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Does gamification affect brand engagement and equity? A study in online brand communities

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ABSTRACT

Gamification has become a popular technique in marketing. Many companies believe that gamification can potentially increase the engagement, awareness and loyalty of consumers with respect to the brand. However, there is current dearth of empirical evidence supporting these beliefs beyond the pervasive hype. In this study we investigated the relationships between gamification, brand engagement and brand equity among consumers (N = 824) of two online gamified brand communities. The results showed that achievement and social interaction -related gamification features were positively associated with all three forms of brand engagement (emotional, cognitive and social). Immersion -related gamification features were only positively associated with social brand engagement. Additionally, brand engagement was further positively associated with brand equity. The results imply that gamification can positively affect brand engagement and further increase brand equity, and that gamification appears to be an effective technique for brand management.

1. Introduction

As consumer engagement towards the brand is considered a key aspect of company equity and capital (Keller, 2001), a lot of attention in marketing domain has been cast on the question of how the consumer can be made loyal and aware of the brand (Leckie, Nyadzayo, & Johnson, 2016). The thinking around this question has evolved over the years from transaction-based perspective to relationship -based marketing perspective and finally to engaging customers in all possible ways (Pansari & Kumar, 2017). However, it has been observed that most marketing efforts towards engaging the consumers such as customer loyalty programs, point-based management and membership systems which are commonly based on monetary and material rewards have been postulated to be less efficient in garnering long-term loyalty compared to strategies that may garner intrinsic need satisfaction (Dholakia, 2006; Dorotic, Bijmolt, & Verhoef, 2012) such as gamification (Hamari, 2019; Sailer, Hense, Mayr, & Mandl, 2017; Wolf, Weiger, & Hammerschmidt, 2019; Xi & Hamari, 2019).

At the same time, games have become to be considered a pinnacle of engaging interactions without extrinsic or utilitarian reasons (Granic, Lobel, & Engels, 2014; Hamari & Keronen, 2017; Mallon & Lynch, 2014; Malone, 1981; Ryan, Rigby, & Przybylski, 2006) sometimes even to the degree of addiction (Grüsser, Thalemann, & Griffiths, 2006). Therefore, it is not surprising that marketing practitioners have recently started seeking for solutions to consumer engagement hurdles from the realm of video games (Hofacker, De Ruyter, Lurie, Manchanda, & Donaldson, 2016; Huotari & Hamari, 2017; Wolf et al., 2019; Wünderlich, Gustafsson, Hamari, Parvinen, & Haff, 2019). The phenomenon of transforming services and products to be more game-like is called gamification (Hamari, 2019; Huotari & Hamari, 2017) and has become one of the largest technology trends during the last decade. Therefore, majority of firms are interested to employ gamification as means to increase consumers' motivation to engage with their brands. However, after considerable investments in gamification, many gamified business projects have largely failed (Amalgam Insights, 2018), which has caused companies to gradually lose confidence in the role of gamification in building strong customer-brand connection. Thus, there exist extreme polar ends in terms of the belief companies have in the effectiveness of gamification in brand management.

According to existing studies, gamification has been found to be positively associated with brand attitude (Terlutter & Capella, 2013; Yang, Asaad, & Dwivedi, 2017), brand awareness (Lucassen & Jansen, 2014), brand engagement (Berger, Schlager, Sprott, & Herrmann, 2017; Harwood & Garry, 2015; Robson, Plangger, Kietzmann, McCarthy, & Pitt, 2016), brand involvement (Nobre & Ferreira, 2017) and brand love (Hsu & Chen, 2018a). While most research investigates the effect of

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Table 1
Extant empirical studies related the to relationship between gamification and brand management.

Source	Independent variable	Mediator variable	Dependent variable	Methodology	Key findings
Berger et al. (2017)	High interactivity; optimal challenge	Emotional brand engagement; cognitive brand engagement	Self-brand connection	Experiment	Gamified interactions that are highly interactive and optimally challenging facilitate self-brand connections.
Gatautis et al. (2016)	Game component and game mechanics	N/A	Cognitive, emotional and behavioral brand engagement	Survey	Gamification is positively related to consumer brand engagement, but the relation is rather weak.
Harwood and Garry (2015)	Challenge, tasks, rewards, badges, leaderboard and win condition	Customer engagement behaviors, fun/enjoyment (flow), dissatisfaction	Reward, relationship, loyalty, subversion	Netnographic approach	The findings identify key processes and outcomes of CE and CEB within virtual gamified platforms.
Hsu and Chen (2018b)	Perceived mobility, utilitarian and hedonic features	User experience; perceived benefits; perceived values	Brand equity (perceived quality, loyalty, associations, trust)	Web-based survey	Mobility has a significant impact on utilitarian & hedonic features, while mobility and utilitarian and hedonic features influence user experience, which affects brand equity.
Lucassen and Jansen (2014)	Gamification mechanisms	N/A	Brand engagement, brand awareness and brand loyalty	Interview and case studies	There is a promising future for the gamification industry.
Robson et al. (2016)	Key gamification mechanics for player types	N/A	Engagement of customers and employees	Case study	Gamification can create engaging customer experiences to improve the way customers interact with a brand or firm.
Summers and Young (2016)	Four categories: challenge, curiosity, fantasy, and control	N/A	Brand engagement	Case study	Not all gamification elements have the same effect on brand engagement.
Xu et al. (2017)	Game design elements	N/A	Brand awareness, engagement, tourist experiences, engagement and customer loyalty, entertainment and employee management	Case study	Gamification increases brand awareness and loyalty to the destination.
Yang et al. (2017)	Perceived – usefulness – ease of use – social influence – enjoyment	Intention of engagement	Brand attitude	Focus group and survey	Studied usefulness and enjoyment as predictors to engagement intention and brand attitude. Ease of use was not significantly related to engagement intention and brand attitude; social influence was not related to engagement intention.

gamification on an overall level or simply by having gamification as a research context, more granular and detailed research on gamification and marketing is still scarce (Koivisto & Hamari, 2019; Rapp, Hopfgartner, Hamari, Linehan, & Cena, 2018). Particularly, much of the published research has failed to investigate how different categories of gamification design affect different marketing outcomes or consumer engagement dimensions beyond qualitative exploratory investigations (Lucassen & Jansen, 2014; Robson et al., 2016). Therefore, there is a dearth of evidence on the effectiveness of gamification beyond the simple results that gamification seems to be generally useful. More importantly, brand equity as the main construct to measure the strength or value of a brand has not been studied as the dependent variable in current gamification -related literature. Thus, there is a research gap in the mechanisms of how gamification can increase brand engagement and brand equity.

