
Effects of gamification incorporated in branded apps on brand responses

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Abstract: This study investigates the effects of gamified branded apps (GBAs) on brand responses, helping fill knowledge gaps around the relationship of GBAs, brand responses, and the mediating role of flow. The results show that perceived challenge, competitive achievement, and intrinsic social interaction are the key drivers of flow for users of GBAs, which positively and significantly affects brand attitudes and purchase intentions. The results also show creativity plays a moderating role in the relationship between the independent variables and brand responses. The findings advance current knowledge by identifying consumers' psychological impressions when using GBAs. In addition, the authors develop and validate scale items for perceived challenge, competitive achievement, and social interaction. These can increase the robustness of future research. This study also illustrates the loci on which the brand manager should focus to increase brand attitudes and purchase intentions, verifying the role of creativity in gamification. Finally, the authors conclude this paper with a number of practical suggestions.

Keywords: achievement; branded apps; challenge; flow; gamification.

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1 Introduction

With the growing popularity of smart phones, businesses are increasingly using their own branded mobile applications (apps) to connect with consumers (Wang et al., 2016) and deliver brand messages and product information. However, consumers often lose interest in the apps they download, leading them to delete or abandon them (Zhao and Balague, 2015). Many brands have, therefore, started to gamify their apps to differentiate them from others. Gamification is the use of game elements and mechanics, usually in the form of problem-solving, to reach a goal (Zichermann and Cunningham, 2011). It typically involves a complete story and a goal and employs game mechanics (e.g., points, levels, leaderboards, badges, challenges/quests, onboarding, and engagement loops), dynamics (interactions with the mechanics), and aesthetics (players' emotions during interaction) for non-game situations (Robson et al., 2014; Zichermann and Cunningham, 2011).

Gamified branded apps (GBAs) increase consumers' engagement and change consumers' behaviours (Zhao and Balague, 2015). By using GBAs, companies hope to raise consumers' awareness of their brands and boost customer engagement in mobile communications. Gamification is a new method for promoting brands, satisfying consumers' needs, and providing consumers with unique brand experiences (Canning, 2016; Chen and Haley, 2014; Peters and Leshner, 2013). For instance, the Domino's Pizza Hero app includes a game in which users knead dough, apply sauce, sprinkle cheese, and add ingredients to make a high-quality pizza (Kim et al., 2016). Consumers who play Kellogg's 'Apple Jacks™ Race to the Bowl Rally' app can use Apple Jacks' mascot to create virtual characters to participate in the Ice Kingdom race. Users can earn additional points and speed up to collect Apple Jacks' grain (Zhao and Balague, 2015). These apps are appealing to consumers because they offer high hedonic value (Canning, 2016), implying that users can enter the state of flow. The more a user plays an GBA, the stronger the bond between the user and the brand, which can enhance the brand's image and popularity (Zhao and Balague, 2015). Because gamification and flow affect the success of branded apps, in this study we focus on the relationships between these factors and their effects on brand responses.

Several knowledge gaps in the existing literature are evident in relation to understanding gamification and branded apps. First, the majority of gamification studies have focused on sports (Hamari and Koivisto, 2015), environment (Froehlich, 2015), education (Hamari et al., 2016), governmental services (Bista et al., 2014), marketing (Kranz et al., 2013), and public participation (Tolmie et al., 2014). Previous studies have rarely examined gamification and a brand's mobile app, so it is somewhat difficult to generalise existing results to branded apps. Furthermore, most existing studies have investigated the reasons for app adoption (e.g., Alnawas and Aburub, 2016) rather than the psychological paths triggered by gamification and its effects on brand responses. Hence, research on this topic can help brand managers better leverage gamification to improve the effectiveness of their GBAs. Empirical evidence has demonstrated that gamification positively affects users' behavioural intentions (Hamari and Koivisto, 2013). Recent studies have indicated gamification can attract players, increase engagement, and enable players to enter a state of flow (Deterding et al., 2011). Nevertheless, GBAs are quite different from other types of gamified apps, mainly because GBAs offer fewer story lines or only provide one or more goals with no story at all. Thus, we investigate the effects of GBAs on brand responses, such as brand attitudes (BA) and purchase intentions (PI).

A second gap surrounds user achievements and GBAs. Scholars have explored how achievement, derived from playing games, helps players gain flow experience (Sweeter and Wyeth, 2005; Lomas et al., 2013). But this may be inadequate to describe the GBA market context. We note consumers can enjoy two kinds of achievement in GBAs; one type is derived from playing the game and the other type is from performing better than the other GBA users. There is no empirical evidence that shows whether both kinds of achievement generate the same effects on flow.

A third gap is found in relation to social interactions, which can facilitate technology adoption and consumer decision-making. We propose that models of consumer evaluations of GBAs need to incorporate consumers' social interactions. We identify two types of social interaction:

- 1 consumers interactions with other users while playing GBAs
- 2 consumers interactions with other GBA users, friends, and other consumers on other media (e.g., internet blogs, discussion groups, and social media) to share their game experience, scores, or recommendations.

Previous research does not indicate whether both types of social interaction positively affect brand responses.

