rodrigues, Costa, and Oliveira., 2016). Game designs are expected to trigger positive emotional responses in the users through the game flow experience (Hamari and Koivisto, 2015). Ramanathan and McGill (2007) suggest that an affective experience with an object contributes to that individual's cognitive evaluation of the object. Therefore, the perceived effectiveness of gamification reflects users' evaluative beliefs toward the application of gaming elements in a technology and could be influenced by users' affective experience of those elements. Perceived enjoyment captures the positive affective responses drawn from the gaming experience and reflects the extent to which the gaming experience is enjoyable (Rouibah *et al.*, 2016). Earlier research on gamification suggested that perceived enjoyment and perceived playfulness positively contribute to users' evaluation of the embedded game elements, as well as game-associated end-goal behaviors (Fitz-Walter *et al.*, 2017; Rodrigues, Costa and Oliveira., 2016). Therefore, the following is proposed:

Hypothesis 1 Perceived enjoyment of the game has a positive effect on the perceived effectiveness of gamification.

4.2 Effects of the perceived effectiveness of gamification and perceived ease of use on attitude

In order to understand the specific determinants of gamification that lead to technology adoption, gamification is here further theorized by introducing the perceived effectiveness of gamification (PEG) into TAM. Based on this conceptualization, PEG reflects users' perceptions and evaluative beliefs regarding the extent to which the gaming elements facilitate their engagement with the technology. In TAM, attitude captures overall evaluative beliefs and is largely influenced by the individual's perceptions of the end behavior (i.e. adoption) (Ajzen and Fishbein, 1977; Davis *et al.*, 1989). The effective implementation of gamification in a piece of technology results in a more positive evaluation of the technology and a more favorable attitude toward adoption (Hamari and Koivisto, 2013). Therefore, PEG, drawn from a game embedded in the technology, is expected to make a positive contribution to users' attitude toward technology adoption. It is postulated that:

Hypothesis 2 Perceived effectiveness of gamification has a positive effect on attitude toward technology adoption.

According to TAM, perceived ease of use (PEOU) by an individual is one of the factors that determine that person's attitude toward the use of a specific technology and consequently determines its intended use, which results in its adoption (Davis, 1989). PEOU is defined as "the degree to which a person believes that using a particular system would be free of effort within an organizational context" (Davis, 1989, p. 320). The impact of PEOU on attitude toward the adoption of mobile payment has been empirically validated in studies (see for instance Liébana-Cabanillas *et al.*, 2014b; Wang and Sun, 2016; Wu, Liu and Huang, 2016; Zhang *et al.*, 2011). As suggested by Hew *et al.* (2015), apps that are conceived as being easy to use will attract consumers. The design of the engagement and/or interaction process should be fully adaptable to the capabilities and skills of the expected consumers, this being particularly pertinent to people who are not familiar with technology (Kourouthanassis *et al.*, 2010); hence, this is considered one of the most influential attributes in the adoption of new technology. Thus, it is proposed that:

Hypothesis 3 Perceived ease of use has a positive effect on attitude toward technology adoption.

4.3 Mediating role of perceived usefulness

Perceived usefulness (PU) is another essential factor that determines attitude toward behavioral intention in TAM. PU, in accordance with TAM, is defined as "the degree to which a person believes that using a specific system will increase his or her job performance" (Davis *et al.*, 1989, p. 985). Applied in the context of this study, PU is defined as the degree to which an elderly person believes that using mobile payment will help him or her to complete a transaction. Where PU is the determining factor in an individual's attitude toward technology adoption in TAM, consumers' perception of the usefulness of technology has been found to mediate the relationship between PEOU and attitude toward the adoption of technology (Benson *et al.*, 2018; Rodrigues, Costa and Oliveira, 2016; Venkatesh, 2000). Researchers have also suggested that the effective embedment of gaming elements in technology positively influences consumers' perception of the technology's usefulness (Rodrigues, Oliveira and Costa, 2016). Yang *et al.*'s study (2017) provides support for the use of gamification as a technological platform that influences consumers' attitude and behaviors. Although perceived effectiveness of gamification is expected to be an important component of attitude formation, this could be more efficiently harnessed for the development of evaluative beliefs on adoption through enhancing perceived usefulness of adoption (Davis *et al.*, 1989; Sheng and Zolfagharian, 2014). After all, PU plays a determining role in shaping potential users' attitude toward and adoption of technology (Davis *et al.*, 1989). Perceived effectiveness of gamification could contribute to and enhance the development of a favorable attitude toward adoption if it enables users to be aware of the usefulness of the technology (Rodrigues, Costa and Oliveira, 2016).

Therefore, this study extends TAM by exploring two possible types of relationship between the three constructs of PU, PEOU and PEG. First, PEOU and PEG can act independently, each affecting attitude toward adoption directly. Second, there may be mediating effects. That is, PEOU influences PU, which, in turn, affects attitude (Davis *et al.*, 1989; Rodrigues, Oliveira and Costa, 2016; Venkatash, 2000; Yang *et al.*, 2017). Similarly, PEG may also have indirect effects on attitude via PU (Rodrigues, Oliveira and Costa, 2016). Thus, it is proposed:

Hypothesis 4 Perceived usefulness mediates the relationship between perceived effectiveness of gamification and attitude toward technology adoption.

Hypothesis 5 Perceived usefulness mediates the relationship between perceived ease of use and attitude toward technology adoption.

4.4 Effects of attitude on adoption intention

Social cognitive theories (such as TAM) suggest that attitude, which captures an individual's attitudinal tendency (i.e. good vs. bad, favored vs. not favored and positive vs. negative), is an essential antecedent to intention (i.e. behavioral manner – to adopt vs. not to adopt) when it comes to the development of a particular adoption behavior (Davis *et al.*, 1989). As discussed earlier, if a technology is perceived as useful and easy to use, and the application of gaming elements is seen as an effective value-adding tool, the potential user will develop the evaluative beliefs regarding the technology. Studies have shown that individuals will form a strong behavioral intention to adopt innovative technology if they have a positive attitude toward the technology and its adoption (Herz and Rauschnabel, 2019; Hsu and Lin, 2016). A positive attitude will contribute to forming a stronger technology adoption intention (Davis *et al.*, 1989). Therefore, the following is proposed:

Hypothesis 6 A positive attitude toward technology adoption has a positive effect on adoption intention.

4.5 Moderating role of perceived risks

As mentioned earlier, a key criticism of TAM is its lack of consideration of the mechanism that converts an attitude into a behavioral intention (Shin, 2013; Shin and Kim, 2015). Empirical evidence drawing upon social cognitive theories has suggested that a range of moderators exist in the attitude-behavioral intention relationship across different individual behaviors, such as social influence or subjective norms (e.g. Hassan, Shiu, and Parry, 2016; Povey *et al.*, 2000), habit (e.g. Hua *et al.*, 2017), group identification (e.g. Terry and Hogg, 1996) and trust (e.g. Fang, Shao and Lan, 2009). More specifically, in the context of TAM, pioneering scholars identified various moderators between attitude and adoption intention, such as age, gender, prior experience, religiosity and technology anxiety, in adopting new technologies (Agag and El-Masry, 2016; Forsythe, 2008; Kasilingam, 2020). The empirical evidence in this regard jointly supports Ajzen's (2002, 2005) assertion that, compared to everyday routine behavior during which attitude translates into intention automatically, novel behaviors and unfamiliar situations (e.g. technology adoption) are likely to evoke careful deliberation in converting attitude into behavioral intention. The association between attitude and behavioral intention is contingent on context-specific factors (Ajzen, 2002, 2005; Graafland, 2017). Here, context-specific factors are considered to be the researched population's perceptions that are drawn from a specific research context and shape an individual's behavior in that context (Ajzen, 2002; Arduini *et al.*, 2010). In order to examine the moderator between attitude and behavioral intention toward mobile payment adoption, particularly among the silver generation, the context-specific factor is elderly adults' perceptions associated with new technology adoption. Here, we highlight the perceived risks as the moderator that weakens the positive relationship between attitude and intention, for several reasons.

First, drawing upon prospect theory, we argue that adoption intention is shaped by both the costs and benefits of adoption (Chiu *et al.*, 2014; Chung and Koo, 2015). Since TAM does not particularly consider the costs of adoption, the perceived risks as the cost of adoption could be considered in the deliberation prior to the development of adoption intention (Ajzen, 2002). Unlike a routine behavior (e.g. regular daily exercise), adopting mobile payment technology as a novel behavior is usually thoroughly considered, particularly among senior consumers. Previous research also indicates that perceived risk may negatively moderate the attitude-behavior relationship, especially in novel behaviors (e.g. Campbell and Goldstein, 2001; Gurhan-Canli and Batra, 2004; Ho, Ocasio-Velázquez and Booth, 2017). Integrating TAM with prospect theory, we therefore consider if perceived risks capturing the main costs of adoption moderates (weakens) the impact of attitude on technology adoption intention among the silver generation.

Second, moderation between attitude and intention needs to be considered as a context-specific factor (Ajzen, 2002, 2005; Graafland, 2017) and the concept of perceived risk is particularly important in the context of the silver generation's mobile payment adoption. This is because studies suggest that older adults are more susceptible to perceiving risk with regard to the use of mobile payment (Kim *et al*., 2016; Liébana-Cabanillas *et al*., 2014a, b; Wang and Sun, 2016). The elderly population tends to embark on less risk-taking behavior than do younger people and they prefer to have more control over financial resources (Caffaro *et al*., 2018; Paliwoda *et al*., 2007). In addition, the concept of 'virtual' cash digitized by the use of mobile payment seems to remove human control from the processing of transactions and is thus perceived among older people as risky. Research reveals that fear of loss of financial control is likely to impede the rate of adoption and increase reluctance regarding the use of such mobile payment technology among the elderly (Plouffe *et al*., 2001; Worthington *et al*., 2011). It is reasonable to anticipate that an elderlyconsumer is more likely to perceive a higher level of risk associated with adopting mobile payment. This type of context-specific perception is shaped by the uncertainties drawn from the adoption decision and hinders the conversion from attitude to adoption intention (Bennett and Harrell, 1975; Tuu and Olsen, 2012).

Therefore, considering the significance of perceived risks from both the theoretical and contextual perspectives, it is postulated:

Hypothesis 7 Perceived risks moderate (weaken) the positive relationship between attitude and adoption intention.

5. Method

5.1 Data collection

Data was collected using an interviewer-administered questionnaire survey. The questions were drafted in English, with the intention of administering them in Chinese among older WeChat users. To assess the equivalence between the original English instrument and the translated Chinese (Mandarin) instrument, a translation and subsequent back-translation process was undertaken through a 'team translation' approach (Douglas and Craig, 2007). The survey items were first translated into Chinese by two of the bilingual authors independently and the results compared and collated. The items were then back-translated into English by two other natives of China who are academics and fluent in English. A fifth native of China with vast experience of translations in academic and business environments verified the accuracy of the translation by checking differences in meaning between the original and back-translated instruments. The comparison of the two versions led to the conclusion that the instruments were equivalent.