To fill the current research gap, the objective of this study is to investigate the relationships between the three main categories of gamification features (immersion, achievement and social interaction-related), and the three main dimensions of brand engagement (emotional, cognitive and social) and further brand equity. We conducted an online survey among users (N = 824) of gamified brand communities of Xiaomi and Huawei, which are two successful gamified services in China. This study adds to the current body of literature in gamification and marketing fields by providing empirical evidence on the relationships between different gamification categories, dimensions of brand engagement and brand equity, as well as practical insights into which gamification categories are preferable to use, depending on the target brand engagement sought.

2. Background and hypotheses

2.1. Background

Gamification refers to the design approach that attempts to bring about similar positive experiences as those seen in games, and consequently affect user behavior and cognitive processes (Hamari, 2019; Huotari & Hamari, 2017). In the literature, definitions of gamification commonly focus on either the experiential aspect (the gameful experience - e.g. the pursuit of satisfying the intrinsic need: e.g. Högberg, Hamari, & Wästlund, 2019) or the game design (e.g. what elements of design can be used in gamification: e.g. Deterding, Dixon, Khaled, & Nacke, 2011). In research related to game design, gamification and player typologies, a distinction is generally made between three primary categories of game mechanics and game-design related gaming motivations: immersion -related, achievement -related, and social interaction -related dimensions (2007; Hamari & Tuunanen, 2014; Hamari, Koivisto, & Sarsa, 2014; Koivisto & Hamari, 2019; Peng, Lin, Pfeiffer, & Winn, 2012; Snodgrass, Dengah, Lacy, & Fagan, 2013; Yee, 2006; Yee, Ducheneaut, & Nelson, 2012) which also appear to be intuitively connected with the dimensions of intrinsic need satisfaction (immersion-autonomy, achievement-competence and social -relatedness) in terms of self-determination theory (Ryan & Deci, 2000) as well as established in literature that examine the relationship between them (e.g. Wolf et al., 2019; Xi & Hamari, 2019). Therefore, the classification of gamification design into achievement, immersion and social interaction -related draws support from several veins of literature on different fields.

Immersion -related features primarily try to immerse the player in self-directed inquisitive activity, including game mechanics such as avatars, storytelling, narrative structures, roleplay mechanics, etc. *Achievement -related* features primarily attempt to enhance the players' sense of accomplishment, and include such game mechanics as badges, challenges, missions, goals, leaderboards, progression metrics, etc. *Social interaction -related* features are mainly used to enable users' social interaction (Jang, Kitchen, & Kim, 2018), and include game mechanics such as team, group and competition (Hamari & Tuunanen, 2014;

Koivisto & Hamari, 2019; Peng et al., 2012; Snodgrass et al., 2013; Yee et al., 2012; Yee, 2007).

In the literature on brand management, several factors have been connected with brand engagement such as degree of involvement (Vivek, Beatty, & Morgan, 2012), psychological ownership (Pierce, Kostova, & Dirks, 2001), or affective or computational commitment (Bowden, 2009). Today, gamification has been postulated to be a powerful novel approach for increasing brand engagement and equity (Hollebeek, Juric, & Tang, 2017). Given that gamification in marketing is still a relatively new area, only a few studies have investigated the relationships between gamification and brand -related variables (Berger et al., 2017; Nobre & Ferreira, 2017; Yang et al., 2017). Table 1 describes directly related works that focus on both gamification and brand engagement. Firstly, some studies have only discussed gamification as the research context rather than as a variable (e.g. Hsu & Chen, 2018a, 2018b; Yang et al., 2017). Thus, while these studies relate to gamification, the research models employed do not allow conclusions to be drawn about how gamification has affected consumer engagement. Rather, these studies simply investigated the common variables of e.g. perceived usefulness, ease of use and enjoyment (Yang et al., 2017), high interactivity and optimal challenge (Berger et al., 2017), and utilitarian and hedonic features (Hsu & Chen, 2018b) in the context of gamified services. Another limitation of the current body of literature is that most studies only investigated limited numbers of gamification mechanics (e.g. challenge, tasks, rewards, badges, leaderboard and win condition, see Harwood & Garry, 2015; challenge, curiosity, fantasy and control, see Summers & Young, 2016; leaderboards, badges, points, increasing task difficulty, new levels, types of play, infinite play, finite end, multiplayer orientation, see Robson et al., 2016) rather than having investigated gamification holistically by including all of the categories of gamification design into the research model. More importantly, across this body of research, the glaring gap is that most studies do not measure the users' true reflections of their interactions with gamification features (such as importance and interaction frequency) and rather assume that users would have been exposed to gamification (Berger et al., 2017; Gatautis, Banyte, Piligrimiene, Vitkauskaite, & Tarute, 2016; Harwood & Garry, 2015; Lucassen & Jansen, 2014). Therefore, on a vaguer level such studies often revert to investigating the intentions of people to e.g. continue using the gamified system. Additionally, statements that gamification may be positively associated with brand attitude (Yang et al., 2017), brand engagement (Berger et al., 2017; Harwood & Garry, 2015; Robson et al., 2016; Xu, Buhalis, & Weber, 2017), brand involvement (Nobre & Ferreira, 2017) and brand love (Hsu & Chen, 2018a) are still relatively weakly established due to the qualitative nature of the extant corpus investigating the relationship of gamification and brand management. Prior studies employ methods such as the netnography (Harwood & Garry, 2015), case study (Robson et al., 2016; Summers & Young, 2016; Xu et al., 2017), focus group (Yang et al., 2017), or interview methods (Lucassen & Jansen, 2014). Therefore, there is a lack of empirical evidence of the effects and impact that gamification can have on brand equity.

2.2. The relationship between gamification and brand engagement

Brand engagement is considered to be a result of co-creative customer experience where consumers interact with the service portfolio and service providers representing the brand, which then further reflects the nature of consumers' particular interactive brand relationships (Brodie, Hollebeek, Jurić, & Ilić, 2011; Hollebeek, Glynn, & Brodie, 2014). Brand engagement has been conceptualized to compose mainly of emotional, cognitive and social engagement (So, King, & Sparks, 2014; Vivek, 2009; Vivek, Beatty, Dalela, & Morgan, 2014). The emotional aspect of brand engagement is related to *affection* and refers to "a consumer's degree of positive brand -related affect in a particular consumer/brand interaction" (Hollebeek et al., 2014) or *enthusiasm* and refers to "the zealous reactions and feelings of a person related to using or interacting with the focus of their engagement" (So et al., 2014; Vivek et al., 2014). Cognitive brand engagement refers to the degree of interest the person has or wishes to have in interacting with the focus of their engagement, named conscious attention (Vivek et al., 2014), the duration of focus (So et al., 2014), or the brand -related thought processing and elaboration in brand interaction (Hollebeek et al., 2014). Social brand engagement involves the enhancement of the interaction based on the inclusion of others with the focus of engagement (Bijmolt et al., 2010; Van Doorn et al., 2010), which is more relevant with online aspects, and involves socializing and participating in the online community with others (Calder, Malthouse, & Schaedel, 2009; Vivek et al., 2014).