A fourth gap exists in relation to the role of creativity in GBAs and brand responses. Previous research findings indicate creativity in advertisements not only attracts consumers' attention but also positively influences advertising attitudes and PI (Modig and Rosengern, 2014). This study examines the potential moderating effects of creativity.

In sum, the current research aims to

- 1 explore how consumers' perceived challenge (PC), achievement, and social interaction affect their BA and PI
- 2 clarify the mediating effects of flow
- 3 investigate whether different levels of creativity of GBAs lead to different psychological paths
- 4 offer practical suggestions for brands to develop more effective GBAs.

This research makes a number of important contributions. By investigating the effects of gamification on brand responses with flow mediating the effects, the current research advances knowledge through identifying consumers' psychological impressions when using GBAs. Specifically, we divide achievement into two types (promotional and competitive) and incorporate intrinsic and extrinsic social interactions (ESIs) into our model. The result is a clearer picture of GBA effects. In addition, we develop and validate scale items for PC, competitive achievement, and social interaction, which can greatly aid the robustness of future research. We also verify the role of creativity in gamification by unveiling how it leads consumers to different psychological paths. These results provide brand managers with insights into the elements and mechanics of GBA designs that drive consumers' perceptions of challenge, achievement, and social interaction. The study also identifies the types of perception that influence flow. The results indicate the loci on which brand managers should focus in order to increase BA and purchase decisions.

2 Flow theory

Several studies have demonstrated that gamified activities can stimulate consumers' state of flow (Koivisto and Hamari, 2014; Robson et al., 2014; Steffen et al., 2013). Flow refers to a psychological state in which an individual focuses on one activity to the exclusion of other informational inputs (Csikszentmihalyi, 1975). An individual experiencing a state of flow is completely involved in the focal activity (Csikszentmihalyi, 1975), unaware of his/her surroundings (Hamari et al., 2016) and feels that time passes quickly (Csikszentmihalyi, 1977). People can experience flow in a wide variety of activities, including shopping, writing, games, sports, rock climbing, gambling, working, exercising, and art performances. Flow grants people high levels of concentration and enjoyment (Robson et al., 2014; Zhou and Lu, 2011).

Scholars have investigated the factors that facilitate flow during internet search and online games (Koivisto and Hamari, 2014; Robson et al., 2014). Not only does the experience of flow give rise to consumers' interest in websites and products but also lowers their sensitivity to prices. Flow also affects individuals' attitudes (Landers et al., 2015; Steffen et al., 2013; van Noort et al., 2012) and increases their PI (Liu et al., 2011; Steffen et al., 2013).

In this study, the term flow refers to the psychological state consumers experience when using GBAs. Users of GBAs restrict their attention to the game, ignore their surroundings and other irrelevant information. They feel time passes quickly and experience enjoyment. They may transfer the feelings of pleasure and indulgence they experience to the product or brand, thus creating favourable BA and PI. We therefore propose the following hypothesis:

H1 Flow positively influences BA (H1a), which increases PI (H1b).

3 Psychological state triggered by GBAs

A growing literature examines the factors that influence consumers' usage and downloading of apps. Scholars have discovered that promotion and timing (Kang et al., 2015) play important roles in app downloading intentions. Although research on branded apps is extremely limited, some scholars have found that convenience (IPSOS, 2013), information, and entertainment (Bellman et al., 2011; Lariviere et al., 2013) are important factors affecting consumers' adoption of branded apps. Nevertheless, previous research studies have failed to determine how gamification affects brands. We propose a model that explains how GBAs trigger psychological states for consumers (PC, achievement, and social interaction), which positively influence flow and leads to enhanced BA and PI. Different levels of creativity might also present different psychological paths.

3.1 *Perceived challenge*

Providing an adequate level of challenge in games can attract players and maintain their desire to continue playing (Csikszentmihalyi, 1991). This requires designing games in

ways that match the players' skills (Fu et al., 2009). Challenges balance the difficulty of the game with the player's ability to overcome the difficulty (Fu et al., 2009; Sweeter and Wyeth, 2005). In this study, we define PC as the degree of balance between the GBA's difficulty and the consumers' ability to overcome that difficulty. PC also induces wonder and curiosity (Malone, 1981, 1982), influences the player's involvement (Lomas et al., 2013), and positively increases flow (Fu et al., 2009; Hamari et al., 2016; Sweeter and Wyeth, 2005). For example, in McDonald's app, 'Drop into Macca's', consumers can control the protagonist, Carl, to dodge obstacles and furious animals (Zhao and Balague, 2015). When the consumer's abilities and the game's difficulty (dodging obstacles and animals) are balanced, the consumer may perceive he/she can overcome the challenge, which provides incentive for him/her to focus and engage themselves deeply in the game, thus entering a state of flow. This may also result in consumers developing positive feelings towards the brand, increasing their PI. We therefore propose the following hypothesis:

H2 PC positively affects flow.

