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Antecedents and consequences of sending and receiving information in mobile gaming apps

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ABSTRACT

Mobile gaming applications (apps) are increasingly engineered to encourage the sending and receiving information between players in hopes of generating word-of-mouth and stimulating purchases. This research utilizes a social influence perspective to examine the trait antecedents (identification as a member of the gaming community, susceptibility to informational influence) and behavioral consequences (paying for downloads of mobile app games, making in-app purchases, sharing of gaming experiences) of the desires to send and receive market information in mobile gaming apps.

A structural equation model was constructed and tested from a survey of 265 US adults who identified themselves as playing mobile gaming apps. Results show dramatically different antecedents and consequences between trait desires to send and receive market information in mobile gaming apps. The desire to send market information significantly and positively affected all three gaming behaviors, while the desire to receive market information had a negative effect on in-app purchases. The desire to send market information also fully mediated the impact of susceptibility to informational influence on all three behaviors. These findings help expand knowledge of informational exchange in mobile games to help developers increase engagement and monetization.

1. Introduction

In 2021, mobile gaming applications (gaming apps) were downloaded 83 billion times and generated $116 Billion in revenue worldwide (App Annie, 2022). Gaming apps also generated 50% more revenue than all other gaming platforms, namely PC and home consoles, combined (App Annie, 2021). This figure is even more impressive when one considers that only 10% of mobile games charge for download (Dinsmore, Wright, & Plotkina, 2021). The other 90% of mobile games rely upon a freemium pricing model, where they are free to acquire and rely upon in-app purchases that typically come from <2% of players (Liftoff, 2018).

Key to the growth of gaming apps has been the building of communities where players compete, cooperate, form relationships, and learn. As one mobile gaming CEO described (Schatz, 2017): "[Mobile] games that generate active communities of players usually offer engaging, deep systems that satisfy a variety of different desires: role-playing, social interaction, intellectual challenges…Great game design, an ability to drive word-of-mouth, and player communities are what keep games alive in the long run." Despite the emphasis that mobile gaming app marketers have placed on incorporating social components into game design, the effect of social influence on gaming monetization has remained under-researched (Fang, Zheng, Ye, & Goes, 2019) leaving an important question unanswered: What is the impact of social influence on mobile gaming behaviors?

This research extends Dholakia, Bagozzi, and Pearo's (2004) social influence model for virtual communities examining how *social influence traits* (identification with the gaming community, susceptibility to informational influence) impact *desires* (desire to send market information, desire to receive market information), and ultimately influence *participatory behaviors* (paying for initial downloads of a mobile game, making in-app purchases, and sharing gaming experiences).

Through a survey of 265 US gaming app users, a structural equation model tests how players' identification as members of a gaming

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community (GameAffinity) and susceptibility to informational influence (SusceptInfo) influence those desires. Finally, the model tests the impact of those desires on participatory behavioral intentions. Results show dramatically different antecedents and consequences between trait desires to send and receive market information in mobile gaming apps. The desire to send market information significantly and positively affected all three gaming behaviors, while the desire to receive market information had a negative effect on in-app purchases. The desire to send market information also fully mediated the impact of susceptibility to informational influence on all three behaviors.

The findings of this study extend knowledge of informational influence in mobile games to help developers increase engagement and monetization of these apps.

The structure of the manuscript is as follows: an overview of social influence theory and relevant literature, development of hypothesized relationships, description of the survey methods, results, and discussion.

2. Literature review

2.1. Social influence in virtual communities

Research specific to social influence and mobile gaming is limited. However, literature on gaming and other online communities likely offers a window into social factors that may influence mobile gaming behaviors.

Social influence theory related to virtual communities (Bagozzi & Dholakia, 2002; Dholakia et al., 2004) offers a relevant framework. Members of virtual communities are motivated to engage and exchange information that has both functional and hedonic value (Bagozzi & Dholakia, 2002; Krishen, Berezen, & Raab, 2019), which is also true for gaming app communities. The functional value to players is risk mitigation in purchases (of either the game itself, or enhancements to the game) and game advancement. The hedonic value through this engagement is a shared experience, collaboration, and a feeling of belonging (Jakobsson & Taylor, 2003). Social influence has been shown to drive usage intent in educational apps (Menon, 2022). Dholakia et al.'s (2004) social influence model for virtual communities shows *social influence traits* shaping *desires*, which then influence *decision-making and participation*. Within the hierarchy of this model, desires are positioned to mediate the effect of social influence traits on decision-making and participation.