A few empirical studies on gamification also indicate that gamification can affect brand engagement. Gatautis et al. (2016) investigated the impact of gamification on consumer brand engagement in the Lithuanian market, while the relationship was not strong according to their empirical results. Additionally, Berger et al. (2017) showed that gamified interactions which are highly interactive and optimally challenging, are positively related to the emotional and cognitive dimensions of brand engagement.

However, regarding the relationship between gamification and the different dimensions of brand engagement, no clear empirical basis on which to firmly base hypotheses currently exists. If we draw from wider game research and brand engagement literature, it can be observed that *immersion -related features* are commonly connected with the experience of expressive freedom (Peters, Calvo, & Ryan, 2018; Wolf et al., 2019), flow and optimal experience (Chang, 2013), i.e. more emotional and affective aspects (e.g. enjoyment, joy, pride and surprise). Therefore, immersion -based gamification can be expected to positively associated with emotional brand engagement However, *achievement -related features* are commonly tied to a more cognitive style, and goal-driven engagement and behavior. Achievement -related features such as badges, challenges, missions, goals, leaderboards, progression metrics, etc. are composed of goal-structures (see goal setting theory, Landers, Bauer, & Callan, 2017), effort investment (see effort justification theory, Baek, Yoon, & Kim, 2015) and optimizing consumer behavior etc., requiring more information processes. Therefore, it can be assumed that achievement -related features are more likely to be most strongly associated with cognitive brand engagement. Similarly, *social interaction -related features* such as 'likes', commenting, collaboration and teams can be assumed to be naturally positively affect social brand engagement (Leclercq, Hammedi, & Poncin, 2018). The service providers such as online brand communities can foster norms of reciprocity and trust and, therefore, create opportunities for engagement by making users feel connected to the brand and increasing their knowledge of other members (Gil de Zúñiga, Jung, & Valenzuela, 2012). Thus, when there are more interactions with social-oriented gamification features, customers can easily get/share information about the brand from/with others which can increase social capital and foster social brand engagement. Therefore, we propose the following three hypotheses:

H1. Interaction with immersion -related gamification features is a) positively and b) more strongly associated with emotional brand engagement than with other dimensions of brand engagement.
H2. Interaction with achievement -related gamification features is a) positively and b) more strongly associated with cognitive brand engagement than with other dimensions of brand engagement.
H3. Interaction with social interaction -related gamification features is a) positively and b) more strongly associated with social brand engagement than with other dimensions of brand engagement.

2.3. The relationship between brand engagement and brand equity

Brand equity is regarded as one of the most core aspects of the intangible assets a company may have (Kim & Ko, 2012; Simon & Sullivan, 1993). In this study, we focus on brand equity from the perspective of the individual consumer (customer-based brand equity). Customer-based brand equity is the driving force for stimulating incremental financial gains for the firm (Lassar, Mittal, & Sharma, 1995), and refers to a set of brand assets linked to a brand, its name and symbol (Aaker, 1991). Among others, brand equity consists of brand loyalty and awareness Accordingly, brand loyalty refers to the tendency to be loyal to a focal brand, which is demonstrated by an intention to buy the brand as a primary choice (Yoo & Donthu, 2001); and brand awareness or brand association is the ability for customers to recognize or recall a brand as a member of a certain product category (Keller, 1993; Lowry, Vance, Moody, Beckman, & Read, 2008; Rossiter & Percy, 1987).

Brand engagement is naturally often considered to be one of the most important determinants of brand equity (Hoeffler & Keller, 2002; Weiger, Wetzel, & Hammerschmidt, 2017). When customers are willing to invest more time, energy and money, the higher involvement with the brand have a positive impact on brand equity (Christodoulides, Jevons, & Bonhomme, 2012). Specifically, customers who have a higher engagement with a brand can be more satisfied with the brand and exhibit higher loyalty (Weiger et al., 2017; Wirtz et al., 2013). In addition, when customers actively interact with a brand in a social media-based context, not only will they review some degree of information about the brand, but also recommend it to others and have a higher intention to buy (Hutter, Hautz, Dennhardt, & Füller, 2013). Therefore, we can easily infer that brand engagement is positively related to brand equity.

Consistent with the brand -related literature, in this study, we expect that the three different dimensions of brand engagement will be positively associated brand equity. Figure 1 below depicts the research model and the hypotheses pertaining to relationships between constructs in the model. When customers have a strong emotional attachment to the brand (Hwang & Kandampully, 2012) or perceive high emotional quality (Leek & Christodoulides, 2012), they will make a commitment to the brand such as a willingness to pay a higher price premium (Hwang & Kandampully, 2012), achieve higher emotional satisfaction (Yu & Dean, 2001), and exhibit purchasing loyalty (Chaudhuri & Holbrook, 2001), all of which can further enhance the brand equity. Moreover, when customers cognitively engage with a brand, they will often pay attention to the relevant information related to the brand and gain explicit knowledge about it (Matthews, Son, & Watchravesringkan, 2014), which is again an antecedent for brand equity. Social interaction with other users also generates an important value effect on brand involvement, and can further develop brand equity (Berry, 2000). On one hand, the engaged consumers can be considered as potential brand activists (Wallace, Buil, & de Chernatony, 2014), and they are more likely to participate in different brand -related activities and exhibit a higher brand loyalty (Kwon, Kim, Sung, & Yoo, 2014). On the other hand, when customers can freely discuss and share the brand with other customers, they will become more familiar with the brand, often think about the brand, and this further influences their purchase intention (Hutter et al., 2013). Therefore, a further hypothesis can be proposed:

H4. The three dimensions of brand engagement (emotional, cognitive and social) are positively associated with a) brand awareness and b) brand loyalty.