The questionnaires were distributed in various residential areas of Suzhou, a major city in China, between March and May 2019, the period immediately after Chinese New Year when *hongbao* is commonly used. Trained Chinese research assistants conducted face-to-face surveys with consumers aged 50 and over in local communities and colleges for the elderly. For this study, current users of WeChat yet to use its mobile payment functions were considered eligible for inclusion in the survey and 633 individuals agreed to take part (a 67.5% response rate); 582 of those invited to participate were currently using WeChat, 163 of whom already used mobile payment, including WeChat Pay or other mobile payment apps. The penetration rates of WeChat and WeChat Pay were 92% and 28%, respectively. To better address the research objectives, only WeChat users who had not adopted WeChat Pay were invited to complete the questionnaire. This resulted in a final sample of 419 valid responses from WeChat users who were in the pre-adoption stage of WeChat Pay. The age range of the sample was 50-80 years, with an average age of 56.11 (standard deviation [SD]=6.43); 59.2% were female; just over half (54.7%) were not employed; and 69.5% of the respondents had a monthly income of 2,000-8,000 yuan (equivalent to around $295-$1,180). The majority of the sample (77.3%) had used WeChat for two to four years (see Table 2).

[Insert Table 2 here]

5.2. Measures

The measurement items for each construct were adapted from the literature and measured by 7-point Likert scales, ranging from “Strongly disagree” to “Strongly agree”. Perceived enjoyment was measured by a 4-item scale modified from Davis (1989), Koivisto and Hamari (2014) and van der Heijden (2004). Perceived ease of use was measured using a modified 4-item scale based on studies by Wakefield *et al.* (2011) and Venkatesh and Davis (2000). The conceptualization of the perceived effectiveness of gamification was measured using a 3-item scale modified from Rodrigues, Oliveira and Costa (2016) and Wu, Peng, Li and Chen (2016). Perceived usefulness was measured using a 4-item scale adopted from Wu *et al.* (2017). Ajzen’s (1991) 4-item measurement scale was used to measure attitude. Adoption intention was measured using a 4-item scale from Rodrigues, Costa and Oliveira (2016). Perceived risk was measured using a 4-item scale from Wu *et al.* (2017).

6. Analysis and results

The survey data were analyzed in two stages. In the first stage, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted in order to establish scale reliability and validity, as it has been suggested that EFA and CFA should be employed to validate scales originally developed in the West when applying them to other cultural contexts (Zhou *et al.*, 2012). In the second stage, statistical testing with structural equation modeling (SEM) was carried out, which included indirect paths (for testing the mediating effects) and an interaction term (for testing the moderating effects). The results are presented in the following sections.

6.1 Construct measurement

Measurement scales were first subjected to EFA using SPSS 25.0 software. Maximum likelihood factor analysis with oblique rotation (direct oblimin) was used as the factors were expected to be correlated. The EFA results confirmed the factor structure in the proposed model. At this stage, poorly performing items with low item-total correlations could be eliminated. Eighteen of the 23 items were retained, comprising six factors, which is consistent with the proposed measurement structure.

The psychometric properties of the constructs were examined by CFA using the AMOS 25.0 program. The CFA results for the 18-item model demonstrated good model fit (χ^2/df=2.86, IFI=.96, TLI=.95, CFI=.95, RMSEA=.07). The mean value for perceived enjoyment was very positive (mean=6.16; SD=1.11). Respondents also reported a high level of perceived effectiveness of gamification (mean=5.61; SD=.78), perceived ease of use (mean=5.26; SD=.78) and perceived usefulness (mean=5.52; SD=.86). They also held a positive attitude (mean=5.78; SD=.89) and showed a high level of adoption intention (mean=5.80; SD=.93). The respondents also perceived a lower level of risk (mean=3.99; SD=.67).

The validated measures showed good internal consistency and reliability as measured using Cronbach's alpha. All the constructs had composite reliability values greater than the recommended level of .75 (see Table 3). Convergent and discriminant validity was also evident in the average variance extracted (AVE) values of more than 0.5, with the square root of the AVEs greater than the correlations of the constructs (Fornell and Larcker, 1981). See Appendix A for all validated scale items.

[Insert Table 3 here]

6.2 Testing direct paths and mediation effects

The second stage of the data analysis involved examining the significance and strength of each of the hypothesized relationships. SEM was employed to do this. The fit indices of the structural model were adequate (χ^2/df=2.86, IFI=.96, TLI=.95, CFI=.96, RMSEA=.07). To test the mediating effect of PU in the relationships between PEG and attitude and between PEOU and attitude, the bootstrapping bias-corrected confidence interval procedure in AMOS was used (Preacher and Hayes, 2008; Zhao *et al.*, 2010), rather than the widely employed causal steps approach for testing mediation (Baron and Kenny, 1986), which has a number of limitations (Hayes, 2009). Bootstrapping, which is a 'nonparametric' way of computing a sampling distribution, is recommended as a more powerful method of testing mediation effects (Preacher and Hayes, 2008). This study used 2,000 bootstrapped samples and the bias-corrected percentile approach generated 95% confidence intervals. Overall, the proposed direct effects were all accepted: H1 (β=.44; p<.01), H2 (β=.19; p<.01), H3 (β=.32; p<.01), and H6 (β=.81; p<.01). Both proposed mediating effects, PEG and PEOU on attitude via PU, were positive and significant at the p<.01 level and, therefore, H4 and H5 were supported (see Table 4).

[Insert Table 4 here]

6.3 Testing the moderating effect of perceived risks

The hypothesis is that the relationship between attitude and adoption intention (AI) may be weakened by perceived risks (PR). The moderating relationships were tested by SEM using AMOS. A new variable, the cross-product between the predictor (attitude) and the moderator (PR), was created and included in the path model. The analysis bootstrapped 2,000 samples to obtain 95% bias-corrected confidence intervals. The fit indices of the structural model were excellent (χ^2/df=2.03, IFI=.99, TLI=.97, CFI=.99, RMSEA=.05). The results showed a significant direct positive effect of attitude on AI (β=.81; p<.001), and a negative moderating effect of PR. The path coefficient of the interaction was -.09 (p<.01). H7 was, therefore, supported.

The analysis was carried out using two models: the first model examined the main (direct and indirect) effects specified in hypotheses H1-H6; the second model added the moderating effects hypothesized in H7. The coefficients and model fit indices are presented in Table 5.

[Insert Table 5 here]

To understand the form of the interaction, the independent value of attitude for the outcome variable of adoption intention was plotted based on the level of perceived risk (see Figure 2). Figure 2 illustrates the change in the relationship between attitude and adoption intention at different levels of perceived risk. With an increase in perceived risks, the slope of the regression line becomes flatter. In other words, the positive relationship between attitudes and intention to use appears to be moderated (weakened) as an individual's perceived risk increases.

[Insert Figure 2 here]

7. Discussion

7.1 General discussion

This study elucidates how gamification can be harnessed effectively in facilitating the adoption of mobile payment technology among the silver generation. Drawing upon prospect theory and the literature of technology acceptance and gamification, this study highlights the significance of an enjoyment-initiated gamified experience in improving the effectiveness of gamification. The study also demonstrates the mechanisms of PEG and PEOU in helping the older generation to develop a favorable attitude toward mobile payment technology. In line with prospect theory and earlier studies, perceived risk was identified as a significant barrier to converting a positive attitude into the intention to adopt mobile payment among older users. The following discussion details the rationale and explanations indicated by the findings.

First, the findings suggest that perceived enjoyment positively influences the effectiveness of gamification. Most research on gamification emphasizes the playfulness-oriented experience and asserts that individuals obtain a sense of enjoyment through participation in games. This sense of enjoyment in turn enhances users' perceived effectiveness of gamification in technology adoption (Eppmann *et al.*, 2018; Hofacker *et al.*, 2016; Robson *et al.*, 2015; Tan, 2018). Unlike previous studies that suggest gamification is oriented by a gamified experience, the conceptualization of gamification in this study is exploratory and concentrates on the effectiveness of games in facilitating users' adoption of technology. In other words, this study explores the extent to which a gamified element can play a role in motivating an individual's involvement and engagement with the technology. Gamification functions as an accelerator that facilitates consumers' technology involvement, perception and ultimate adoption behavior, triggered through the gaming element. This finding echoes Koivisto and Hamari's (2014) suggestion that an enjoyable experience with aspects that are fun and playful is essential to the design of gamified elements. This finding adds value to existing knowledge of the effects of gamification from a sociodemographic perspective. Previous studies on gamification focused either on the digital natives or the general public, without drawing sociodemographic boundaries (Brigham, 2015; Buckley and Doyle, 2017). In the contemporary world where an aging population is becoming the norm, research on technology should take this into consideration (Pan and Jordan-Marsh, 2010; Wang and Sun, 2016), which this study has fulfilled. The positive association between enjoyment and the effectiveness of gamification revealed in this study also suggests that gamification is not a domain reserved for the young. Gamified elements in technology are also much enjoyed by the silver generation. Therefore, having enjoyable games that are compatible with the target group can be a practical step toward support for digital inclusion and technology engagement among the silver generation.

Second, the findings reveal that perceived effectiveness of gamification, perceived usefulness and perceived ease of use of technology contribute to developing a positive attitude toward mobile payment. In line with the literature on technology acceptance, perceived usefulness and perceived ease of use are key determinants in the formation of attitudes toward different technologies. Specifically, in this study, perceived usefulness reflected the extent to which senior consumers believed that mobile payment enhanced their payment experience. That is, the greater the benefit that is perceived from mobile payment technology, the higher the likelihood that a favorable attitude toward the technology will be developed. PEOU simply represents, in this case, senior consumers' belief regarding the extent to which using mobile payment will be effort-free (Davis *et al.*, 1989; Liébana-Cabanillas *et al.*, 2019). Such beliefs also contribute to forming a positive attitude toward technology. In addition to perceived usefulness and ease of use, PEG is identified as a new dimension that contributes to consumers' attitude toward a technology. This study has argued that gamification facilitates an individual's familiarity and involvement with a new technology that extends from a technology that has been adopted (Hamari and Koivisto, 2015). In reference to this study, WeChat was initially developed as a messaging and social networking app. With the addition of the mobile payment function to the app, the implementation of the digital red packet game contributes to senior users' understanding of mobile payment technology, thereby shaping their attitude toward mobile payment. More importantly, in addition to the direct effects discussed above, the results of this study also suggest that perceived usefulness mediates the effects that PEOU and PEG have on users' attitude formation. This finding has important implications. First, regardless of how easily a technology can be navigated, without being perceived as a useful item, its PEOU cannot have an impact on the formation of a favorable attitude toward the technology (Chang *et al.*, 2015; Rahman *et al.*, 2017). Second, applying a similar logic, effective gamification advances users' understanding of the benefits of that technology and further contributes to developing a more favorable attitude toward it (Sheng and Zolfagharian, 2014).

Third, the findings suggest a positive association between attitude and users' intention to adopt technology and support the suggestion of the moderating role of perceived risk in the relationship. Social cognitive theorists (e.g., Ajzen and Fishbein, 1977; Bandura, 1986; Davis *et al.*, 1989) investigating individual behaviors also provide support for a positive relationship between attitude and behavioral intention, as adopted in technology acceptance studies (e.g. TAM). This finding is, therefore, in line with the fundamental proposition of social cognitive theories. However, earlier studies also emphasized the importance of further examination of the gap between attitude and behavioral intention, particularly in the identification of barriers in the behavioral mechanism of technology adoption (Shin, 2013; Shin and Kim, 2015). Previous researchers suggest that research that fills this gap needs to consider the situational context and individual characteristics, such as age, gender and personal background (Ajzen, 2005; Graafland, 2017). Studies on the adoption of mobile payment technology have generally identified perceived risks as one of the most significant barriers to the adoption process, which is understandable given the association with money and finances (De Kerviler *et al.*, 2016; Yang *et al.*, 2015). The focus in this study on senior users amplifies findings regarding such effects, as this group of users is generally more cautious in the use of technology for financial transactions due to its unfamiliarity with and distrust of technology (Caffaro *et al.*, 2018; Paliwoda *et al.*, 2007). Therefore, senior users tend to perceive higher risks than their younger counterparts in the use of mobile payment. These perceived risks, underpinned by senior users' reservations regarding fintech and a conservative attitude toward financial security, moderate negatively the conversion from a positive attitude to the intention to adopt mobile payment.