3.2 Perceived achievement

Perceived achievement refers to the degree of accomplishment that consumers attain when interacting with the game mechanics (Norman et al., 2004). Games often adopt a scoring system to quantify performance, which prompts players to experience a sense of pleasure and accomplishment (Lin et al., 2015). The outcome usually determines the motivation for pursuing a goal (Kaiser et al., 2017). We classify GBA achievement into two types: promotional and competitive. Promotional achievement refers to in-game performance and rewards. In particular, consumers are more willing to play GBAs when in-game rewards can be exchanged for real-world bonuses (discounts, vouchers, or credits). For example, in MacDonald's 'drop into Macca's', if players collect enough points, they have a chance to getting a free hamburger, or even a gift card worth US\$1000. The GBA, 'protect the football', launched by Buffalo Wild Wings, allows customers to exchange in-game rewards for store discounts (Zhao and Balague, 2015).

Competitive achievement relates to comparative performance. According to social comparison theory, people usually compare themselves with others for self-evaluation (Festinger, 1954). In a game, scoring and badge systems publicise players' status and gaming skill (Antin and Churchill, 2011). Showing player achievements influences players' competitive and win/lose mentalities (Bista et al., 2014), and it has a positive impact on players' gaming performance, frequency of play, and pleasure (Lin et al., 2014). In short, GBAs intensify comparisons with others. Accordingly, we expect competitive achievement, triggered by GBAs, reduces consumers' self-awareness, increased their pleasure, and can cause them to enter a state of flow. Achievement may positively, albeit indirectly, affect consumers' purchase decisions (Norman et al., 2004). We therefore propose the following hypothesis:

H3 Perceived promotional achievement (PPA) (H3a) and competitive achievement (H3b) positively affect flow.

3.3 *Perceived social interaction*

Social mechanics are crucial for developing a successful game. Many studies have discovered social interaction increases players' involvement and intentions to continue playing (Chica and Rand, 2017; Su et al., 2016). Many GBAs feature social mechanics to enhance social interactions between and among users, prompting them to share and recommend the apps and brands to other consumers. In this study, perceived social interaction, via GBAs, can be categorised into two types: intrinsic and extrinsic. Intrinsic social interaction (ISI) refers to a player's perceived in-game interactions (with other users), facilitated by the social mechanics of the GBA. ESI refers to perceived interactions through media other than the GBA (e.g., discussion groups, social media, and mobile apps) for sharing GBA experiences, performance, and recommendations with other consumers. Not only do social interactions fulfil players' needs for new friends and maintaining relationships, they also facilitate the gaming experience (Terlutter and Capella, 2013). Players who establish social connections with other players likely have increased feelings of enjoyment and excitement, which leads to flow and purchase decisions (Su et al., 2016). Therefore, we propose the following related hypothesis:

- H4 Perceived ISI (H4a) and ESI (H4b) positively affect flow.
- H5 Flow mediates the relationship between PC (H5a), promotional achievement (H5b), competitive achievement (H5c), ISI (H5d), ESI (H5e), and BA.
- H6 BA mediate the relationship between flow and PI.

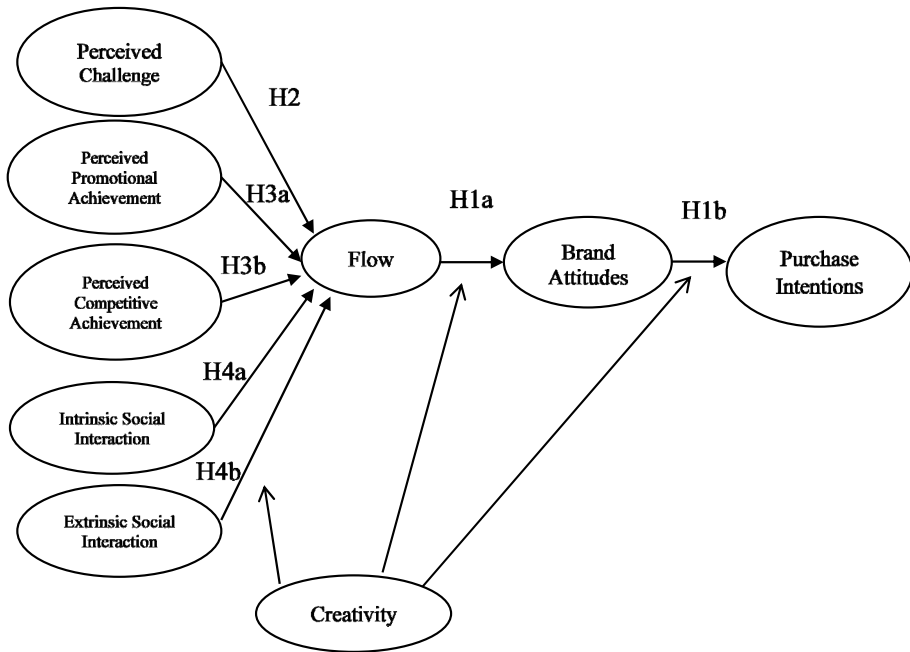
4 Creativity

Creativity can attract attention, enhance communication effects, and positively influence product value (Bruce et al., 2017). Creativity increases consumers' advertising attitudes, ad recall, and PI (Ang et al., 2014; Modig and Rosengern, 2014). Creative game design and mechanics can increase a player's enjoyment, thus enhancing the player's PI (Agogué et al., 2015; Hyypiä and Parjanen, 2015). Both academic researchers and business practitioners have stressed the essential role creativity plays in influencing consumer preferences. However, the psychological processes that underlie the moderating effects of creativity are unclear. Will creativity amplify the impact of PC, achievement, and social interaction on flow, leading to a higher BA and PI? Will a GBA with high creativity generate more favourable BA and PI than a GBA with low creativity? We combine these questions into the following research question:

- RQ1 How does GBA creativity influence the impact of PC, achievement, and social interaction on flow, BA, and PI?