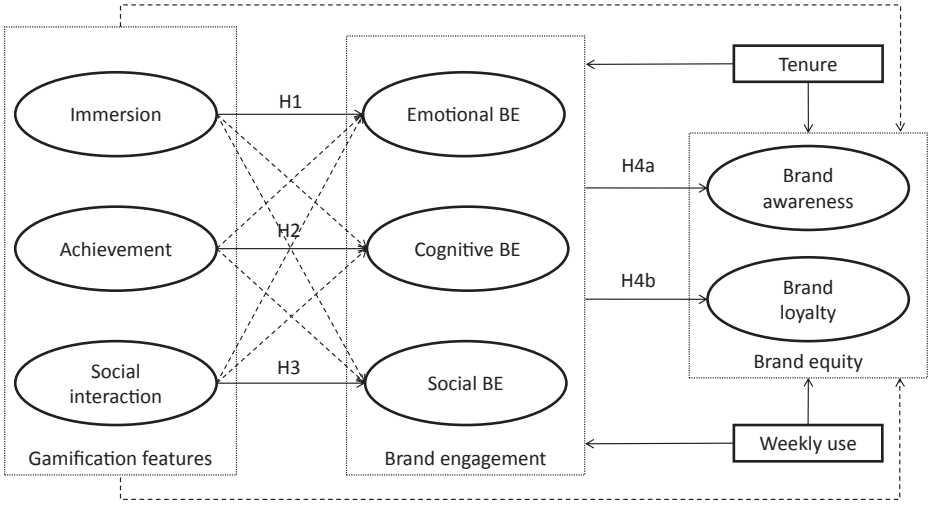

Fig. 1. The research framework and hypothesis.
Note: – Tenure and weekly use are the two control variables in this study. – Since some unexpected effects between gamification features and brand awareness and brand loyalty, we also tested the direct effect between gamification and brand equity in this study.

3. Empirical study

3.1. Measures

From December 2017 to February 2018, we conducted an online survey in the Xiaomi and Huawei brand communities, which represent two large technology product-related online brand communities in China. A total of thirteen gamification features were identified. To be precise, avatar/virtual identity/profile, customization/personalization features and narrative/story are categorized as immersion -related features; badges/medals/trophies, virtual currency/coins, points/score/experience points, status bar/progress, level, leaderboards/rankings/highscore lists and increasingly difficult tasks are achievement -related features; and team, social competition, and social network features are social interaction -related features. In the literature related to interaction with information systems and social interaction, frequency (Chua, 2002) and importance (Novak, Hoffman, & Yung, 2000) have often been used for measuring interaction. Thus, in this study, participants were asked to estimate the frequency at which they interact with each feature and the importance of that interaction. We measured all of the items using a 7-point scale, ranging from 1 (not at all important) to 7 (extremely important), and from 1 (never) to 7 (every time). In accordance with prior research on games and gamification, the mechanics were divided into three latent constructs: interaction with immersion -related gamification features (3), achievement -related gamification features (7), and social interaction -related gamification features (3). By conducting the exploratory factor analysis (EFA) of the twenty-six measurement items in SPSS and the Algorithm result in Smart-PLS, there was no cross-loading.

Furthermore, we assessed emotional brand engagement with five items, cognitive brand engagement with four items, and social brand engagement with six items, based on previous research by So et al. (2014), Vivek (2009) and Vivek et al. (2014). A 7-point scale was provided, ranging from 1 (strongly disagree) to 7 (strongly agree). Higher scores indicated a higher level of consumer brand engagement in the emotional, cognitive and social aspects. In addition, the measurement of brand equity included the aspects of brand awareness and brand loyalty. Four items were used to measure brand loyalty adapted from research by Chaudhuri and Holbrook (2001), Washburn and Plank (2002) and Yoo and Donthu (2001), and five items were used to measure brand awareness adapted from research by Washburn and Plank (2002) and Yoo and Donthu (2001). All of these items were slightly modified to fit the context of the present study.

In addition, we also measured the two control variables of tenure (how long have you been a registered member of this community) and weekly use (how much time do you usually spend during a normal week visiting this service), which may also affect brand engagement and brand equity in the two online brand communities.

Table 2
Demographic information of respondents.

	N	%		N	%
Gender			**Education**		
Male	427	51.8%	Middle school	8	1.0%
Female	397	48.2%	High school/Vocational education/technical school	41	5.0%
Age			Associate's degree	66	8.0%
Less than 20	16	1.9%	Bachelor's degree	539	65.4%
20–29	338	41.0%	Master's degree and above	170	20.6%
30–39	321	39.0%			
40–49	149	18.1%			
			Tenure		
			Less than 3 months	6	0.7%
Occupation			3–6 months	44	5.3%
Student	166	20.1%	6–9 months	67	8.1%
Self-employed	45	5.5%	9–12 months	110	13.3%
Paid Employment	410	49.8%	12–15 months	258	31.3%
Military/Government	77	9.3%	15–18 months	103	12.5%
Professional/ technical	94	11.4%	18–21 months	83	10.1%
Unemployed	18	2.2%	21–24 months	53	6.4%
Others	14	1.7%	More than 2 years	100	12.1%
Income per month (rmb)			**Weekly use**		
Less than 2500	25	3.0%	Less than 15 min	23	2.8%
2500–4999	200	24.3%	15–30 min	113	13.7%
5000–7499	167	20.3%	30–45 min	165	20.0%
7500–9999	223	27.1%	45–60 min	302	36.7%
10000–12499	116	14.1%	1–3 h	87	10.6%
12500–14999	53	6.4%	3–6 h	94	11.4%
15000–17499	27	3.3%	6–9 h	26	3.2%
17500–19999	6	0.7%	9–12 h	7	0.8%
20,000 or more	7	0.8%	More than 12 h	7	0.8%

3.2. Participants

A sample of 824 respondents (464 from Xiaomi and 360 from Huawei community) participated in the study. Users who had never visited the Xiaomi or Huawei online brand communities, who had limited variability across their responses and who had failed the filter questions were omitted from the data. In order to investigate any non-response bias, we performed a *t*-test of the demographic variables between the first 100 and last 100 samples and found that there was no significant difference between the two group samples. As shown in the demographic characteristics of the respondents in Table 2, the gender distribution of the sample was relatively equal with male respondents representing 51.8% and female respondents representing 48.2%. Regarding age, most of the respondents were between the ages of 20 and 39, representing 80% of the total sample. Most respondents had completed a bachelor's degree (86%), 49.8% were in paid employment, and 20.1% were students. 97% of respondents had a monthly income higher than 2499 RMB and 0.8% over 19,999 RMB. 72.4% of the respondents had belonged to the community for more than one year. As for the amount of use per week, 221 users visited the Xiaomi or Huawei brand communities for over 1 h per week, accounting for 26.8%.

3.3. The overall model

The assessment of approximate model fit can be used to asses the global model fit (Henseler, Hubona, & Ray, 2016). Currently, the only approximate model fit criterion implemented for PLS path modelling is the standardized root mean square residual (SRMR) (Hu & Bentler, 1999). According to the PLS Algorithm result, the estimated model of SRMR was 0.081 which is close to the cut off value (see Hu & Bentler, 1999). Thus the model fit was acceptable in this study.