7.2 Theoretical contributions

This study makes a number of important theoretical contributions. First, from a perspective of gamification, and differing from previous studies that focused on the gamified experience (e.g. emotional arousal, involvement and reward mechanisms), this study introduces a new conceptualization of PEG and its measurement. This outcome enhances understanding of the usefulness of gamification from the users' perspective in helping to develop a favorable attitude toward a technology. This answered urgent calls from other researchers for further research on the necessity and effectiveness of gamification (e.g. Lucassen and Jansen, 2014; Poncin *et al.*, 2017). Although the integration of gamification into technology is trending, this approach should only be used if it is effective in facilitating business objectives. This study also highlights the 'edutaining approach' of effective gamified experience design, in which a game not only needs to be enjoyable, but also underlines the usefulness of the technology. Further, this study integrates PEG into an extended TAM and demonstrates the adoption of mobile payment activated by gamification among senior users. The emphasis on senior technology users provides empirical evidence that the impact of gamification is not restricted to any particular age group. This finding is critical, as it expands the boundaries of gamification research and applications beyond the youth. Second, this study contributes to the further development and extension of TAM. By bridging TAM with prospect theory, this study affirms that the trade-off between the gains and losses perceived from a technology shapes older adults' behavioral tendency. Through these theories, this study also confirms that perceived risk is a key barrier to senior users' adoption of technology, as it moderates the gap between attitude and behavioral intention. This finding provides empirical evidence for the existence of an attitude-intention gap and highlights the significance of situational and sociodemographic factors in filling this gap. By integrating prospect theory with TAM, this study further identifies that negative beliefs toward a technology are developed independently from positive evaluations, which also shape the conversion between favorable attitude and positive behavioral intention.

7.3 Managerial and societal implications

In addition to its theoretical contributions, this study also brings novel managerial and social insights. First, the importance of technology adoption through gamification among the silver generation suggests that digital games are no longer the reserve of young people. This study challenges the stereotypical belief that games are only for youths and validates the notion that the players who engage in digital games have been extended to include the silver generation. In an era in which an aging population and digitization are happening concurrently, improving digital literacy and the digital inclusion of older adults by encouraging their technology adoption is essential to develop a more accessible and inclusive social environment. The International Telecommunication Union (ITU) has highlighted the gaps in technology uses across different age cohorts revealed in the pandemic crisis of COVID-19, and suggests that closing the digital divide and accelerating digital inclusion on a global scale are essential in ensuring the socioeconomic development and participation of all global citizens in digitization (ITU News, 2020). Implementing interesting, simple and enjoyable gaming elements into technology eases the psychological resistance that senior people experience with technology. This study also validates game engagement as being effective in encouraging seniors to use technology to explore the adoption of a technology and/or its extended features. Technology developers should recognize the gaming preferences of the targeted silver generation (e.g. for games that are simple, enjoyable and resonant) and deploy relevant gaming elements to encourage technology adoption among senior users. This, in the fintech sector, would accelerate the adoption of financial services (e.g. e-payment, e-banking, customer service and support) that employ new technologies (e.g. face recognition, voice recognition and chatbots) among senior consumers. More importantly, incorporating a tailored gamified experience into the promotion and penetration strategies for the latest technologies will, in the long term, address the challenge of the digital inclusion of older people in society and ensure equality in access to services, such as financial inclusion (Diniz *et al.*, 2016), for all strata of society. Findings from this study can be used as an exemplar to provide guidance to other technology developers across different industries to develop efficient and effective game-oriented strategies to increase adoption and usage rates of technology, especially for those in the field of geriatrics, which could benefit the elderly but have not so far been positively received by them (e.g. wearable sensor technology, smart health services and smart homes) (Guo *et al.*, 2013; Kekade *et al.*, 2018; Portet *et al.*, 2013).

Second, the contextualization of gamification in this study is novel and differs from most research on gamification pertaining to game design (such as points, scores, badges and medals). The digitized red packet examined here not only represents a gamified experience that enhances technology adoption, but also encompasses the practice of an ancient Chinese culture and tradition. This suggests that cultural traditions are not a barrier to technology penetration. In fact, when technology firms discover and optimize the crossing points of traditions and technologies, the former could act as facilitators to catalyze the penetration of technology. However, caution is needed for technology developers espousing the use of cultural traditions in technology adoption. The cultural and/or traditional elements implemented need to be relevant to and resonant with the targeted audience in order to be a good fit for the intended technology. For example, in this study, a red packet traditionally indicates money-gifting behavior, particularly during festive times and auspicious occasions in Chinese culture. The implementation of mobile payment technology in this case is an intuitive fit. There needs to be acknowledgment of contextual factors in order to generate the theoretical understanding surrounding a phenomenon. This kind of cultural adoption in a digital context could be generalized and utilized in different cultures. For example, in Western cultures, a similar idea could be used to digitize individuals' gifting behaviors on special occasions, such as Christmas, birthdays and weddings. This might not only be related to the penetration of mobile/online payment technology, but also the further digitization of modern gift card culture. Extending the implications to a wider context, technology developers need to pay close attention to the cultural practices associated with the applications of the technology. After all, innovations that are consistent with the norms, customs and/or traditions within a society are more likely to be accepted.

Third, two key factors relating to gamification-elicited technology adoption among the silver generation warrant particular attention. First, gamification must serve the purpose of assisting senior users' discovery and exploration of a technology, as well as to highlight the usefulness of the technology. Allowing senior users to be 'edutained' by games might not only enable them to enjoy a gamified experience, but also to become familiar with and gain further knowledge of the functions of the technology. The idea of edutainment could be applied in emerging technologies that consumers may lack knowledge of and/or be resistant to, such as the internet of things, cloud computing, online health care, augmented reality and autonomous driving technologies. What can be inferred from this is that gamification could be utilized as an edutainment tool in an effective manner to motivate users, especially seniors, to develop a positive attitude and a favorable adoption intention toward new technology. Second, perceived risks remain a critical barrier that prevents seniors from actualizing the adoption of mobile payment, the key concerns being the potential loss of financial control and a lack of security. Although effective placement of gaming elements allows senior adults to develop a positive evaluation and behavioral tendency toward new technology, there is no room for complacency or over-optimism with the implementation of gamification. Risk concerns seem to prevent senior adults from adopting new technologies. Thus, marketing strategies implemented by technology developers need to be tailored accordingly, with careful consideration when targeting the silver generation. Technology firms could utilize different strategies to address the concerns regarding risk of this generation, such as offering assurances and guidance, providing community and social support, and encouraging peer-to-peer experience sharing, in addition to technical support (Sheikh *et al.*, 2019). With the increasing incorporation of gamification in technology, technology developers could consider adopting gamified instructions or quizzes to address risk-related doubts that senior users have, thereby facilitating their adoption of technology (Hamari, 2017).

8. Limitations and future research directions

This study adopted a unique sociocultural perspective in extending understanding of the impact of gamification on technology adoption, specifically from the viewpoint of the silver generation. Although this study makes several contributions, it also has several limitations. First, the study examined a single technology in an Eastern cultural context. Individuals' technology adoption behaviors have been found to be culture-specific and future research could examine cultural differences in gamification and their impact on senior users' technology adoption (Straub *et al.*, 1997). Second, the conceptualization of gamification in this study focused on its effectiveness in helping users' exploration of and involvement with multiple functions. Future research could examine the antecedents of the level of senior users' engagement with games and the mechanisms that influence adoption behaviors. Third, the latest digital red packet application supports user-to-user (U2U) and business-to-user (B2U) red packets. Future research could seek to identify the differences between U2U and B2U gamification in terms of motivation, engagement and effectiveness. Fourth, this study focused exclusively on the silver generation. It is suggested that future researchers conduct comparison studies between youths and seniors to identify distinctions between their perceptions of gaming elements incorporated in technology, thereby providing more insights into the development of gamification that would suit users of different ages (Comunello *et al.*, 2017). Fifth, this research identified perceived risks as a barrier that prevents senior consumers from adopting mobile payment technology. Future studies could also employ an exploratory approach to investigate senior technology users' risk-related psychological mechanisms and develop corresponding risk-reducing strategies that technology firms could implement in their product design and promotion.

References

Agag, G. and El-Masry, A. A. (2016), “Understanding consumer intention to participate in online travel community and effects on consumer intention to purchase travel online and WOM: An integration of innovation diffusion theory and TAM with trust”, *Computers in Human Behavior*, Vol. 60, pp. 97-111.

Ajzen, I. (1991), “The theory of planned behaviour”, *Organizational Behavior and Human Decision Processes*, Vol. 50 No. 2, pp. 179-211.

Ajzen, I. (2002), “Residual effects of past on later behavior: Habituation and reasoned action perspective”, *Personality and Social Psychology Review*, Vol. 6 No. 2, pp. 107-122.

Ajzen, I. (2005), *Attitudes, Personality, and Behavior*, McGraw-Hill Education, London.

Ajzen, I. and Fishbein, M. (1977), “Attitude-behavior relations: a theoretical analysis and review of empirical research”, *Psychological Bulletin*, Vol. 84 No. 5, p. 888.

Al-Jabri, I.M. and Sohail, M.S. (2012), “Mobile banking adoption: application of diffusion of innovation theory”, *Journal of Electronic Commerce Research*, Vol. 13 No. 4, pp. 379-391.

Altmeyer, M., Lessel, P. and Krüger, A. (2018), “Investigating gamification for seniors aged 75+”. In *Proceedings of the 2018 Designing Interactive Systems Conference* (pp. 453-458).

Arduini, D., Belotti, F., Denni, M., Giungato, G. and Zanfei, A. (2010), “Technology adoption and innovation in public services the case of e-government in Italy”, *Information Economics and Policy*, Vol. 22 No. 3, pp. 257–275.

Bandura, A. (1986), “The explanatory and predictive scope of self-efficacy theory”, *Journal of Social and Clinical Psychology*, Vol. 4 No. 3, pp. 359-373.

Baptista, G. and Oliveira, T. (2017), “Why so serious? Gamification impact in the acceptance of mobile banking services”, *Internet Research*, Vol. 27 No. 1, pp. 118-139.

Barclays (2019), *Ageing population: silver spending opportunities*, available at: https://privatebank.barclays.com/news-and-insights/2019/july/silver-spending-opportunities/ (accessed 8 October 2019).

Baron, R.M. and Kenny, D.A. (1986), “The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations”, *Journal of Personality and Social Psychology*, Vol. 51 No. 6, pp. 1173.

Bauer, R.A. (1960), “Consumer behavior as risk taking”, in Hancock, R.S. (Ed.), *Dynamic marketing for a changing world, proceedings of the 43rd American Marketing Association Conference in Chicago, IL, June*, pp. 389-398.

Bauer, R.A. (1967), “Consumer behavior as risk taking”, in Cox, D.F. (Ed.), *Risk Taking and Information Handling in Consumer Behavior*, Harvard University Press, Boston, MA, pp. 389-398.