The model proposed in this study is shown as Figure 1.

Figure 1 GBA model



5 Method

5.1 GBA choices

To determine how high and low creativity differentiates gamification effects, we chose four GBAs that meet our criteria for the functions of all forms of perceived achievement and social interaction: McDonalds (GBA 1), Starbucks (GBA 2), Muji (GBA 3), and FASIO (GBA 4). Fifteen college students were recruited to download the GBAs. They were asked to use each app for 15 minutes. Subsequently, they were asked to fill out a pretest questionnaire regarding the level of creativity. The measurement of creativity was adopted and revised from Ang et al. (2014), asking the respondents to indicate their agreement on the extent of GBA’s creativity. The results indicated that GBA 1 (M = 5.87, SD = .32) had the highest creativity, while GBA 4 (M = 3.33, SD = .92) had the lowest. We therefore used MacDonaldd’s and Fasio GABs in this study.

5.2 Instrument development

Seven-point Likert scales, ranging from (1) *strongly disagree* to (7) *strongly agree*, were used to measure all the variables in the research. The survey instrument developed for this study involved using validated items from relevant literature for assessing constructs

in this study. PC is defined as the degree of balance between the difficulty of a GBA and consumers' capabilities of overcoming that difficulty. Two of the measurement items were adopted and revised from Hamari et al. (2016); we also added two revised scale items from Fu et al. (2009) to factor in the concept of users' ability and skills in game playing. PPA is defined as in-game performance and rewards. We developed the scale items. Perceived competitive achievement (PCA) refers to comparative performance. We developed the scale items from Bista et al.'s (2014). ISI is defined as consumers' perceived in-game interactions among app users, facilitated by the social mechanics of a GBA. We developed the scale items from Lin et al.'s (2015). ESI is defined as perceived interactions among app users and non-app users involving media other than the GBA. We used the literature to develop the scale items.

Flow is conceptualised as the psychological state of narrowing down consciousness, gaining pleasure, losing time, and neglecting the surroundings and other irrelevant information. The scales were adapted from van Noort et al. (2012).

BA refer to the tendency to respond to a brand favourably or unfavourably. The measurement was adapted from Bellman et al. (2011). PI refers to the intention of purchasing a brand. Three items from Lee (2015) were used.

5.3 Sample and research procedures

Our study sample comprises GBA users. The initial version of the questionnaire was pre-tested on 30 respondents to discuss the length and format of the instrument, as well as the clarity and appropriateness of wording. It resulted in the revision of some questions that were regarded as ambiguous. An online sample was used. MySurvey was used to collect data from Nov. 22 to 30. Two sets of survey were created, one for high creativity, the other for low creativity. Respondents participated in one, and only one set of the survey. The survey invitation was posted in online forum discussion groups focusing on apps, branded apps, and smartphone.

Respondents first read a general introduction describing what GBA is and the intent of the survey. We used four items to determine whether they are valid respondents: if they are smartphone users, downloaded any GBAs, the frequency and time of using GBA per week. Then, a link was provided for the download. They were asked to download the branded app and play it for 15 minutes. Subsequently, they were asked to answer five questions related to the app content and mechanics. These questions served to screen out respondents who did not use or understand the app. Next, they were asked to indicate their agreement or disagreement on the construct items for the variables. The last section requested background information, such as age, education level, gender, income, and occupation. To increase participation incentives, a successful response can get into a lottery for a chance to win a iPad Mini, five USD6 certificates of a convenient store (7-Eleven), and five USD3 certificates of Line (mobile app) credits. A total of 979 questionnaires were returned. Following the exclusion of those responses with too many missing values, as well as those who were not smartphone users and those who did not answer the screen questions correctly, we were ultimately left with a total of 938 questionnaires for analysis in this study.

Detailed profile of respondents is shown in Table 1. The majority of this sample consisted of young people. It is consistent with the market report (National Development Council, 2016).

Table 1 Profile of respondents

	<i>Items</i>	<i>Frequency %</i>	
Gender	Male	408	(43.5)
	Female	530	(56.5)
Age	Under, 19	58	(6.2)
	20–24	468	(49.9)
	25–29	280	(29.9)
	30–34	83	(8.8)
	35–39	35	(3.7)
	40–44	8	(.9)
	45–49	5	(.5)
	50 and above	1	(.1)
Education	Under high school	2	(.2)
	High school	25	(2.7)
	College	707	(75.4)
	College above	204	(21.7)
Income	Under 10,000	400	(42.6)
	10,001–20,000	116	(12.4)
	20,001–40,000	310	(33.0)
	40,001–60,000	81	(8.6)
	60,001–80,000	22	(2.3)
	80,001–100,000	2	(.2)
	Over 100,000	7	(.7)

6 Data analysis

SPSS 22 and Amos 21 were used for data analysis.