3.4. Measurement model

An analysis of validity and reliability of the measurement model as well as the analysis of the path model was undertaken using the component-based PLS-SEM. When the measurement model includes formative constructs, then PLS-SEM is considered to be a more appropriate structural equation modelling technique compared to CB-SEM (Coltman, Devinney, Midgley, & Venaik, 2008; Hair, Ringle, & Sarstedt, 2011; Lowry & Gaskin, 2014). According to the understanding of formative constructs taken from Jarvis, MacKenzie, and Podsakoff (2003) and Rossiter (2002), in this study, three different gamified interactions are seen as formative constructs, since the frequency and importance of each gamification feature is posited as being the common cause of construct and variation in item measures causing variation in the constructs. Conversely, the brand engagement and brand equity are seen as reflective models given that their indicators are assumed to be caused by the latent variables. Thus, the model includes both formative (interaction with gamification features) and reflective constructs (brand engagement and equity).

Table 3
Formative measurement.

Construct		Loading	Weight	VIF
Interaction with gamification features				
Immersion -related features				
-The importance of interacting with _____				
IIF1	avatar/virtual identity/profile	0.717	0.050	2.068
IIF2	customization/personalization	0.689	0.202	1.539
IIF3	narrative/story	0.824	0.358	1.847
The frequency of interacting with_____				
FIF1	avatar/virtual identity/profile	0.861	0.424	1.936
FIF2	customization/personalization	0.733	0.209	1.667
FIF3	narrative/story	0.697	0.016	2.031
Achievement -related features				
-The importance of interacting with _____				
IAF1	badges/medals/trophies	0.753	0.133	2.085
IAF2	virtual currency/coins	0.670	0.004	2.046
IAF3	points/scores/experience points	0.642	−0.021	1.994
IAF4	status bars/progress bars	0.655	0.035	1.857
IAF5	avatar/virtual identity/profile levels	0.818	0.266	2.205
IAF6	leaderboards/rankings/highscore lists	0.660	0.031	1.870
IAF7	increasingly difficult tasks	0.702	0.045	2.033
-The frequency of interacting with_____				
FAF1	badges/medals/trophies	0.779	0.174	2.290
FAF2	virtual currency/coins	0.600	0.066	1.582
FAF3	points/scores/experience points	0.756	0.106	2.322
FAF4	status bars/progress bars	0.603	−0.061	1.908
FAF5	avatar/virtual identity/profile levels	0.885	0.440	2.133
FAF6	leaderboards/rankings/highscore lists	0.573	−0.021	1.665
FAF7	increasingly difficult tasks	0.712	0.033	2.151
Social interaction -related features				
-The importance of interacting with ____				
ISF1	competition	0.847	0.397	1.963
ISF2	team	0.815	0.149	2.457
ISF3	social networking features	0.709	0.196	1.584
-The frequency of interacting with_____				
FSF1	competition	0.633	−0.009	1.739
FSF2	team	0.799	0.298	1.878
FSF3	social networking features	0.752	0.228	1.708

3.4.1. Formative model

The assessment of the validity of formative constructs is different from the reflective measurement. With formative constructs, the assumption is not that items would correlate, but rather the construct is "formed" from the indicators. We assessed the collinearity and external validity of the formative measurement model (see Table 3). The variance inflation factors (VIF) for each indicator indicate the possible presence of collinearity, and for formative measures, the values of VIF greater than 3.3 indicate high multicollinearity (Diamantopoulos & Siguaw, 2006). According to Table 3, all of the VIFs ranged from 2.457 to 1.539 (all were lower than 3), which suggests that multicollinearity is not a concern. Some authors suggest examining the external validity of a formative measured construct rather than internal consistency examinations (e.g. Cronbach's alpha) (Bagozzi, 1994; Diamantopoulos & Winklhofer, 2001). Accordingly, this study assessed the validity of formative constructs by evaluating indicator weights and loadings. Indicators of well-specified formative constructs should have statistically significant weights (Cenfetelli & Bassellier, 2009), however indicators with statistically non-significant weights but with high loadings should be retained in the model (Majchrzak, Wagner, & Yates, 2013). Even though some of the indicators had low weights that were statistically non-significant, all of the indicators had high loadings (above 0.573), indicating that the external validity is acceptable (Cenfetelli & Bassellier, 2009). In addition, four items had negative weights, but the correlations between items in the interaction with achievement -related features and interaction with social -related features were all positive according to the result of Pearson correlation test.

Table 4
Reflective measurement.

Construct		Loading
Brand engagement		
Emotional dimension α = 0.881 CR = 0.913 AVE = 0.678		
EBE1	I feel excited about this brand	0.819
EBE2	I am heavily into this brand	0.873
EBE3	I am passionate about this brand	0.742
EBE4	I am enthusiastic about this brand	0.796
EBE5	I love this brand	0.881
Cognitive dimension α = 0.812 CR = 0.876 AVE = 0.639		
CBE1	I like to learn more about this brand	0.764
CBE2	I pay a lot of attention to anything about this brand	0.806
CBE3	Anything related to this brand grabs my attention	0.831
CBE4	I think about the brand a lot	0.795
Social dimension α = 0.853 CR = 0.895 AVE = 0.630		
SBE1	I love talking and using products of the brand with my friends	0.809
SBE2	I enjoy talking and using products of the brand more when I am with others	0.764
SBE3	Talking and using products of the brand are more fun when other people around me do it too	0.833
SBE4	I feel good about sharing my experiences with the products of the brand with others	deleted
SBE5	I feel fellowship with other people who use the products of the brand	0.789
SBE6	I like recommending the products of the brand to others	0.772
Brand equity		
Brand loyalty α = 0.849 CR = 0.898 AVE = 0.688		
BL1	I will not buy other brands if the brand [Huawei/Xiaomi] is available at the store	0.806
BL2	I am committed to this brand	0.842
BL3	I will likely buy this brand the next time I buy [product of Huawei/Xiaomi]	0.852
BL4	I would be willing to pay a higher price for this brand over other brands (assuming the products were otherwise similar in features)	0.816
Brand awareness α = 0.879 CR = 0.912 AVE = 0.673		
BA1	I am very familiar with this brand	0.804
BA2	I can recognize the brand among other competing brands	0.823
BA3	Some characteristics of the brand come to my mind quickly if I think about the brand.	0.846
BA4	I can quickly recall the symbol or logo of this brand	0.806
BA5	It is not very difficult for me to imagine this brand	0.824

3.4.2. Reflective model

For testing the validity and reliability of the reflective measurement model, we conducted a confirmatory factor analysis (CFA) to assess the reliability, convergent validity, and discriminant validity of the reflective constructs. Specifically, we assessed convergent validity with three metrics: average variance extracted (AVE), composite reliability (CR) and Cronbach's Alpha. Firstly, we investigated the loadings of the items and found the loading of item SBE 4 was 0.325, which was lower than 0.6. By removing item SBE4, all of the Cronbach's α of variables were higher than the recommended value of 0.7 (Kline, 1998) and the AVEs of all reflective variables were higher than 0.5 (Fornell & Larcker, 1981). In regard to construct reliability (CR), all of the values were between 0.876 and 0.913, again, higher than 0.7 (Fornell & Larcker, 1981). See Table 4 for more details.