Bayuk, J. and Altobello, S.A. (2019), “Can gamification improve financial behavior? The moderating role of app expertise”, *International Journal of Bank Marketing*, Vol. 37 No. 4, pp. 951-975.

Bennett, P.D. and Harrell, G.D. (1975), “An evaluation of the expectance/value model of attitude measurement for physical prescribing behavior”, *Journal of Marketing Research*, Vol. 11 No. 3, pp. 269-278.

Benson, V., Ezingeard, J.N. and Hand, C. (2018), “An empirical study of purchase behaviour on social platforms”, *Information Technology & People*, Vol. 32 No. 4, pp. 876-896.

Birnholtz, J. (2010), “Adopt, adapt, abandon: understanding why some young adults start, and then stop, using instant messaging”, *Computers in Human Behavior*, Vol. 26 No. 6, pp. 1427-1433.

Brigham, T.J. (2015), “An introduction to gamification: adding game elements for engagement”, *Medical Reference Services Quarterly*, Vol. 34 No. 4, pp. 471-480.

Buckley, P. and Doyle, E. (2017), “Individualising gamification: an investigation of the impact of learning styles and personality traits on the efficacy of gamification using a prediction market”, *Computers & Education*, Vol. 106 No. 1, pp. 43-55.

Burton-Jones, A. and Hubona, G.S. (2006), “The mediation of external variables in the technology acceptance model”, *Information & Management*, Vol. 43 No. 6, pp. 706-717.

Caffaro, F., Lundqvist, P., Micheletti Cremasco, M., Nilsson, K., Pinzke, S. and Cavallo, E. (2018), “Machinery-related perceived risks and safety attitudes in senior Swedish farmers”, *Journal of Agromedicine*, Vol. 23 No. 1, pp. 78-91.

Campbell, M.C. and Goldstein, R.C. (2001), “The moderating effect of perceived risk on consumers’ evaluations of product incongruity: Preference for the norm”, *Journal of Consumer Research*, Vol. 28 No. 3, pp. 439-449.

Cardador, M.T., Northcraft, G.B. and Whicker, J. (2017), “A theory of work gamification: something old, something new, something borrowed, something cool?”, *Human Resource Management Review*, Vol. 27 No. 2, pp. 353-365.

Chang, C.C., Hung, S.W., Cheng, M.J. and Wu, C.Y. (2015), “Exploring the intention to continue using social networking sites: the case of Facebook”, *Technological Forecasting and Social Change*, Vol. 95, pp. 48-56.

Chaouali, W. and Souiden, N. (2019), “The role of cognitive age in explaining mobile banking resistance among elderly people”, *Journal of Retailing and Consumer Services*, Vol. 50 No. 1, pp. 342-350.

Che, X. and Ip, B. (2017), *Social Networks in China*, Chandos Publishing, Cambridge, UK.

Chen, K. and Chan, A.H. (2011), “A review of technology acceptance by older adults”, *Gerontechnology*, Vol. 10 No. 1, pp. 1-12.

Chen, L., Gillenson, M.L. and Sherrell, D.L. (2002), “Enticing online consumers: an extended technology acceptance perspective”, *Information & Management*, Vol. 39 No. 8, pp. 705-719.

Chen, L.D. (2008), “A model of consumer acceptance of mobile payment”, *International Journal of Mobile Communications*, Vol. 6 No. 1, pp. 32-52.

Chesham, A., Wyss, P., Müri, R. M., Mosimann, U. P. and Nef, T. (2017), “What older people like to play: genre preferences and acceptance of casual games”, *JMIR Serious Games*, Vol. 5 No. 2, pp. 8-13.

Chiu, C.M., Hsu, M.H., Lai, H. and Chang, C. M. (2012), “Re-examining the influence of trust on online repeat purchase intention: the moderating role of habit and its antecedents”, *Decision Support Systems*, Vol. 53 No. 4, pp. 835-845.

Chiu, C.M., Wang, E.T., Fang, Y.H. and Huang, H.Y. (2014), “Understanding customers' repeat purchase intentions in B2C e-commerce: the roles of utilitarian value, hedonic value and perceived risk”, *Information Systems Journal*, Vol. 24 No. 1, pp. 85-114.

Choudrie, J., Junior, C.-O., McKenna, B. and Richter, S. (2018), “Understanding and conceptualising the adoption, use and diffusion of mobile banking in older adults: a research agenda and conceptual framework”, *Journal of Business Research*, Vol. 88, pp. 449-465.

Choudrie, J., Pheeraphuttharangkoon, S., Zamani, E. and Giaglis, G. (2014), “Investigating the adoption and use of smartphones in the UK: a silver-surfers perspective”, working paper, Hertfordshire Business School, University of Hertfordshire, available at: https://uhra.herts.ac.uk/handle/2299/13507 (accessed 2 February 2019).

Chung, J.E., Park, N., Wang, H., Fulk, J. and McLaughlin, M. (2010), “Age differences in perceptions of online community participation among non-users: An extension of the

Technology Acceptance Model", *Computers in Human Behavior,* Vol. 26 No. 6, pp. 1674-1684.

Chung, N. and Koo, C. (2015), "The use of social media in travel information search", *Telematics and Informatics*, Vol. 32 No. 2, pp. 215-229.

Comunello, F., Fernández Ardèvol, M., Mulargia, S. and Belotti, F. (2017), "Women, youth and everything else: age-based and gendered stereotypes in relation to digital technology among elderly Italian mobile phone users", *Media, Culture & Society*, Vol. 39 No. 6, pp. 798-815.

Conger, K. and Griffith, E. (2020), "As life moves online, an older generation faces a digital divide", *New York Times*, 27 March, available at: https://www.nytimes.com/2020/03/27/technology/virus-older-generation-digital-divide.html (accessed 4 April 2020).

Crespo, A.H. and Del Bosque, I.R. (2010), "The influence of the commercial features of the Internet on the adoption of e-commerce by consumers", *Electronic Commerce Research and Applications*, Vol. 9 No. 6, pp. 562-575.

Crosno, J.L. and Cui, A.P. (2014), "A multilevel analysis of the adoption of sustainable technology", *Journal of Marketing Theory and Practice*, Vol. 22 No. 2, pp. 209-224.

Dahlberg, T., Guo, J. and Ondrus, J. (2015), "A critical review of mobile payment research", *Electronic Commerce Research and Applications"*, Vol. 14 No. 5, pp. 265-284.

Davis, F.D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly*, Vol. 13 No. 3, pp. 319-340.

Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. (1989), "User acceptance of computer technology: a comparison of two theoretical models", *Management Science*, Vol. 35 No. 8, pp. 982-1003.

De Kerviler, G., Demoulin, N.T. and Zidda, P. (2016), "Adoption of in-store mobile payment: are perceived risk and convenience the only drivers?", *Journal of Retailing and Consumer Services*, Vol. 31 Iss. C, pp. 334-344.

de Luna, I.R., Liébana-Cabanillas, F., Sánchez-Fernández, J. and Muñoz-Leiva, F. (2019), "Mobile payment is not all the same: the adoption of mobile payment systems depending on the technology applied", *Technological Forecasting and Social Change*, Vol. 146, pp. 931-944.

Deng, Z., Mo, X. and Liu, S. (2014), "Comparison of the middle-aged and older users' adoption of mobile health services in China", *International Journal of Medical Informatics*, Vol. 83, pp. 210–224.

Deterding, S., Sicart, M., Nacke, L., O'Hara, K. and Dixon, D. (2011), "Gamification: using game-design elements in non-gaming contexts", in *CHI '11 extended abstracts on human factors in computing systems*, 7-12 May, Vancouver, Canada, Association for Computing Machinery, New York, pp. 2425-2428.

Di Giacomo, D., Ranieri, J., D'Amico, M., Guerra, F. and Passafiume, D. (2019), "Psychological barriers to digital living in older adults: computer anxiety as predictive mechanism for technophobia", *Behavioral Sciences*, Vol. 9 No. 9, pp. 96-108.

Diniz, E.H., Cernev, A.K. and Nascimento, E. (2016), "Mobile social money: an exploratory study of the views of managers of community banks", *Revista de Administração (São Paulo)*, Vol. 51 No. 3, pp. 299-309.

Diniz, E.H., Porto de Albuquerque, J. and Cernev, A. (2011), "Mobile money and payment: a literature review based on academic and practitioner", in *proceedings of SIG Global Development Fourth Annual Workshop in Shanghai, China, 3 December,* available at https://ssrn.com/abstract=2924669 (accessed 6 January 2020).

Douglas, S.P. and Craig, C.S. (2007), “Collaborative and iterative translation: an alternative approach to back translation”, *Journal of International Marketing*, Vol. 15 No. 1, pp. 30-43.

Eppmann, R., Bekk, M. and Klein, K. (2018), “Gameful experience in gamification: construction and validation of a Gameful Experience Scale [GAMEX]”, *Journal of Interactive Marketing*, Vol. 43 Iss. C, pp. 98-115.

European Commission (2018), “Silver economy study: how to stimulate the economy by hundreds of millions of euros per year”, report, 3 May, available at: https://ec.europa.eu/digital-single-market/en/news/silver-economy-study-how-stimulate-economy-hundreds-millions-euros-year (accessed 16 April 2019).

Fang, J., Shao, P. and Lan, G. (2009), “Effects of innovativeness and trust on web survey participation”, *Computers in Human Behavior*, Vol. 25 No. 1, pp. 144-152.

Featherman, M.S. and Pavlou, P.A. (2003), “Predicting e-services adoption: a perceived risk facets perspective”, *International Journal of Human-Computer Studies*, Vol. 59 No. 4, pp. 451-474.

Fernández-Ardèvol, M. (2011), “Interactions with and through mobile phones: what about the elderly population”, *Wi: Journal of Mobile Media,* available at: http://wi.mobilities.ca/interactions-with-and-through-mobile-phones-what-about-the-elderly-population/ (accessed 15 March 2019).

Filho, E.J.M.A., Gammarano, I.D.J.L.P. and Barreto, I.A. (2019), “Technology-driven consumption: digital natives and immigrants in the context of multifunctional convergence”, *Journal of Strategic Marketing*, available at: https://doi.org/10.1080/0965254X.2019.1656278 (accessed 18 August 2019)

Fitz-Walter, Z., Johnson, D., Wyeth, P., Tjondronegoro, D. and Scott-Parker, B. (2017), “Driven to drive? Investigating the effect of gamification on learner driver behavior, perceived motivation and user experience”, *Computers in Human Behavior*, Vol. 71, pp. 586-595.

Fornell, C. and Larcker, D.F. (1981), “Evaluating structural equation models with unobservable variables and measurement error”, *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.

Fox, G. and Connolly, R. (2018), “Mobile health technology adoption across generations: narrowing the digital divide”, *Information Systems Journal*, Vol. 28 No. 6, pp. 995-1019.

Gallagher, S.D. (2020), “Coronavirus: how to help the elderly and other vulnerable people during the outbreak”, *Independent*, available at: https://www.independent.co.uk/life-style/health-and-families/coronavirus-update-help-elderly-people-support-food-banks-uk-a9408871.html (accessed 4 April 2020).

Glynn, C.J., Huge, M.E. and Hoffman, L.H. (2012), “All the news that’s fit to post: a profile of news use on social networking sites”, *Computers in Human Behavior*, Vol. 28 No. 1, pp. 113-119.