6.1 Manipulation checks

We checked the manipulation of creativity. As expected, GBA1 ($M = 5.15$) was high creativity. GBA4 ($M = 3.84$) was low creativity.

6.2 Validity and reliability

Exploratory Factor Analysis was conducted to examine whether the underlying items correctly measure the constructs. The results (Appendix) reveal that factor loadings were satisfactorily above 0.70 in the range of 0.70 to 0.95. Based on results of the first confirmatory factor analysis, items that have low item-to-construct loadings (<0.6) were eliminated: 1 item of PC, 2 items of promotional achievement, and 2 items from flow were dropped. We then conducted the second confirmatory factor analysis. The results (Table 2) show that

- 1 most of the factor loading of each item is higher than 0.7
- 2 the average variance extracted (AVE) is higher than 0.5, showing good convergent validity
- 3 analysis of discriminant validity (Table 3) shows that each single construct is distinct from other constructs
- 4 the composite reliability (CR) and internal consistency reliability – Cronbach’s alpha is higher than 0.7
- 5 the result of confirmatory factor analysis suggests a marginally good fit for the model, with normed fit index (NFI) = 0.93; comparative fit index (CFI) = 0.95; and root mean square error of approximation (RMSEA) = 0.07.

All of the statistics show that the data has high reliability and validity.

Table 2 Validity and reliability

<i>Construct</i>	<i>Items</i>	<i>Factor loading</i>	<i>CR</i>	<i>AVE</i>	<i>Cronbach α</i>
PC	Playing this gamified branded app challenges me	0.76	0.85	0.59	0.84
	Playing this gamified branded app challenges me to the best of my ability	0.91			
	Playing this gamified branded app stretches my capabilities to my limits	0.69			
	Playing this gamified branded app provides a good test of my skills.	0.69			
PPA	I have great hope of successfully getting the rewards in the gamified branded app.	0.79	0.73	0.58	0.73
	I have competence to win the rewards in the gamified branded app.	0.73			
PCA	I can outperform others in winning in-game rewards in the gamified branded app.	0.78	0.86	0.68	0.86
	My performance in this gamified branded app is better than other users.	0.85			
	I can earn more in-game rewards than other users from this gamified branded app.	0.84			
ISI	The gamified branded app provides a means to communicate with other users.	0.86	0.91	0.72	0.91
	The gamified branded app allows for interactions among users.	0.91			
	I interact with other users in the gamified branded app.	0.90			
	I discuss my game experience with other users in the gamified branded app.	0.71			

Table 2 Validity and reliability (continued)

<i>Construct</i>	<i>Items</i>	<i>Factor loading</i>	<i>CR</i>	<i>AVE</i>	<i>Cronbach α</i>
ESI	I can interact with other users on other media/app.	0.87	0.93	0.81	0.93
	I interact with my friends about the gamified branded app on other media/app.	0.94			
	I interact with people outside of the gamified branded app.	0.89			
Flow	I experience a loss of self-consciousness when playing this gamified branded app.	0.76	0.92	0.75	0.92
	When using this gamified branded app, I felt in control.	0.87			
	Playing this gamified branded app was interesting.	0.94			
	When using this gamified branded app, I was totally absorbed in what I was doing.	0.89			
BA	I like this brand.	0.91	0.94	0.84	0.94
	I find this brand enjoyable.	0.93			
	I find this brand pleasant.	0.91			
PI	I am willing to purchase this brand in the future.	0.94	0.96	0.88	0.96
	Given a chance, I will purchase this brand.	0.95			
	I intend to purchase this brand in the future.	0.93			

Table 3 Discriminant validity

	<i>M</i>	<i>SD</i>	<i>PC</i>	<i>PPA</i>	<i>PCA</i>	<i>ISI</i>	<i>ESI</i>	<i>FLOW</i>	<i>BA</i>	<i>PI</i>
PC	4.44	.036	.79							
PPA	4.96	.039	.53***	.76						
PCA	4.27	.039	.62***	.52***	.82					
ISI	3.92	.043	.59***	.42*	.58***	.85				
ESI	4.56	.041	0.56***	.58***	.58***	.62***	.90			
FLOW	3.65	.044	0.60***	.44***	.61***	.68***	.53***	.87		
BA	5.42	.033	0.33***	0.48***	0.26***	.15***	.37***	.17***	.92	
PI	5.60	.035	0.24***	.41***	0.17***	.04	.30***	.65*	.83***	.94