Research in this area has focused on a variety of virtual communities and primarily upon visible attributes of community members (number of followers, posting frequency, etc.) that create social influence. On Twitter, following size and numbers of mentions (Cha, Haddadi, Benevenuto, & Gummadi, 2010) and reposts (Shi, Rui, & Whinston, 2014) were positively related to social influence. Similarly, on crowdfunding sites such as GoFundMe™, Liu, Chen, and Fan (2021) looked at crowdfunding communities and found that fundraisers' following size and posting frequency were positively related to social influence.

2.2. Mobile gaming

2.2.1. Social influence research in mobile gaming

Specific to games, social influence has been found to positively influence adoption and use of mobile games (Baabdullah, 2018). Fang et al. (2019) examined the social influence of different classes of friends on making in-game purchases. They found that friends of players who had no other friends in common ("pure friends") had a stronger influence on purchasing than those who did ("simmelian-tie friends"). Peer recommendations are significantly influential in virtual communities (Wang, Ren, Wan, & Yan, 2020), including mobile gaming (Wang, 2022). Additionally, in-app purchases in freemium games are often enhanced when players are informed of their skill level relative to other players (Jiao, Tang, & Wang, 2021).

Eastwick and Gardner (2009) found that aspects of a player's avatar like race have an impact on interactions in virtual gaming communities. Chang, Liu, and Chen (2014) utilized a social cognitive theory (SCT) finding that social influence was a significant factor in persevering in game play. Yang, Chiu, and Chen (2011) found a gender effect in social influence's impact on online game play, with women being more susceptible to social influence than men. A meta-analysis (Hamari & Keronen, 2017) of online game play found social influence had a positive effect on enjoyment, attitude toward the game, perceived usefulness of the game, and perceived ease of use.

More often, research related to personality has been focused on the use of social platforms such as Facebook. For example, neuroticism was found to be positively related to social network use (Wehrli, 2008) generally and extraversion was negatively related to use of Facebook (Moore & McElroy, 2012) in particular.

Research on personality traits related to social influence in virtual communities is more limited (Oyibo & Vassileva, 2019). Specific to personality and social influence, studies (Halko & Kientz, 2010; Kaptein, Markopoulos, De Ruyter, & Aarts, 2015) have demonstrated that segmenting messaging to specific personality traits can increase social influence. Studies of "big five" personality traits (agreeableness, neuroticism, extraversion, openness to experience, conscientiousness) found neuroticism to be the strongest predictor of susceptibility to social influence generally (Oyibo and Vassileva (2019), and in health-related apps (Halko & Kientz, 2010) specifically. Alqahtani, Meier, and Orji (2021) examined factors influencing the persuasiveness of mental health apps, where different app features were more persuasive for different personality traits. For example, highly neurotic people were influenced by the presence of a privacy policy while conscientious people were persuaded by messages of encouragement. When evaluating online content on a mobile device, agreeableness was the strongest predictor of the perceived credibility of that content (Oyibo, Orji, & Vassileva, 2017).

2.2.2. Unique aspects of the gaming community

The gaming community is distinguished from either virtual or brand communities in three important ways.

First, gaming communities are neither purely online or offline (Zhong, 2011), nor are they dedicated to an individual brand. Many mobile app games are designed for virtual connections to other players while some, like augmented reality hit Pokemon Go™, are specifically designed for offline, group participation. Even purely online games have communities of players who meet up offline to play.

Second, gamers consume a multitude of brands, making it more of a "consumption community" (Muniz & O'guinn, 2001) for not just one product, but a *class* of them. Market data shows gamers are polygamous in their consumption, with 85% trying multiple new games every year and almost half trying new games every month (Limelight Networks, 2018). As such, gamers belong to multiple gaming communities or subcultures, referred to as "guilds" (Chan & Vorderer, 2006; Hsiao & Chiou, 2012). The set of guilds to which each individual belongs can be highly diverse in terms of game type (individual, multi-player, etc.), genre (sports, fantasy, word games, etc.), membership, and culture. So, a person consciously associating with the gaming community reflects an identification with a gaming lifestyle that includes an eclectic and constantly-evolving set of guild memberships and experiences.