As per the assessment of discriminant validity, no inter-correlation of constructs exceeded the square root of the AVE of either of the compared constructs (see Table 5). The square root of the AVE of the three dimensions of brand engagement and two dimensions of brand equity were 0.824, 0.799, 0.794, 0.821 and 0.829 respectively, so we can conclude that discriminant validity has been met.

4. Results

The model explained 9.6% (R^2 = 0.096) of the variance of emotional brand engagement, 11.3% (R^2 = 0.113) of the variance of

Table 5
Discriminant validity.

	Immersion features	Achievement features	Social interaction features	Emotional BE	Cognitive BE	Social BE	Brand awareness	Brand loyalty	Weekly use	Tenure
Immersion features	**N/A**									
Achievement features	0.296	**N/A**								
Social interaction features	0.254	0.256	**N/A**							
Emotional BE	0.147	0.237	0.239	**0.824**						
Cognitive BE	0.167	0.266	0.259	0.498	**0.799**					
Social BE	0.195	0.272	0.287	0.511	0.572	**0.794**				
Brand awareness	0.137	0.117	0.125	0.325	0.300	0.298	**0.821**			
Brand loyalty	0.139	0.167	0.181	0.356	0.338	0.306	0.592	**0.829**		
Weekly use	−0.082	−0.004	0.005	0.009	−0.010	0.000	−0.011	0.003	**1**	
Tenure	−0.051	0.041	0.014	0.068	−0.019	0.017	0.096	0.091	0.183	**1**

cognitive brand engagement, 13.1% (R^2 = 0.131) of the variance of social brand engagement, 15.3% (R^2 = 0.153) of the variance of the brand awareness and 17.9% (R^2 = 0.179) of the variance of the brand loyalty. The variance explained of the dependent variables was relatively low, indicating that gamification features only explained a relatively small portion of the overall brand engagement. Surprisingly, brand engagement also explained a small part of the overall of brand equity.

Regarding the relationship between interaction with immersion -related features and the three dimensions of brand engagement, the results showed that interaction with immersion -related features was not significantly associated with either emotional (β = 0.053, p = 0.135) or cognitive brand engagement (β = 0.058, p = 0.109), and only positively associated with social brand engagement (β = 0.084, p = 0.015). Thus, H1a and H1b were rejected according to the result. Regarding the relationship between interaction with achievement -related features and brand engagement, interaction with achievement -related features was positively associated with emotional brand engagement (β = 0.173, p < 0.001), cognitive brand engagement (β = 0.201, p < 0.001) and social brand engagement (β = 0.191, p < 0.001) respectively. Therefore, results supported H2a. Similarly, interaction with social features was positively associated with all dimensions of brand engagement: emotional (β = 0.180, p < 0.001), cognitive (β = 0.193, p < 0.001) and social brand engagement (β = 0.216, p < 0.001). Therefore, H3a was also supported. However, the analysis of confidence intervals revealed that H1b, H2b and H3b should be rejected since confidence intervals of path coefficients between interaction with a set of gamification features and the types of brand engagement overlapped strongly.

Moreover, the three dimensions of brand engagement were significantly positively associated with brand awareness (for emotional brand engagement, β = 0.187, p < 0.001; cognitive brand engagement, β = 0.137, p = 0.001; social brand engagement, β = 0.115, p < 0.05) and brand loyalty (for emotional brand engagement, β = 0.204, p < 0.001; cognitive brand engagement, β = 0.168, p < 0.001; social brand engagement, β = 0.074, p = 0.065). Accordingly, the relationship between social brand engagement and brand loyalty was insignificant. Thus, the results supported H4a and rejected H4b. In order to test if there are significant differences between the two data groups (Huawei vs Xiaomi) in their group-specific path coefficients, we also conducted multi-group analysis (bootstrapping, sample = 2000). According to the result, there was no significant difference of path coefficients (all p values were between 0.151 and 0.949).

Regarding the two control variables, only tenure was positively associated with brand awareness (β = 0.093, p = 0.005) and brand loyalty (β = 0.082, p = 0.011). Since there might be some unexpected effect between gamification features and brand equity, we also tested the direct effect of gamification on brand awareness and brand loyalty respectively. Only the direct effect between immersion -related features and brand awareness was statistically significant while no existing effect changes dramatically. For the full results, please refer to Table 6.

5. Discussions and conclusions

As a novel marketing technique, gamification is believed to effectively engage and motivate customers, as well as to spark further consumption behaviors. However, beyond optimistic expectations, there has been a lack of empirical evidence on whether and how gamification may be able to improve marketing performance such as brand engagement and brand equity. Thus, in this study, we investigated the relationship between three categories of gamification features, and three dimensions of brand engagement and brand equity in the online brand communities. According to the empirical results of the study, achievement and social interaction -related gamification features were both positively associated with emotional, cognitive and social brand engagement. More specifically, achievement -related gamification features had the relationship with cognitive brand engagement, and social interaction -related gamification features had the relationship with social brand engagement (H2a and H3a were accepted). Surprisingly, immersion -related features were only positively related to social brand engagement, but not to either emotional brand engagement or cognitive brand engagement (H1a and H1b were rejected). Furthermore, all dimensions of brand engagement were positively associated with brand awareness (thus H4a was accepted). Additionally, only emotional brand engagement and cognitive brand engagement were significantly related to brand loyalty (H4b was rejected). Overall, the results imply that gamification appears to have a significant effect on consumer brand engagement, however, on an overall level consumer interaction with gamification features does not seem to explain a large portion of the consumer brand engagement.

The relationships between types of gamification and the dimensions of brand engagement that were not found to have any significant association present further lines of discussion. The main deviation from the set hypotheses was that immersion -related features were not significantly associated with emotional brand engagement, however they were seen to have a small effect on social brand engagement. One possible explanation for this is that immersive -related features such as avatars/virtual identity/profile and personalization features may have more of a social function as they afford displaying information about oneself to others, and this can facilitate consumers to exchange information about the brand rather than spur them to explore and immerse themselves into the brand themselves. If a brand -related website only contains immersion -related gamification features, this is not immersive enough to evoke genuine emotional experiences such as excitement, enthusiasm and passion, in the same ways as traditional video games do. Further, the strongest motivation for customers to make contributions to the online brand community is to get more social benefits (Hennig-Thurau, Gwinner, Walsh, & Gremler, 2014). Customers can easily engage with the brand in the community through

Table 6
Structural equation model full results.