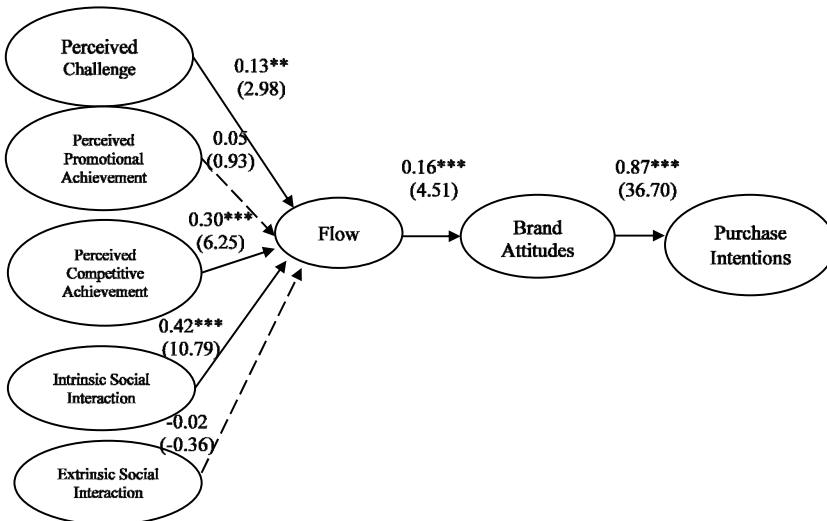
Notes: **p < .01; ***p<.001

Table 4 Path analysis of the model

Path	All (t)	High creativity (t)	Low creativity (t)
	β		
Perceived challenge > Flow	0.13** (2.98)	0.20** (2.95)	0.11 (1.89)
Perceived promotional achievement > Flow	0.005 (0.93)	0.11 (1.48)	-0.09 (-1.44)
Perceived competitive achievement > Flow	0.30*** (6.25)	0.24** (3.02)	0.36*** (6.07)
Perceived intrinsic social interaction > Flow	0.42*** (10.79)	0.36*** (6.45)	0.42*** (7.78)
Perceived extrinsic social interaction > Flow	-0.02 (-0.36)	-0.07 (-1.07)	0.10 (1.66)
Flow > Brand attitudes	0.16*** (4.51)	0.26*** (5.26)	0.12* (2.48)
Brand attitudes > PI	0.87*** (36.60)	0.94*** (23.70)	0.89*** (27.57)
<i>Model FIT index</i>			
χ^2 /DF	6.36	3.49	4.66
p-value	0.000	0.000	0.000
CFI	0.93	0.93	0.96
NFI	0.92	0.91	0.89
RMSEA	0.07	0.07	0.08

Notes: *p < 0.05; **p < 0.01; ***p < 0.001
(): t value

Figure 2 Path analysis for the GBA model



Notes: *p < 0.05; **p < 0.01; ***p < 0.001
(): t value

6.3 Model assessment

Table 4 and Figure 2 show path coefficients and their significance for the model. The results suggest a good fit with NFI = 0.92; CFI = 0.93; and RMSEA = 0.07. The structural model exhibits a good fit.

7 Results for research questions and hypotheses testing

As indicated in Table 4 and Figure 2, all path coefficients in the proposed model are significant, except the paths from PPA to flow and from perceived ESI to flow. H3a and H4b are therefore not supported. The results indicate that flow ($\beta = 0.16$ $t = 4.51$, $p < 0.001$) positively affects BA. BA ($\beta = 0.87$, $t = 36.70$, $p < 0.001$) positively influence PI. H1a and H1b are therefore supported. Flow indirectly influence PI ($\beta = 0.16 \times 0.87 = 0.14$) through BA.

Table 5 Mediating effects

Mediating path	Direct path	β	S.E.	t	Sobel test	Aroian test	Goodman test
<i>All</i>							
PC > FLOW > BA	PC > FLOW	0.13	0.048	2.708	2.36*	2.33*	2.40*
	FLOW > BA	0.16	0.033	4.848			
PPA > FLOW > BA	PPA > FLOW	0.05	0.044	1.136	1.11	1.08	1.13
	FLOW > BA	0.16	0.033	4.848			
PCA > FLOW > BA	PCA > FLOW	0.30	0.051	5.882	3.74*	3.71*	3.77*
	FLOW > BA	0.16	0.033	4.848			
ISI > FLOW > BA	ISI > FLOW	0.42	0.032	13.125	4.55*	4.54*	4.56*
	FLOW > BA	0.16	0.033	4.848			
ESI > FLOW > BA	ESI > FLOW	-0.02	0.037	-0.541	-0.54	-0.53	-0.55
	FLOW > BA	0.16	0.033	4.848			
FLOW > BA > PI	FLOW > BA	0.16	0.033	4.848	4.81*	4.80*	4.81*
	BA > PI	0.87	0.024	36.25			
<i>High creativity</i>							
PC > FLOW > BA	PC > FLOW	0.20	0.073	2.740	2.52*	2.49*	2.54*
	FLOW > BA	0.26	0.041	6.341			
PPA > FLOW > BA	PPA > FLOW	0.11	0.073	1.507	1.47	1.45	1.48
	FLOW > BA	0.26	0.041	6.341			
PCA > FLOW > BA	PCA > FLOW	0.24	0.085	2.824	2.58*	2.55*	2.61*
	FLOW > BA	0.26	0.041	6.341			
ISI > FLOW > BA	ISI > FLOW	0.36	0.050	7.2	4.76*	4.73*	4.78*
	FLOW > BA	0.26	0.041	6.341			
ESI > FLOW > BA	ESI > FLOW	-0.07	0.062	-1.129	-1.11	-1.10	-1.13
	FLOW > BA	0.26	0.041	6.341			
FLOW > BA > PI	FLOW > BA	0.26	0.041	6.341	6.12*	6.12*	6.13*
	BA > PI	0.94	0.040	23.5			