Many brand communities focus on matters peripheral to consumption, such as traditions and history (Muniz & O'guinn, 2001). Gamers, however, focus primarily on consumption, spending six hours per week playing games and another two hours per week watching others play on sites like Twitch™ (Limelight Networks, 2018).

Lastly, game designs incorporate and incentivize the use of community-building features. Even single player games such as Candy Crush™ push reward offers to players for sharing scores and posting game updates to their social networks. There is little difference between the game itself and the community that is integrated to it.

2.3. Uses and gratifications

The social influence framework extends the *uses and gratifications paradigm* (Flanagin & Metzger, 2001; McQuail, 1987) which finds that individuals select media to satisfy motivations such as community engagement. This engagement, in turn, provides the user with social and psychological gratifications.

The emergence of more interactive technologies in the 21st century has created a need to ascertain specific gratifications of each new platform, including various kinds of devices and applications (Sundar & Limperos, 2013). Uses and gratifications has been used to explain motivations for use of social media (Meng & Leung, 2021; Whiting & Williams, 2013) and mobile applications (Sheldon & Bryant, 2016; Smock, Ellison, Lampe, & Wohn, 2011),

The primary motivation for community engagement under this paradigm includes attaining "purposive value" which includes sending and receiving information through virtual community participation (Dholakia et al., 2004). As a result, these communal exchanges can bring status, goal-attainment, social connection, and emotional support.

The selection of mobile gaming platforms offers a similar array of potential uses and gratifications. Mobile gamers engage with the virtual community available on that platform to gain purposive value that yields enhanced status within that community, goal attainment in the form of advancement in gameplay, as well as social connections.

3. Hypothesis development

3.1. Participatory behaviors

3.1.1. Paying for downloads of gaming apps

The freemium business model entails providing a basic level of service at no cost to the consumer (Anderson, 2009; Lyons, Messinger, Niu, & Stroulia, 2012) in hopes of seeking revenue opportunities through the individual's continued use. By removing the barrier to acquisition, game developers intend to encourage download, trial, and habitual use of their apps (Dinsmore, Dugan, & Wright, 2016).

In many gaming apps, users have the option of paying upfront to download a full-featured version or installing a free version of a game that can later be enhanced at some cost. That initial choice of the free or paid version of an app poses an interesting dilemma to a consumer where he or she pays for the convenience and utility of having a full-featured version of an app. The willingness to pay for an app when a free alternative is available is operationalized in this research as "PayApp" (Dinsmore, Swani, & Dugan, 2017).

3.1.2. In-app purchases

Despite inherent risks in allowing free downloads, gaming companies have been highly successful in monetizing these "free" users. All of the top 10 grossing mobile app games in April of 2022 used a "free-to-download" with IAPs—or "Freemium"—model (App Annie, 2022).

Whether the game is initially acquired via free or paid download, IAPs are the largest revenue stream in gaming apps, representing 43% of all revenues (App Annie, 2019). Selling in-game content has dramatically impacted game design (Hamari, 2011; Hamari & Lehdonvirta, 2010) where the primary objective is less about creating a fun experience, and more about creating compelling opportunities for users to make purchases. Research has found that players make IAPs of virtual goods that are both related (gaming powers/abilities) and unrelated (avatars) to game play (Wohn & Na, 2012). Ravoniarison and Benito (2019) identified eight themes (such as financial risk and overspending anxieties) that affect a player's attitude toward an IAP offer.

3.1.3. SocialGaming

In terms of the present research, we define SocialGaming as the behavior of a person sharing his or her gaming experience with others, be it to enhance enjoyment of the game, exchanging game-related information, or social reasons.

There appears to be an innate link between social behaviors and online gaming where players can interact. Social factors such as gift-giving and number of friends playing a particular game (Wohn, 2014), not only enable more social interactions but also positively influence the purchase of virtual goods in online gaming (Hamari et al., 2017). Relatedly, a positive relationship has been found between extraversion and a preference for gaming apps (Lane & Manner, 2012). For gaming app players, there is a strong link between social motivations and game engagement (Wu & Stilwell, 2018). From 2015 Quarter 3 to 2017 Quarter 1, the average number of minutes spent per day on online gaming sessions rose 33% as games become more social in nature (Meeker, 2017, p. 115). Whether it's playing someone online, or merely sharing game features or statuses, companies are driving promotion and usage of their games by creating more opportunities for social connection and sharing of gaming experiences.