Graafland, J. (2017), “Religiosity, attitude, and the demand for socially responsible products”, *Journal of Business Ethics*, Vol. 144 No. 1, pp. 121-138.

Griesel, D. (2018), “Three reasons why marketers shouldn’t overlook the silver generation”, *Forbes, 20 March,* available at: https://www.forbes.com/sites/forbesagencycouncil/2018/03/20/three-reasons-why-marketers-shouldnt-overlook-the-silver-generation/#23e5ee616437 (accessed 1 March 2019).

Günther, M., Kacperski, C. and Krems, J.F. (2020), “Can electric vehicle drivers be persuaded to eco-drive? A field study of feedback, gamification and financial rewards in Germany”, *Energy Research & Social Science*, Vol. 63, available at: https://doi.org/10.1016/j.erss.2019.101407 (accessed 25 December 2019)

Guo, X., Sun, Y., Wang, N., Peng, Z. and Yan, Z. (2013), “The dark side of elderly acceptance of preventive mobile health services in China”, *Electronic Markets*, Vol. 23 No. 1, pp. 49-61.

Gurhan-Canli, Z. and Batra, R. (2004), “When corporate image affects product evaluations: The moderating role of perceived risk”, *Journal of Marketing Research*, Vol. 41 No. 2, pp. 197- 205.

Ha, I., Yoon, Y. and Choi, M. (2007), “Determinants of adoption of mobile games under mobile broadband wireless access environment”, *Information & Management*, Vol. 44 No. 3, pp. 276-286.

Hamari, J. (2013), “Transforming homo economicus into homo ludens: a field experiment on gamification in a utilitarian peer-to-peer trading service”, *Electronic Commerce Research and Applications*, Vol. 12 No. 4, pp. 236-245.

Hamari, J. (2017), “Do badges increase user activity? A field experiment on the effects of gamification”, *Computers in Human Behavior*, Vol. 71, pp. 469-478.

Hamari, J. and Koivisto, J. (2013), “Social motivations to use gamification: an empirical study of gamifying exercise”, in *proceedings of the 21st European conference on information systems, Utrecht, Netherlands, 5-8 June.*

Hamari, J. and Koivisto, J. (2015), “Why do people use gamification services?”, *International Journal of Information Management*, Vol. 35 No. 4, pp. 419-431.

Hassan, L. M., Shiu, E., & Parry, S. (2016), “Addressing the cross-country applicability of the theory of planned behaviour (TPB): A structured review of multi-country TPB studies”, *Journal of Consumer Behaviour*, Vol. 15 No. 1, pp. 72-86.

Hayes, A.F. (2009), “Beyond Baron and Kenny: statistical mediation analysis in the new millennium”, *Communication Monographs*, Vol. 76 No. 4, pp. 408-420.

Helsper, E.J. (2010), “Gendered internet use across generations and life stages”, *Communication Research*, Vol. 37 No. 3, pp. 352-374.

Herrero, A. and San Martín, H. (2012), “Effects of the risk sources and user involvement on e-commerce adoption: application to tourist services”, *Journal of Risk Research*, Vol. 15 No. 7, pp. 841-855.

Herrero, A.H. and Del Bosque, I.R. (2010), “The influence of the commercial features of the Internet on the adoption of e-commerce by consumers”, *Electronic Commerce Research and Applications*, Vol. 9 No. 6, pp. 562-575.

Herz, M. and Rauschnabel, P.A. (2019), “Understanding the diffusion of virtual reality glasses: the role of media, fashion and technology”, *Technological Forecasting and Social Change*, Vol. 138, pp. 228-242.

Hew, J.J., Lee, V.H., Ooi, K.B. and Wei, J. (2015), “What catalyses mobile apps usage intention: an empirical analysis”, *Industrial Management & Data Systems*, Vol. 115 No. 7, pp. 1269-1291.

Ho, S. M., Ocasio-Velázquez, M., & Booth, C. (2017), “Trust or consequences? Causal effects of perceived risk and subjective norms on cloud technology adoption”, *Computers & Security*, Vol. 70, pp. 581-595.

Hofacker, C.F., De Ruyter, K., Lurie, N.H., Manchanda, P. and Donaldson, J. (2016), “Gamification and mobile marketing effectiveness”, *Journal of Interactive Marketing*, Vol. 34, pp. 25-36.

Hoffmann, C.P., Lutz, C. and Meckel, M. (2014), “Digital natives or digital immigrants? The impact of user characteristics on online trust”, *Journal of Management Information Systems*, Vol. 31 No. 3, pp. 138-171.

Högberg, J., Shams, P. and Wästlund, E. (2019), “Gamified in-store mobile marketing: the mixed effect of gamified point-of-purchase advertising”, *Journal of Retailing and Consumer Services*, Vol. 50, pp. 298-304.

Holmes, K., Balnaves, M. and Wang, Y. (2015), “Red bags and WeChat (Wēixìn): online collectivism during massive Chinese cultural events”, *Global Media Journal: Australian Edition*, Vol. 9 No. 1, pp. 15-26.

Hossain, M.M. and Prybutok, V.R. (2008), “Consumer acceptance of RFID technology: an exploratory study”, *IEEE Transactions on Engineering Management*, Vol. 55 No. 2, pp. 316-328.

Hsu, C.L. and Lin, J.C.C. (2016), “Effect of perceived value and social influences on mobile app stickiness and in-app purchase intention”, *Technological Forecasting and Social Change*, Vol. 108, pp. 42-53.

Hsu, S.H., Chang, J.W. and Lee, C.C. (2013), “Designing attractive gamification features for collaborative storytelling websites”, Cyberpsychology, Behavior, and Social Networking, Vol. 16 No. 6, pp. 428-435.

Hua, L. Y., Ramayah, T., Ping, T. A., & Jun-Hwa, C. (2017). Social media as a tool to help select tourism destinations: The case of Malaysia. *Information Systems Management*, *34*(3), 265-279.

Huang, C.K., Chen, C.D. and Liu, Y.T. (2019), “To stay or not to stay? Discontinuance intention of gamification apps”, *Information Technology & People*, Vol. 32 No. 6, pp. 1423-1445.

Huotari, K. and Hamari, J. (2012), “Defining gamification: a service marketing perspective”, in *MindTrek '12: proceeding of the 16th international academic MindTrek conference in Tampere, Finland*, *3-5 October*, Association for Computing Machinery, New York, pp. 17-22.

Huotari, K. and Hamari, J. (2017), “A definition for gamification: anchoring gamification in the service marketing literature”, *Electronic Markets*, Vol. 27 No. 1, pp. 21-31.

Hwang, J. and Choi, L. (2020), “Having fun while receiving rewards?: Exploration of gamification in loyalty programs for consumer loyalty”, *Journal of Business Research*, Vol. 106 Iss. C, pp. 365-376.

ITU News (2020), “Coronavirus: how can we help our elderly embrace technology?”, available at: https://news.itu.int/coronavirus-how-can-we-help-our-elderly-embrace-technology/ (accessed 4 April 2020).

Jacobs, H. (2018), “One photo shows that China is already in a cashless future”, *Business Insider*, 15 April, available at: https://www.businessinsider.com.au/alipay-wechat-pay-china-mobile-payments-street-vendors-musicians-2018-5 (accessed 6 April 2019).

Jang, S., Kitchen, P.J. and Kim, J. (2018), “The effects of gamified customer benefits and characteristics on behavioral engagement and purchase: evidence from mobile exercise application uses”, *Journal of Business Research*, Vol. 92, pp. 250-259.

Johnson, D., Deterding, S., Kuhn, K.A., Staneva, A., Stoyanov, S. and Hides, L. (2016), “Gamification for health and wellbeing: a systematic review of the literature”, *Internet Interventions*, Vol. 6, pp. 89-106.

Kahneman, D. and Tversky, A. (1979), “Prospect theory: an analysis of decision under risk”, *Econometrica,* Vol. 47 No. 2, pp. 263-291.

Kasilingam, D. L. (2020), “Understanding the attitude and intention to use smartphone chatbots for shopping”, *Technology in Society*, Vo. 62, pp.101280.

Kaufman - Scarborough, C. and Lindquist, J. (2002), “E - shopping in a multiple channel environment”, *Journal of Consumer Marketing*, Vol. 19 No. 4, pp. 333-350.

Kekade, S., Hseieh, C.H., Islam, M.M., Atique, S., Khalfan, A.M., Li, Y.C. and Abdul, S.S. (2018), “The usefulness and actual use of wearable devices among the elderly population”, *Computer Methods and Programs in Biomedicine*, Vol. 153, pp. 137-159.

Kim, E.M. and Yang, S. (2016), “Internet literacy and digital natives’ civic engagement: Internet skill literacy or Internet information literacy?”, *Journal of Youth Studies*, Vol. 19 No. 4, pp. 438-456.

Kim, J. and Forsythe, S. (2008), “Adoption of virtual try-on technology for online apparel shopping”, *Journal of Interactive Marketing*, Vol. *22 No.* 2, pp. 45-59.

Kim, S., Gajos, K.Z., Muller, M. and Grosz, B.J. (2016), “Acceptance of mobile technology by older adults: a preliminary study”, in *MobileHCI '16: proceedings of the 18th international conference on human-computer interaction with mobile devices and services in Florence, Italy, September*, Association for Computing Machinery, New York, pp. 147-157.

Kim, Y. and Crowston, K. (2011), “Technology adoption and use theory review for studying scientists' continued use of cyber-infrastructure”, *proceedings of the American Society for Information Science and Technology,* Vol. 48 No. 1, pp. 1-10.

Klapztein, S. and Cipolla, C. (2016), “From game design to service design: a framework to gamify services”, *Simulation & Gaming*, Vol. 47 No. 5, pp. 566-598.

Koivisto, J. and Hamari, J. (2014), “Demographic differences in perceived benefits from gamification”, *Computers in Human Behavior*, Vol. 35, pp. 179-188.

Koivisto, J. and Hamari, J. (2019), “The rise of motivational information systems: a review of gamification research”, *International Journal of Information Management*, Vol. 45, pp. 191-210.

Kominers, S.D. (2020), “Free good delivery for the elderly would be smart”, *Bloomberg Opinion*, 24 March, available at: https://www.bloomberg.com/opinion/articles/2020-03-24/coronvirus-food-delivery-services-have-opening-to-win-seniors (accessed 4 April 2020).

Kourouthanassis, P.E., Giaglis, G.M. and Karaiskos, D.C. (2010), “Delineating ‘pervasiveness’ in pervasive information systems: a taxonomical framework and design implications”, *Journal of Information Technology*, Vol. 25 No. 3, pp. 273-287.

Kumar, A. and Lim, H. (2008), “Age differences in mobile service perceptions: comparison of Generation Y and baby boomers”, *Journal of Services Marketing*, Vol. 22 No. 7, pp. 568-577.

Landers, R.N. (2019), “Gamification misunderstood: how badly executed and rhetorical gamification obscures its transformative potential”, *Journal of Management Inquiry*, Vol. 28 No. 2, pp. 137-140.

Landers, R.N., Auer, E.M. and Abraham, J.D. (2020), “Gamifying a situational judgment test with immersion and control game elements”, *Journal of Managerial Psychology*, available at: https://doi.org/10.1108/JMP-10-2018-0446 (accessed 1 April 2020).

Landers, R.N., Auer, E.M., Collmus, A.B. and Armstrong, M.B. (2018), “Gamification science, its history and future: definitions and a research agenda”, *Simulation & Gaming*, Vol. 49 No. 3, pp. 315-337.