Path coefficients	β	p	95% CI	
Immersion features → Emotional brand engagement	0.053	0.135	−0.005	0.133
Immersion features → Cognitive brand engagement	0.058	0.109	−0.001	0.138
Immersion features → Social brand engagement	0.084*	0.015	0.026	0.163
Achievement features → Emotional brand engagement	0.173***	0.000	0.117	0.260
Achievement features → Cognitive brand engagement	0.201***	0.000	0.143	0.284
Achievement features → Social brand engagement	0.191***	0.000	0.141	0.276
Social interaction features → Emotional brand engagement	0.180***	0.000	0.112	0.249
Social interaction features → Cognitive brand engagement	0.193***	0.000	0.124	0.261
Social interaction features → Social brand engagement	0.216***	0.000	0.148	0.286
Emotional brand engagement → Brand awareness	0.187***	0.000	0.109	0.261
Emotional brand engagement → Brand loyalty	0.204***	0.000	0.129	0.276
Cognitive brand engagement → Brand awareness	0.137***	0.001	0.050	0.216
Cognitive brand engagement → Brand loyalty	0.168***	0.000	0.085	0.240
Social brand engagement → Brand awareness	0.115**	0.007	0.027	0.196
Social brand engagement → Brand loyalty	0.074	0.065	−0.008	0.151
Immersion features → Brand awareness	0.074 *	0.050	−0.001	0.148
Immersion features → Brand loyalty	0.051	0.183	−0.021	0.129
Achievement features → Brand awareness	−0.02	0.642	−0.089	0.076
Achievement features → Brand loyalty	0.024	0.562	−0.048	0.116
Social features → Brand awareness	−0.003	0.933	−0.071	0.074
Social features → Brand loyalty	0.047	0.215	−0.027	0.124
Weekly use → Emotional brand engagement	0.002	0.947	−0.066	0.071
Weekly use → Cognitive brand engagement	−0.001	0.981	−0.067	0.068
Weekly use → Social brand engagement	0.005	0.880	−0.062	0.072
Weekly use → Brand awareness	−0.022	0.504	−0.087	0.041
Weekly use → Brand loyalty	−0.008	0.794	−0.075	0.055
Tenure → Emotional brand engagement	0.061	0.067	−0.005	0.122
Tenure → Cognitive brand engagement	−0.027	0.416	−0.092	0.039
Tenure → Social brand engagement	0.009	0.771	−0.056	0.070
Tenure → Brand awareness	0.093**	0.005	0.025	0.154
Tenure → Brand loyalty	0.082*	0.011	0.019	0.144

β = standard regression coefficient, *CI* = confidence interval.
$p < 0.05$ *; $p < 0.01$ **; $p < 0.001$ ***.

"socialization" by interacting with different immersion -related features. It is also worth mentioning that immersion -related features has a small direct effect on brand awareness. This maybe because the more interaction with immersion -related features might lead customers to have more willingness to explore the brand community which gradually make them become more aware with the brand.

Another interesting aspect of the results was that interaction with both achievement and social features were positively associated with all of the dimensions of brand engagement, and the path coefficients were similar and highly significant. This may be perhaps because in the Xiaomi and Huawei gamified communities, most of the achievement and social interaction -related gamification features are designed in combination with brand information, which can be more attractive to users (Xi & Hamari, 2019). Regarding the achievement features, being high on a highscore list/leaderboard, collecting badges, accumulating points, earning virtual currency and fulfilling tasks can afford a multifaceted experience of cognitive processes of brand knowledge, an emotional experience from the winning state, as well as a social experience stemming from the resulting social prestige. In terms of social interaction -related features, being a member of a specific group, establishing social connections with others through joining teams, engaging in group competition, or frequently interacting with different social networking features (such as messages, blogs, like, chat, etc.) can not only afford a sense of belonging to the brand community, but also intrinsically motivate customers to process the brand information with others (Xi & Hamari, 2019), and to cultivate a passionate attachment to the brand from having similar gameful experiences to those featured in most massive multiplayer online role-playing games. These results would imply that employing achievement and social interaction features on brand community websites would seem to be a fruitful approach.

The last thing worth mentioning is that even though the path coefficients of the categories of gamification features towards brand engagement and brand equity were less than 0.3, the role of gamification on brand performance cannot be neglected. According to Table 6, neither tenure nor weekly use was associated with brand engagement. One possible explanation for this is that many of the traditional marketing techniques of online communities may be able to increase weekly use and attract new members, but do not intrinsically motivate customers to engage with the specific brand (Xi & Hamari, 2019). However, it can be expected that gamification can increase the three aspects of brand engagement to a certain extent. As a further observation, only tenure was positively associated with brand equity, which means experienced longer tenure members rather than those with more weekly use in online brand communities usually have a higher willingness to pay, to repeat purchase behavior, and are also more familiar with the brand.

5.1. Contributions and implications

In this study, we studied the role of gamification in brand management by investigating the relationships between different categories of gamification features, brand engagement and brand equity. The results imply that gamification had a moderate effect on brand engagement and consequently on brand equity. In filling the current gap in research on the gamification of information systems, marketing electronic commerce and games, this study made a considerable empirical and theoretical contribution, as well as providing a practical knowledge to managers of online brand communities and practitioners in social media marketing spheres.

According to the literature review featured earlier in this article, it was detected that most of the prior research has made only limited investigations into the effects of gamification on brand engagement. Especially, those research tends to draw either fairly broad conclusions,

or more specific ones that are less rigorously or quantitatively corroborated (e.g. Lucassen & Jansen, 2014; Robson et al., 2016; Summers & Young, 2016; Xu et al., 2017). As a result, the specific and targeted research findings that would allow differentiated conclusions to be drawn in terms of different forms of gamification have been seen to be lacking. To address this situation, this study looked to examine the relationships between all of the three main types of gamification, and brand engagement and brand equity. Based on the data showing a relatively high internal and external validity, and also the structural equation modeling analysis that was carried out, the study provides a deeper understanding of the role of gamification in brand management.

The present study undertook a more granular analysis relying on empirical evidence compared with prior literature in terms of studies on brand engagement. Unlike most of the prior studies which have usually considered brand engagement as a uni-dimensional construct (see Lucassen & Jansen, 2014; Harwood & Garry, 2015; Summers & Young, 2016; Xu et al., 2017), this study examined the relationships between different gamification features with three kinds of brand engagement (emotional, cognitive and social), which can help explain the mechanisms of how gamification affects brand engagement and what kinds of the gamification features are more appropriate for use. More importantly, given the lack of further discussion around the role of gamification in brand equity (which according to Lassar et al. (1995) is the driving force for incremental financial gains to a firm), this study has proved that brand equity can be increased by using gamification features in an online service or system such as an online brand community.