Table 5 Mediating effects (continued)

<i>Mediating path</i>	<i>Direct path</i>	β	<i>S.E.</i>	<i>t</i>	<i>Sobel test</i>	<i>Aroian test</i>	<i>Goodman test</i>
<i>Low creativity</i>							
PC > FLOW > BA	PC > FLOW	0.11	0.059	1.864	1.44	1.36	1.53
	FLOW > BA	0.12	0.053	2.264			
PPA > FLOW > BA	PPA > FLOW	-0.09	0.051	-1.765	-1.39	-1.31	-1.48
	FLOW > BA	0.12	0.053	2.264			
PCA > FLOW > BA	PCA > FLOW	0.36	0.061	5.902	2.11*	2.09*	2.14*
	FLOW > BA	0.12	0.053	2.264			
ISI > FLOW > BA	ISI > FLOW	0.42	0.041	10.244	2.22*	2.21*	2.23*
	FLOW > BA	0.12	0.053	2.264			
ESI > FLOW > BA	ESI > FLOW	0.10	0.050	2	1.50	1.42	1.59
	FLOW > BA	0.12	0.053	2.264			
FLOW > BA > PI	FLOW > BA	0.12	0.053	2.264	2.26*	2.26*	2.26*
	BA > PI	0.89	0.031	28.710			

Note: * $p < 0.05$

The analysis also demonstrates that ISI ($\beta = 0.42$, $t = 10.79$, $p < 0.001$) serves as the strongest and most positive influence on flow, whilst perceived competitive achievement ($\beta = 0.30$, $t = 6.25$, $p < 0.001$) serves as the second strongest influence, followed by PC ($\beta = 0.13$, $t = 2.98$, $p < 0.03$). The results support H2, H3b, and H4a.

Research question 1 asks how GBA creativity influences impacts of PC, achievement, and social interaction on flow, BA, and PI. The results (Table 4) show that, in high creativity, perceived ISI ($\beta = 0.36$, $t = 6.45$, $p < 0.001$) serves as the strongest and most positive influence on flow, followed by perceived competitive achievement ($\beta = 0.24$, $t = 3.02$, $p < 0.05$), then PC ($\beta = 0.20$, $t = 2.95$, $p < 0.03$). Flow ($\beta = 0.26$, $t = 5.26$, $p < 0.001$) positively affects BA. BA ($\beta = 0.94$, $t = 23.70$, $p < 0.001$) positively influence PI. In low creativity, perceived ISI ($\beta = 0.42$, $t = 7.78$, $p < 0.001$) is the most positive influence on the level of flow while perceived competitive achievement ($\beta = 0.36$, $t = 6.07$, $p < 0.001$) has the second strongest influence. Flow ($\beta = 0.12$, $t = 2.48$, $p < 0.001$) positively affects BA. BA ($\beta = 0.89$, $t = 27.57$, $p < 0.001$) positively influence PI. PC positively triggers flow only when GBA creativity is high.

We assess the significance of the mediation with Aroian's (1944), Goodman's (1960), and Sobel's (1982) tests for indirect effect. Analysis of indirect effect (Table 5) shows that mediating effects PC > FLOW > BA (Sobel $z = 2.36$, $p < .01$; Aroian $z = 2.33$, $p < .01$; Goodman $z = 2.40$, $p < .01$), PCA > FLOW > BA (Sobel $z = 3.74$, $p < .01$; Aroian $z = 3.71$, $p < .01$; Goodman $z = 3.77$, $p < .01$), ISI > FLOW > BA (Sobel $z = 4.55$, $p < .01$; Aroian $z = 4.54$, $p < .01$; Goodman $z = 4.56$, $p < .01$), FLOW > BA > PI (Sobel $z = 4.81$, $p < .01$; Aroian $z = 4.80$, $p < .01$; Goodman $z = 4.81$, $p < .01$) were significant. H5a, H5c, H5d, and H6 receive full support.

8 Conclusions and discussion

8.1 Conclusions

Many companies have gamified their branded apps to foster customer engagement and connect with customers using game elements and mechanics. By combining advertising and entertainment, gamification meticulously situates the brand name, symbol, and attributes in the form of a game to shape consumers' attitudes (Canning, 2016; Chen and Haley, 2014; Peters and Leshner, 2013). We investigated whether GBAs trigger consumers' perceptions, leading to flow, BA, and PI. The results illustrate PC, competitive achievement, and ISIs are key drivers of flow, which positively and significantly influence consumers' BA and PI directly and indirectly.

The perception of a challenge is vital for the success of a game (Sweeter and Wyeth, 2005). The results of this study indicate PC increases flow. When a balance is achieved between the GBA's difficulty and users' abilities, the users may enter a state of flow. These findings are consistent with research Sweeter and Wyeth's (2005) and Hamari et al.'s (2016) results. The current findings also demonstrate perceived competitive achievement significantly affects flow. Comparative performance effectively arouses players' competitive mentality (Bista et al., 2014) and generates excitement, encouraging players to continue exploring other aspects of the game (Lin et al., 2015). When users achieve high scores or receive rewards, they feel like they have beaten other users, which generates highly emotional responses and helps the users enter a state of flow.