Leclercq, T., Poncin, I. and Hammedi, W. (2020), “Opening the black box of gameful experience: implications for gamification process design”, *Journal of Retailing and Consumer Services*, Vol. 52, pp. 1-9.

Lee, M.C. (2009), “Factors influencing the adoption of internet banking: an integration of TAM and TPB with perceived risk and perceived benefit”, *Electronic Commerce Research and Applications*, Vol. 8 No. 3, pp. 130-141.

Liébana-Cabanillas, F. and Lara-Rubio, J. (2017), “Predictive and explanatory modeling regarding adoption of mobile payment systems”, *Technological Forecasting and Social Change*, Vol. 120, pp. 32-40.

Liébana-Cabanillas, F., Marinkovic, V., de Luna, I.R. and Kalinic, Z. (2018), "Predicting the determinants of mobile payment acceptance: a hybrid SEM-neural network approach", *Technological Forecasting and Social Change*, Vol. 129, pp. 117-130.

Liébana-Cabanillas, F., Molinillo, S. and Ruiz-Montañez, M. (2019), "To use or not to use, that is the question: analysis of the determining factors for using NFC mobile payment systems in public transportation", *Technological Forecasting and Social Change*, Vol. 139, pp. 266-276.

Liébana-Cabanillas, F., Sánchez-Fernández, J. and Muñoz-Leiva, F. (2014a), "Antecedents of the adoption of the new mobile payment systems: the moderating effect of age", *Computers in Human Behavior*, Vol. 35, pp. 464-478.

Liébana-Cabanillas, F., Sánchez-Fernández, J. and Muñoz-Leiva, F. (2014b), "The moderating effect of experience in the adoption of mobile payment tools in Virtual Social Networks: the m-Payment Acceptance Model in Virtual Social Networks (MPAM-VSN)", *International Journal of Information Management*, Vol. 34 No. 2, pp. 151-166.

Liébana-Cabanillas, F.J. (2012), "El papel de los sistemas de pago en lo nuevos entornos electrónicos", doctoral thesis, *Departmento de Commercializacion e Investigacion de Mercados*, Universidad de Granada, Granada.

Lien, C.H. and Cao, Y. (2014), "Examining WeChat users' motivations, trust, attitudes, and positive word-of-mouth: evidence from China", *Computers in Human Behavior*, Vol. 41, pp. 104-111.

Lim, H. and Lee, H.J. (2010), "Development of consumer techno segmentation and its application to international markets", *International Journal of Consumer Studies*, Vol. 34, pp. 87–95.

Loos, E. (2012), "Senior citizens: digital immigrants in their own country?", *Observatorio*, Vol. 6 No. 1, pp. 1-23.

Lorenz, A. and Oppermann, R. (2009), "Mobile health monitoring for the elderly: designing for diversity", *Pervasive and Mobile Computing,* Vol. 5, pp. 478–495.

Lucassen, G. and Jansen, S. (2014), "Gamification in consumer marketing - future or fallacy?", *Procedia-Social and Behavioral Sciences*, Vol. 148, pp. 194-202.

Ma, Q., Chan, A.H. and Chen, K. (2016), "Personal and other factors affecting acceptance of smartphone technology by older Chinese adults", *Applied Ergonomics*, Vol. 54, pp. 62-71.

Masamila, B., Mtenzi, F., Said, J. and Tinabo, R. (2010), "A secured mobile payment model for developing markets", in Zavoral, F., Yaghob, J., Pichappan, P. and El-Qawasmeh E. (Eds.) *Networked Digital Technologies. NDT 2010. Communications in computer and information science, vol 87*. Springer, Berlin, Heidelberg, pp. 175-182.

Mehrtens, J., Cragg, P.B. and Mills, A.M. (2001), "A model of Internet adoption by SMEs", *Information & Management*, Vol. 39 No. 3, pp. 165-176.

Metallo, C. and Agrifoglio, R. (2015), "The effects of generational differences on use continuance of Twitter: an investigation of digital natives and digital immigrants", *Behaviour & Information Technology*, Vol. 34 No. 9, pp. 869-881.

Moon, J.W. and Kim, Y.G. (2001), "Extending the TAM for a World-Wide-Web context", *Information & Management*, Vol. 38 No. 4, pp. 217-230.

Morris, M.G. and Venkatesh, V. (2000), "Age differences in technology adoption decisions: implications for a changing work force", *Personnel Psychology*, Vol. 53 No. 2, pp. 375-403.

Müller-Stewens, J., Schlager, T., Häubl, G. and Herrmann, A. (2017), "Gamified information presentation and consumer adoption of product innovations", *Journal of Marketing*, Vol. 81 No. 2, pp. 8-24.

Mullin, K. (2018), "China's cashless economy threatens to leave its elderly - and their money - behind", *Quartz*, 26 November, available at https://qz.com/1435320/chinas-cashless-economy-is-leaving-its-elderly-behind (accessed 16 December 2018).

Munoz-Leiva, F., Climent-Climent, S. and Liébana-Cabanillas, F. (2017), "Determinants of intention to use the mobile banking apps: an extension of the classic TAM model", *Spanish Journal of Marketing - ESIC*, Vol. 21 No. 1, pp. 25-38.

Naicker, V. and Van Der Merwe, D. (2018), "Managers' perception of mobile technology adoption in the life insurance industry", *Information Technology & People*, Vol. 31 No. 2, pp. 507-526.

Nikou, S. (2015), " Mobile technology and forgotten consumers: the young - elderly " , *International Journal of Consumer Studies*, Vol. 39 No. 4, pp. 294-304.

Norton, J.A. and Bass, F.M. (1987), "A diffusion theory model of adoption and substitution for successive generations of high-technology products", *Management Science*, Vol. 33 No. 9, pp. 1069-1086.

Oksman, V. (2006), "Young people and seniors in Finnish mobile information society", *Journal of Interactive Media in Education,* Vol. 2, pp. 1–21.

Paliwoda, S., Marinova, S. and Nilsson, D. (2007), "A cross-cultural comparison of self-service technology use", *European Journal of Marketing*, Vol. 41 No. 3, pp. 367-381.

Pan, S. and Jordan-Marsh, M. (2010), "Internet use intention and adoption among Chinese older adults: from the expanded technology acceptance model perspective", *Computers in Human Behavior*, Vol. 26 No. 5, pp. 1111-1119.

Patsiotis, A., Hughes, T. and Webber, D. (2012), "Adopters and non - adopters of internet banking: a segmentation study", *International Journal of Bank Marketing*, Vol. 30 No. 1, pp. 20-42.

Patsiotis, A., Hughes, T. and Webber, D. (2013), "An examination of consumers' resistance to computer-based technologies", *Journal of Services Marketing*, Vol. 27 No. 4, pp. 294-311.

Pedlow, R., Kasnitz, D. and Shuttleworth, R. (2010), "Barriers to the adoption of cell phones for older people with impairments in the USA: results from an expert review and field study", *Technology and Disability,* Vol. 22, pp. 147–158.

Plouffe, C.R., Vandenbosch, M. and Hulland, J. (2001), "Intermediating technologies and multi -group adoption: a comparison of consumer and merchant adoption intentions toward a new electronic payment system", *Journal of Product Innovation Management: An International Publication of The Product Development & Management Association*, Vol. 18 No. 2, pp. 65-81.

Poncin, I., Garnier, M., Mimoun, M.S.B. and Leclercq, T. (2017), "Smart technologies and shopping experience: are gamification interfaces effective? The case of the Smartstore", *Technological Forecasting and Social Change*, Vol. 124, pp. 320-331.

Portet, F., Vacher, M., Golanski, C., Roux, C. and Meillon, B. (2013), "Design and evaluation of a smart home voice interface for the elderly: acceptability and objection aspects", *Personal and Ubiquitous Computing*, Vol. 17 No. 1, pp. 127-144.

Povey, R., Conner, M., Sparks, P., James, R., & Shepherd, R. (2000), "The theory of planned behaviour and healthy eating: Examining additive and moderating effects of social influence variables", *Psychology & Health*, Vol. 14 No. 6, pp. 991-1006.

Preacher, K.J. and Hayes, A.F. (2008), "Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models", *Behavior Research Methods*, Vol. 40 No. 3, pp. 879-891.

Prensky, M. (2001), "Digital natives, digital immigrants part 1", *On the Horizon*, Vol. 9 No. 5, pp. 1-6.

Prestopnik, N., Crowston, K. and Wang, J. (2017), “Gamers, citizen scientists, and data: exploring participant contributions in two games with a purpose”, *Computers in Human Behavior*, Vol. 68, pp. 254-268.

Prestopnik, N.R. and Crowston, K. (2011), “Gaming for (citizen) science: exploring motivation and data quality in the context of crowdsourced science through the design and evaluation of a social-computational system”, in *2011 IEEE seventh international conference on e-science workshops in Stockholm, Sweden, 5-8 December*, IEEE, Piscataway, NJ, pp. 28-33.

Priporas, C.V., Stylos, N. and Fotiadis, A.K. (2017), “Generation Z consumers' expectations of interactions in smart retailing: a future agenda”, *Computers in Human Behavior*, Vol. 77, pp. 374-381.

PwC (2019), “*Global Consumer Survey Collection 2019”*, PwC, available at: https://www.pwc.com/gx/en/industries/consumer-markets/consumer-insights-survey/2019/consumer-insights-survey/interviews/metro.html (accessed 10 October 2019).

Qasim, H. and Abu-Shanab, E. (2016), “Drivers of mobile payment acceptance: the impact of network externalities”, *Information Systems Frontiers*, Vol. 18 No. 5, pp. 1021-1034.

Rahman, S.A., Taghizadeh, S.K., Ramayah, T. and Alam, M.M.D. (2017), “Technology acceptance among micro-entrepreneurs in marginalized social strata: the case of social innovation in Bangladesh”, *Technological Forecasting and Social Change*, Vol. 118, pp. 236-245.

Ramanathan, S. and McGill, A.L. (2007), “Consuming with others: social influences on moment-to-moment and retrospective evaluations of an experience”, *Journal of Consumer Research*, Vol. 34 No. 4, pp. 506-524.

Robson, K., Plangger, K., Kietzmann, J.H., McCarthy, I. and Pitt, L. (2015), “Is it all a game? Understanding the principles of gamification”, *Business Horizons*, Vol. 58 No. 4, pp. 411-420.

Rodrigues, L.F., Costa, C.J. and Oliveira, A. (2016), “Gamification: a framework for designing software in e-banking”, *Computers in Human Behavior*, Vol. 62, pp. 620-634.

Rodrigues, L.F., Costa, C.J. and Oliveira, A. (2017), “How does the web game design influence the behavior of e-banking users?”, *Computers in Human Behavior*, Vol. 74, pp. 163-174.

Rodrigues, L.F., Oliveira, A. and Costa, C.J. (2016), “Playing seriously - how gamification and social cues influence bank customers to use gamified e-business applications”, *Computers in Human Behavior*, Vol. 63, pp. 392-407.

Rotchanakitumnuai, S. and Speece, M. (2003), “Barriers to Internet banking adoption: a qualitative study among corporate customers in Thailand”, *International Journal of Bank Marketing*”, Vol. 21 No. 6/7, pp. 312-323.

Rouibah, K., Lowry, P.B. and Hwang, Y. (2016), “The effects of perceived enjoyment and perceived risks on trust formation and intentions to use online payment systems: new perspectives from an Arab country”, *Electronic Commerce Research and Applications*, Vol. 19, pp. 33-43.