In addition to the theoretical contribution, our findings also carry practical implications, especially for the designers and managers of online brand communities who frequently have difficulty sustaining user engagement (Suh, Cheung, Ahuja, & Wagner, 2017). According to the empirical results of the study, we suggest that managers and practitioners can consider a wide use of achievement and social interaction -related features in their online brand communities, in order to increase emotional, cognitive and social brand engagement and eventually increase brand awareness and brand loyalty. Immersion -related features can also be adopted according to specific marketing goals, e.g. those targeted at increasing social engagement.

It can also be seen that many traditional marketing techniques such as customer loyalty programs, point-based management and membership systems which are commonly combined with systems based on monetary or material rewards have been considered to decrease the consumers' motivation (Deci, Koestner, & Ryan, 1999), especially in regard to their participation, involvement and engagement in marketing activities, and they also bring huge financial burdens to enterprises. Firms have to learn the art and the science of managing customers to engage them in a profitable and sustainable manner (Pansari & Kumar, 2017). Instead, gamification aims to satisfy users' inner psychological needs (Peng et al., 2012) and further drive their intrinsic motivation by using web and visual based game elements (van Roy & Zaman, 2018). The gameful experiences can trigger continued service usage (Wolf et al., 2019). From this perspective, we believe that employing gamification as a marketing technique can engage customers with brand, and further contribute to higher marketing performance outcomes such as brand equity. Thus, practitioners can consider to gamify the traditional marketing techniques by embedding more motivational affordances of gamification into the existing system. However, additional research is needed to further test marketing performance of the traditional techniques which contain gamification approaches.

5.2. Limitations and future research

One of the strengths of the current study is that it measured the interaction of customers with thirteen gamification features, but at the same time managed to group them into more generalizable larger entities. While such a modelling strategy is able to investigate the phenomenon in a more latent and broad manner, a future research avenue would be to investigate the effect of each single gamification element individually. This may help bring more granularity to future studies, however, at the same time, the larger theoretical picture might start to fade. Moreover, the gamification features might be differently implemented across different services, and therefore a research strategy focusing on testing each mechanic individually may end up losing external validity. As is commonplace with survey-based studies, the returned data consists of self-reported measures and some respondents might not accurately recall specific information such as their interaction frequency with each gamification feature. Thus, it may help if future studies can refer to some online dynamic indicators of webpages and website backstage databases.

Brand equity has traditionally been examined from two different perspectives – financial and customer based (Lassar et al., 1995). In this study, the focus was on the consumer perceptions of the brand, and therefore, we focused on how consumers' brand perceptions are being influenced by the interaction with different gamification features in the online brand community. In the area of measuring consumer-based brand equity, we chose to follow Washburn and Plank (2002) and Yoo and Donthu (2001) measurements of brand equity which are composed of three dimensions: brand loyalty, brand awareness/associations and perceived quality of products of the brand. In some of the earlier works (e.g. Aaker, 1991, 1996; Keller, 1993) brand awareness and association are treated separately. Therefore, a possible limitation of the present work is that we unable to tease out separate results in terms of awareness and association. Yoo and Donthu (2001), however, found that awareness and association are very closely overlapping both in terms of theory and empirical findings. Another limitation related to the conceptualization and measurement of brand equity could be that we did not measure perception of product quality of the brand as part of the brand equity which based on Zeithaml (1988) is considered one of the dimensions of brand equity. Since the assessment of quality is usually based on users' experience of using product, there was not intuitive logic or theory-guided rationaly to hypothesize why the use gamified brand community would affect perception of product quality of the brand. However, it is possible that we might find a differentiate result concerning the product quality of the brand if we had measured it.

Furthermore, this study was conducted in the context of Chinese technology brand communities, and it is possible that results may differ between cultures and purposes of service providers. To increase the generalizability of the findings, future researches can select different gamified services as their research contexts (e.g. exergame, gamified education and gamification for financial service), or conduct intercultural studies by examining the cross-cultural difference in consumer psychology and behavior. To investigate the advantages and long-term effects of gamification in the marketing field, comparison studies between gamification and different marketing techniques can also be conducted. As a final research direction, future studies could investigate the possible moderating effects between gamification and brand engagement which might lead to different results compared with this study. For example, how the interactions with gamification may translate differently to brand engagement and brand equity depending on the gaming history of consumers (Bittner & Schipper, 2014), what kinds of players they are (Robson et al., 2016), and how their interactions relate to their demographic factors such as age and gender (Koivisto & Hamari, 2014).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A:. Brief description of gamification features in this study

Category	Features	Description	Source
Immersion-related gamification features	Avatar	Avatars are visual representations of players within the game or gamification environment which are chosen or even created by the player	Kapp (2012); Werbach and Hunter (2012)
	Customization/ Personalization	Customization has been defined as activities where users themselves modify some aspect of an interface to a certain degree so as to increase its personal relevance	Marathe and Sundar (2011)
	Narrative/Story	Stories are an important part in gamification applications, as they can alter the meaning of real-world activities by adding a narrative 'overlay'	Sailer et al. (2017)
Achievement-related gamification features	Badges	Badges consist of optional rewards and goals, the fulfillment of which is located outside the scope of the core activities of a service	Hamari and Eranti (2011); Hamari (2017)
	Virtual currency	Virtual currency can be earned through desirable activities in the game environment. Participants can also use this virtual currency to buy virtual items	Liu, Alexandrova, and Nakajima (2011)
	Points	Points can be accumulated for certain activities within the gamification environment	Sailer, Hense, Mandl, and Klevers (2013)
	Progress bars	Performance graphs are often used in simulation or strategy games and provide information about the players' performance compared to their preceding performance during a game	Sailer et al. (2013)
	Levels	A system of advancing in the game by collecting a certain amount of points or carrying out specific actions	Gatautis et al. (2016)
	Leaderboards	Leaderboards rank players according to their relative success, measuring them against a certain success criterion	Costa, Wehbe, Robb, and Nacke (2013)
	Tasks	Quests are small tasks players have to fulfill within a game	Sailer et al. (2013)
Social interaction -related gamification features	Social network features	Messages, blogs, chat and connection to social networks	Aparicio, Vela, Sánchez, and Montes (2012)
	Team	Cooperation by introducing teams, i.e. by creating defined groups of players that work together towards a shared objective	Werbach and Hunter (2012)
	Competition	The desire to challenge and compete with others, leading to the possibility for a player or a group of players to win while others lose	Gatautis et al. (2016)

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