However, the findings indicate the impact of PPA on flow is not significant. This result might be attributable to the promotional nature of the rewards. The promotional branding and product information on GBAs are often advertisements and product placements (Chen and Haley, 2014; Peters and Leshner, 2013). Consumers may feel irritated and annoyed when they receive promotional information and advertising, so they ignore these messages (Lee, 2015). Another explanation for the non-significant finding may be the lack of reward diversity. Although scoring systems and virtual rewards build the perception of achievement, existing GBA mechanisms mainly rely on an internal and an external reward (Bunchball, 2010). For example, the McDonald's GBA offers stickers as an internal reward and discount vouchers as an external reward. The Starbucks GBA awards stars (an internal reward) and discount vouchers (external reward). A lack of diversity of rewards may have implications for GBAs.

Consistent with past research, the current findings show social interaction plays an important role in the enhancement of GBA users' flow. Social mechanics enable GBA users to establish social relationships with others, prolonging time spent playing the game time and even altering flow and changing behaviours (Lin et al., 2015; Su et al., 2016; Terlutter and Capella, 2013). The current findings reveal perceived ISI positively and significantly affects flow. When using a GBA, consumers immerse themselves in the game and ignore irrelevant information. They may feel time passes quickly and that they are experiencing great pleasure. In this context, flow is directly transferred to the brand, causing users to form favourable perceptions of the brand (Landers et al., 2015).

The empirical results confirm consumers' BA positively affect PI, which is consistent with the Liu and Shiue's (2014) results. However, we found perceived ESI does not affect flow. We attribute this finding to users' interest in interacting with people who do not use the same GBA and do not have similar personal experiences. Another explanation is ESI requires additional steps to connect with other people on social media or apps, which may require a sudden interruption of game flow. The interruption may decrease the significance of the relationships between flow and ESI.

Finally, the results show creativity leads to different psychological paths. Compared to GBAs with low creativity, high creativity apps amplify the effects of PC on flow. Creativity also amplifies the effects of flow on BA and PI. However, low creativity seems to drive the effects of perceived competitive achievement and ISI on flow more than high creativity.

8.2 Theoretical contributions

This research makes several theoretical contributions. First, previous studies on apps largely focused on motivations for using or downloading the apps. Few studies have explored the impact of GBAs on brand responses. This study contributes to the literature by differentiating psychological paths from PC, achievement, and social interaction involving flow in gamification. The model also explicates how flow influences BA and PI. Second, this study deconstructs perceived achievement and social interaction, which extends knowledge of their roles in the formation of BA. Furthermore, we unfolded the influence of creativity, providing insights into how creativity influences the effects of consumers' perceptions on flow, BA, and PI.

Our research also has some important methodological implications. Past investigations focused on achievement and social interaction as single factors. As such, these earlier studies had limited practical applicability for business. Our deconstruction of the two constructs and the scales developed in this study enable researchers to distinguish the effects of each kind. Another contribution is verifying creativity can exert moderating effects on gamification.

8.3 Managerial implications

Our study has actionable implications for GBA design, branding, and the selection of gamification elements and mechanics. The results reveal that a higher level of consumers' PC, competitive achievement, and ISI increases the flow. Brand managers should, therefore, direct attention to how these consumers' perceptions can be enhanced. Managers can test and measure these perceptions and resulting flow levels before officially launching a new GBA. Practical means include embracing a scalable difficulty system that balances user abilities with game difficulty to enhance users' state of flow. Brands can consider reducing their investment in designs for promotional achievement and focus on developing mechanics for rousing users' perceptions of competitive achievement, such as ranking results and providing badges. App developers can also devise ways for users to interact with one another on GBAs.

Our research suggests GBA development should take creativity into consideration. Consumers seem to be more interested in mechanics that allow them to interact with other users and have competitive achievement in high and low creativity. In high creativity, the manipulation of the challenge can change flow. Brands should set up

different challenge levels for users to overcome difficulties. Failure to do so might hinder the effectiveness of a GBA on BA, inhibiting PI and threatening the GBA's success.

8.4 Limitation

There are several limitations that must be taken into consideration. For example, branded apps come in various forms, such as information-, entertainment-, design-, and tool-centric (Zhao and Balague, 2015). The focus of the app may require brand managers leverage gamification differently. Future research should investigate how these different types of GBA apps influence the psychological path. In addition, the samples examined in this study comprised mostly young users. Though this matches market demographics, the results of this study cannot be overly-generalised to all age groups.

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Appendix*Exploratory factor analysis for independent variables*

<i>Construct</i>	<i>Items</i>	<i>Factor Loading</i>	<i>% of variance</i>
PC	PC2	0.88	65.90
	PC3	0.83	
	PC1	0.79	
	PC4	0.74	
PPA	PPA1	0.79	78.87
	PPA2	0.73	
PCA	PCA3	0.90	78.76
	PCA2	0.89	
	PCA1	0.88	
ISI	ISI2	0.93	77.91
	ISI3	0.93	
	ISI1	0.89	
	ISI4	0.78	
ESI	ESI2	0.95	87.00
	ESI1	0.93	
	ESI3	0.92	