Schierz, P.G., Schilke, O. and Wirtz, B.W. (2010), “Understanding consumer acceptance of mobile payment services: an empirical analysis”, *Electronic Commerce Research and Applications*, Vol. 9 No. 3, pp. 209-216.

Selwyn, N. (2004), “Exploring the role of children in adults’ adoption and use of computers”, *Information Technology & People*, Vol. 17 No. 1, pp. 53-70.

Seto, E., Leonard, K.J., Masino, C., Cafazzo, J.A., Barnsley, J. and Ross, H.J. (2010), “Attitudes of heart failure patients and health care providers towards mobile phone-based remote monitoring”, *Journal of Medical Internet Research,* Vol. 12, p. 55-63.

Sheikh, Z., Yezheng, L., Islam, T., Hameed, Z. and Khan, I.U. (2019), “Impact of social commerce constructs and social support on social commerce intentions”, *Information Technology & People*, Vol. 32 No. 1, pp. 68-93.

Sheng, X. and Zolfagharian, M. (2014), “Consumer participation in online product recommendation services: augmenting the technology acceptance model”, *Journal of Services Marketing*, Vol. 28 No. 6, pp. 460-470.

Shin, D.H. (2013), “Defining sociability and social presence in Social TV”, *Computers in Human Behavior*, Vol. 29 No. 3, pp. 939-947.

Shin, D.H. and Kim, J. (2015), “Social viewing behavior in social TV: proposing a new concept of socio-usability”, *Online Information Review*, Vol. 39 No. 3, pp. 416-434.

Skinner, H., Sarpong, D. and White, G.R.T. (2018), “Meeting the needs of the Millennials and Generation Z: gamification in tourism through geocaching”, *Journal of Tourism Futures*, Vol. 4 No. 1, pp. 93-104.

Stockless, A. (2018), “Acceptance of learning management system: the case of secondary school teachers”, *Education and Information Technologies*, Vol. 23 No. 3, pp. 1101-1121.

Straub, D., Keil, M. and Brenner, W. (1997), “Testing the technology acceptance model across cultures: a three country study”, *Information & Management*, Vol. 33 No. 1, pp. 1-11.

Taipale, S. (2016), “Synchronicity matters: defining the characteristics of digital generations”, *Information, Communication & Society*, Vol. 19 No. 1, pp. 80-94.

Tan, W.K. (2018), “Gamification in aquarium context: intention to play game that imparts knowledge and promotes marine animal conservation”, *Information Technology & People*, Vol. 31 No. 6, pp. 1070-1090.

Terry, D. J., & Hogg, M. A. (1996). Group norms and the attitude-behavior relationship: A role for group identification. Personality and social psychology bulletin, 22(8), 776-793.

Tilvawala, K., Myers, M.D. and Sundaram, D. (2011), “Design of ubiquitous information systems for digital natives”, in *PACIS 2011 proceedings, 192*, available at: http://aisel.aisnet.org/pacis2011/192 (accessed 6 January 2020).

Tuu, H. H., & Olsen, S. O. (2012), “Certainty, risk and knowledge in the satisfaction-purchase intention relationship in a new product experiment”, *Asia Pacific Journal of Marketing and Logistics*, Vol. 24 No. 1, pp. 78-101.

United Nations (2018), “World population review: world population prospects”, available at: http://worldpopulationreview.com/ (accessed 5 June 2019).

Vallespín, M., Molinillo, S. and Muñoz-Leiva, F. (2017), “Segmentation and explanation of smartphone use for travel planning based on socio-demographic and behavioral variables”, *Industrial Management & Data Systems*, Vol. 117 No. 3, pp. 605-619.

van der Heijden, H. (2004), “User acceptance of hedonic information systems”, *MIS Quarterly*, Vol. 28 No. 4, pp. 695-704.

Venkatesh, V. (2000), “Determinants of perceived ease of use: integrating control, intrinsic motivation, and emotion into the technology acceptance model”, *Information Systems Research*, Vol. 11 No. 4, pp. 342-365.

Venkatesh, V. and Davis, F.D. (2000), “A theoretical extension of the technology acceptance model: four longitudinal field studies”, *Management Science*, Vol. 46 No. 2, pp. 186-204.

Vodanovich, S., Sundaram, D. and Myers, M. (2010), “Research commentary - digital natives and ubiquitous information systems”, *Information Systems Research*, Vol. 21 No. 4, pp. 711-723.

Wakefield, R.L., Wakefield, K.L., Baker, J. and Wang, L.C. (2011), “How website socialness leads to website use”, *European Journal of Information Systems*, Vol. 20 No. 1, pp. 118-132.

Wang, K., Akar, G. and Chen, Y.J. (2018), "Bike sharing differences among millennials, Gen Xers, and baby boomers: lessons learnt from New York City's bike share", *Transportation Research Part A: Policy and Practice*, Vol. 116, pp. 1-14.

Wang, Q. and Sun, X. (2016), "Investigating gameplay intention of the elderly using an Extended Technology Acceptance Model (ETAM)", *Technological Forecasting and Social Change*, Vol. 107, pp. 59-68.

Werbach K. (2014), "(Re)Defining gamification: a process approach", in Spagnolli A., Chittaro L., Gamberini L. (Eds)., *Persuasive Technology. Persuasive 2014.* Lecture Notes in Computer Science, Vol 8462, Springer, Cham.

Wildau, G. and Jia, Y. (2019), "Chinese merchants refuse cash as mobile payments take off", *Financial Times,* 1 January, available at: https://www.ft.com/content/a97d76de-035e-11e9-99df-6183d3002ee1 (accessed 2 June 2019).

Worthington, S., Thompson, F.M. and Stewart, D.B. (2011), "Credit cards in a Chinese cultural context - the young, affluent Chinese as early adopters", *Journal of Retailing and Consumer Services*, Vol. 18 No. 6, pp. 534-541.

Wu, J., Liu, L. and Huang, L. (2016), "Exploring user acceptance of innovative mobile payment service in emerging market: the moderating effect of diffusion stages of WeChat Payment in China", in *PACIS 2016 proceedings, 238*, available at: https://aisel.aisnet.org/pacis2016/238 (accessed 1 June 2019).

Wu, J., Liu, L. and Huang, L. (2017), "Consumer acceptance of mobile payment across time: antecedents and moderating role of diffusion stages", *Industrial Management & Data Systems*, Vol. 117 No. 8, pp. 1761-1776.

Wu, J.H., Peng, L., Li, Q. and Chen, Y.C. (2016), "Falling in love with online shopping carnival on singles' day in China: an uses and gratifications perspective", in *2016 IEEE/ACIS 15th international conference on computer and information science (ICIS) in Okayama, Japan 26-29 June*, IEEE, Piscataway, NJ.

Xu, X., Thong, J.Y. and Tam, K.Y. (2017), "Winning back technology disadopters: testing a technology readoption model in the context of mobile internet services", *Journal of Management Information Systems*, Vol. 34 No. 1, pp. 102-140.

Yang, Y., Asaad, Y. and Dwivedi, Y. (2017), "Examining the impact of gamification on intention of engagement and brand attitude in the marketing context", *Computers in Human Behavior*, Vol. 73, pp. 459-469.

Yang, Y., Liu, Y., Li, H. and Yu, B. (2015), "Understanding perceived risks in mobile payment acceptance", *Industrial Management & Data Systems*, Vol. 115 No. 2, pp. 253-269.

Yuan, M. (2018), "China's silver generation has money and time to spend", *East West Bank*, 15 October, available at: https://www.eastwestbank.com/ReachFurther/en/News/Article/Chinas-Silver-Generation-Has-Money-and-Time-to-Spend (accessed 12 December 2018).

Zhang, A., Yue, X. and Kong, Y. (2011), "Exploring culture factors affecting the adoption of mobile payment", in *2011 10th international conference on mobile business in Como, Italy, 20-21 June*, pp. 263-267.

Zhang, T.C., Omran, B.A. and Cobanoglu, C. (2017), "Generation Y's positive and negative eWOM: use of social media and mobile technology", *International Journal of Contemporary Hospitality Management*, Vol. 29 No. 2, pp. 732-761.

Zhao, X., Lynch Jr, J.G. and Chen, Q. (2010), "Reconsidering Baron and Kenny: myths and truths about mediation analysis", *Journal of Consumer Research*, Vol. 37 No. 2, pp. 197-206.

Zheng, L. (2019), "The role of consumption emotions in users' mobile gaming application continuance intention", *Information Technology & People*, Vol. 33 No. 1, pp. 340-360.

Zhou, Y., Liu, X.Y. and Hong, Y. (2012), “When Western HRM constructs meet Chinese contexts: validating the pluralistic structures of human resource management systems in China”, *The International Journal of Human Resource Management*, Vol. 23 No. 19, pp. 3983-4008.

Zichermann, G. and Linder, J. (2010), *Game-based Marketing: Inspire Customer Loyalty Through Rewards, Challenges, and Contests*, John Wiley & Sons.

Appendix A Validated scale items

Adoption intention (AI; Rodrigues, Costa and Oliveira, 2016)

AI1	I would be willing to adopt WeChat Pay
AI2	I intend to use WeChat Pay in future
AI3	I have a strong desire to interact further with WeChat Pay

Attitude toward the use of technology (ATT; Ajzen, 1991)

ATT1	All things considered, I find using WeChat Pay to be a good idea
ATT2	All things considered, I find using WeChat Pay to be a positive thing
ATT3	All things considered, I find using WeChat Pay to be favorable

Perceived enjoyment of the game (PE; Davis, 1989; Koivisto and Hamari, 2014)

PE1	I find the experience of WeChat *hongbao* pleasant
PE2	I find the experience of WeChat *hongbao* exciting
PE3	I find the experience of WeChat *hongbao* interesting

Perceived effectiveness of gamification (PEG; Rodrigues, Oliveira and Costa, 2016; Wu, Peng, Li and Chen, 2016)

PEG1	The WeChat *hongbao* game facilitates the efficient use of WeChat and its extended functions
PEG2	The WeChat *hongbao* game extends my ability to investigate products and services offered by WeChat
PEG3	The WeChat *hongbao* game increases my involvement in the WeChat app

Perceived ease of use (PEOU; Venkatesh and Davis, 2000; Wakefield *et al*., 2011)

PEOU1	It would not be time consuming to make a payment on WeChat Pay
PEOU2	I think using WeChat Pay to make payments would not require a lot of effort
PEOU3	I think WeChat Pay is easy to use

Perceived risks (PR; Wu *et al*., 2017)

PR1	I think using WeChat Pay would put my privacy at risk
PR2	I think using WeChat Pay in monetary transactions online has potential risks
PR3	I think using WeChat Pay has significant risks in making online purchases
PR4	I think using WeChat Pay is a risky choice

Perceived usefulness (PU; Wu *et al*., 2017)

PU1	I think using WeChat Pay would make it easier for me to conduct transactions
PU2	I think using WeChat Pay would increase my efficiency
PU3	I think using WeChat Pay would enable me to pay more quickly

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Tables and Figures

Table 1 Key studies on the conceptualization of gamification

Authors	Conceptualization	Methodology and sampling	Applied technology	Key findings
Zichermann and Linder (2010, p. 20)	"The art and science of turning your customer's everyday interactions into games that serve your business purposes."	Textbook	Customer loyalty program	N/A
Deterding *et al.* (2011, p. 1)	"Use of video game elements in non-gaming systems to improve user experience (UX) and user engagement."	Conceptual study	Human-computer interaction (in general)	N/A
Huotari and Hamari (2012, p. 19)	"A process of enhancing a service with affordances for gameful experiences in order to support the user's overall value creation."	Conceptual study	Gamified service designs	N/A
Hamari and Koivisto (2013, p. 2)	"Service design aimed at providing game-like experiences to users, commonly with the end-goal of affecting user behavior."	Survey (107 users)	Gamified exercise online service community	Social factors (e.g. network effects, social influence, recognition, and reciprocal benefits) predict the attitude toward gamification, continuance intention and word of mouth.
Hsu *et al.* (2013, p. 428)	"The incorporation of game mechanics into nongame settings, which aims to increase users' engagement of the product or service and facilitate certain behaviors."	Mixed method: focus groups and online survey (6,333 users)	Collaborative storytelling website	Identified key attractive gamification features of collaborative storytelling websites (e.g. clear relationship between act and rewards, time pressure and ease of learning, etc.).
Werbach (2014, p. 6)	"The process of making activities more game-like."	Conceptual study	Persuasive technology	N/A

Rodrigues, Costa and Oliveira (2016, p. 622)	“Gamification is the process of integrating game features in a business website, to drive customers participation and engagement (Bunchball, 2010), and is the process of making business activities more game-like (Werbach, 2014).”	Survey (n=53)	Five cases of gamified banking software	Identified the most important software features in e-banking software design with gaming elements.
Rodrigues, Oliveira and Costa (2016, p. 394)	“Gamification is the use of game design elements in non-game contexts.”	Online survey (n=183)	Online digital animation software within e-banking	Gamification positively relates to e-banking adoption and affects the banking business (having a positive business impact).
Cardador *et al.* (2017 p. 355)	“Work gamification can be thought of as an approach to performance management that uses technology to create real time access to performance information and make tasks more enjoyable.”	Conceptual study	Points, badges, levels, leaderboards, and character sheets used in work gamification	Proposes a theory of work gamification.
Huotari and Hamari (2017, p. 25)	“A process of enhancing a service with affordances for gameful experiences in order to support users’ overall value creation.”	Conceptual study	N/A	Conceptualizes the consumer as a co-producer of gamification.
Landers *et al.* (2018, p. 318)	“Gamification science can be defined as a social scientific, post-positivist subdiscipline of game science that explores the various design techniques, and related concerns, that can be used to add game elements to existing real-world processes.”	Conceptual study	N/A	Conceptualizes gamification science within a post-positivist epistemology.

Table 2 Descriptive statistics (n=419)

Variables	Categories	Frequency	Percentage
Gender	Female	248	59.2
	Male	171	40.8
Age	50-60	335	80.0
	61-70	62	14.8
	71 -80	22	5.3
Employment	Retired	149	35.6
	Housewife/husband	80	19.1
	Full-time employee	94	22.4
	Part-time employee	19	4.5
	Self-employed	50	11.9
	Freelancer	26	6.2
	Other	1	0.2
Monthly income	< 2,000 yuan	14	3.3
	2,001-5,000 yuan	160	38.2
	5,001-8,000 yuan	131	31.3
	8,001-11,000 yuan	58	13.8
	11,001-14,000 yuan	35	8.4
	> 14,000 yuan	21	5.0
Length of use	< 1 year	10	2.4
	1-2 years	42	10.0
	2-3 years	245	58.5
	3-4 years	79	18.8
	> 4 years	43	10.3

Table 3 Results of measurement model

Constructs	α	CR[a]	AVE	Mean	SD	N[b]	AI	PE	PEOU	PEG	ATT	PU
AI	.85	0.87	0.69	5.80	.93	3	**0.83**					
PE	.94	0.94	0.84	6.16	1.11	3	0.18***	**0.92**				
PEOU	.81	0.81	0.59	5.26	.78	3	0.43***	0.08	**0.77**			
PEG	.83	0.83	0.63	5.61	.78	3	0.17**	0.59***	0.07	**0.79**		
ATT	.86	0.86	0.67	5.78	.89	3	0.51***	0.32***	0.56***	0.22***	**0.82**	
PU	.85	0.86	0.66	5.52	.86	3	0.76***	0.18***	0.67***	0.11*	0.57***	**0.82**

Note: *n* = 419; AI = adoption intention; ATT = attitude; PE = perceived enjoyment; PEG = perceived effectiveness of gamification; PEOU = perceived ease of use; PU = perceived usefulness.

a Composite reliability;
b Number of items in each validated measure;
Significance of correlations: * p < .05; ** p < 0.01; *** p < 0.001

Table 4 Results of direct effect hypotheses, mediation and moderation tests

				Bootstrap bias-corrected method 95% CI		
		Unstandardized estimates	**SE**	**Lower**	**Upper**	***p***
Direct effects						
H_1	PE → PEG	.44	.03	.36	.50	.00
H_2	PEG → ATT	.19	.05	.08	.29	.00
H_3	PEOU → ATT	.32	.05	.23	.42	.00
H_6	ATT → AI	.81	.09	.65	.96	.00
Indirect effects						
H_4	PEG on ATT via PU	.05	.02	.02	.10	.00
H_5	PEOU on ATT via PU	.28	.04	.19	.38	.00
Interaction						
H_7	PR × ATT on AI	-.09	.03	-.18	.00	.00

Note: AI = adoption intention; ATT = attitude; CI = confidence interval; PE = perceived enjoyment; PEG = perceived effectiveness of gamification; PEOU = perceived ease of use; PR = perceived risk; PU = perceived usefulness.

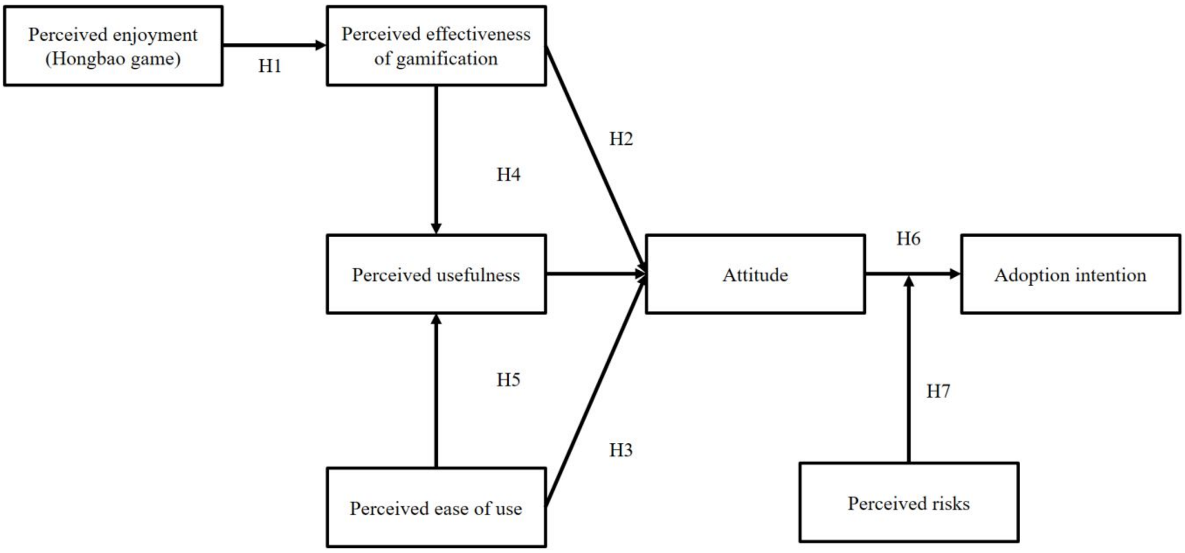
Table 5 Models with and without moderation

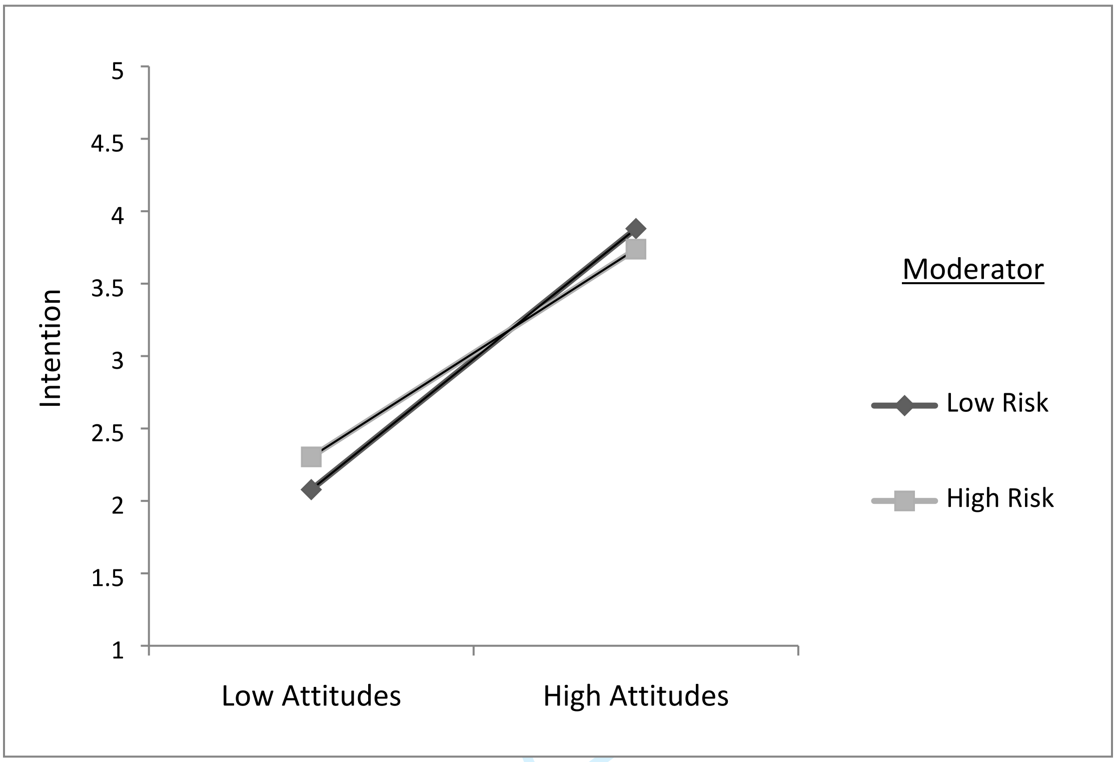
	Model 1 (without moderation)	Model 2 (with moderation)
Direct effects		
PE → PEG	.46**	.44**
PEG → PU	.12**	.05
PEOU → PU	.62**	.63**
PEG → ATT	.44**	.19**
PU → ATT	.22**	.35**
PEOU → ATT	.41**	.32**
ATT → AI	.98**	.81**
PR → AI		.02
Interaction term		
PR x ATT		-.09**
Model fit indices	χ^2/df = 2.86; IFI = .96; TLI = .95; CFI = .96; RMSEA = .07; SRMR = .07	χ^2/df = 2.03; IFI = .99; TLI = .97; CFI = .99; RMSEA = .05; SRMR = .06

* p < .05

** p < .01

Figure 1 Conceptual model


Perceived enjoyment (Hongbao game)
H1
Perceived effectiveness of gamification
H2
H4
Perceived usefulness
Attitude
H6
Adoption intention
H5
H7
H3
Perceived ease of use
Perceived risks

Figure 2 Moderating effect of perceived risks on attitude and adoption intention