3.2. Desires

3.2.1. Desires to send market information

To date, research has not examined the effect of the desires to send or receive market information in either gaming in general, or gaming apps in particular. The desires to send and receive market information are key to generating word-of-mouth communications about products and services (Mowen, Park, & Zablah, 2007). For the player, the desire to send such information to others would likely result from wanting to build and strengthen social ties within the gaming community and potentially lay the foundation for reciprocal acts from those connections.

There are five primary functions of word of mouth (Berger, 2014): persuasion, social bonding, emotion regulation, impression management, and information acquisition. For gaming apps, the desire to send market information relates to emotion regulation and impression management, while the desire to receive it is tied to information acquisition. In the context of gaming apps, "market information" pertains to game statuses, scores, purchases, or "hacks" (solutions to enable advancement in gameplay).

According to Gamenics theory (Isbister & Schaffer, 2008), games should be highly accessible (such as when intuitive and free to acquire) to encourage trial and continued play. Then, players should encounter more challenging levels where they are given three options for overcoming the challenge: time (continued play), social interactions or purchases.

Across all product categories, consumer choice is driven by a desire to create an identity (Belk, 1988). Similarly, what individuals tell others about their consumption helps them signal that identity (Berger & Heath, 2007; Feick & Price, 1987) and enhance self-presentation (Fiske, 2001). For gaming app players, the desire to send market information is, on the surface, a form of altruism, passing along experiences and advice to help others. And while useful information is more likely to be shared (Berger & Milkman, 2012; Chiu, Chiou, Fang, Lin, & Wu, 2007), such sharing is also a form of self-enhancement to convey expertise and status within a community (Rimé, 2009). We believe those high in SendInfo will be more likely to pay for downloads (H1a) and make in-app purchases (H1b) as a means of enhancing status and self-presentation. The acquisition of these premium digital goods will convey status to the gaming community via purchase itself and advancement in gameplay.

Sending/sharing information with others is a coping mechanism to help people regulate their emotions (Dunahoo, Hobfoll, Monnier, Hulsizer, & Johnson, 1998) and provide social support (Berger & Buechel, 2012). People often share difficult experiences, anticipating relief from negative feelings (Zech, 1999). The series of challenges presented by gaming apps provide ample opportunities for frustration and the need to connect with other players for support. Therefore, we believe that SendInfo will be positively associated with SocialGaming (H1c).

H1a. SendInfo will positively influence paying for downloads.

H1b. SendInfo will positively influence IAPs.

H1c. SendInfo will positively influence SocialGaming.

3.2.2. Desire to receive market information

The desire to receive market information in gaming apps is a function of information acquisition where the consumer seeks advice (Rimé, 2009) and resolves problems (Sundaram, Mitra, & Webster, 1998). For gaming apps, advice and information on gameplay help enable advancement in gameplay without having to make an in-app purchase. Unlike the desire to send such information, the desire to receive it is focused solely on that player's immediate needs. While any exchange between two players represents the initiation of a social connection, the receiver is under no obligation (at least explicitly) to maintain that connection or reciprocate to the sender. Additionally, receiving such information in hopes of advancing in the game stands as a potential substitute to making in-app purchases designed to help achieve the same goal.

Therefore, we believe ReceiveInfo will be negatively associated with IAPs (H2b). This is also in keeping with prior findings (Mowen et al., 2007) that ReceiveInfo is positively associated with value consciousness, where an individual exerts effort to maximize value. The role of ReceiveInfo with the other two mobile gaming apps behaviors is less clear. But given ReceiveInfo's association with value-driven behavior, and that it appears to fulfill different, perhaps even opposing functions in mobile gaming apps than the desire to send it, we believe that ReceiveInfo will be negatively related to paying for downloads (H2a) or sharing of gaming experiences (H2c).

H2a. ReceiveInfo will negatively influence paying for downloads.

H2b. ReceiveInfo will negatively influence IAPs.

H2c. ReceiveInfo will negatively influence sharing of social gaming experiences.

3.3. Social influence factors

3.3.1. Game affinity

We define the concept of Game Affinity (GameAffinity) as the degree to which an individual identifies as a member of the gaming community. This social identity exceeds the mere habitual playing of video games. Instead, it represents the level of conforming to the social and cultural norms of the gaming community which can include beliefs, values, and actions. As with all social identities, a sense of belonging to the gaming community becomes a component of the individual's sense of self (Hogg & Abrams, 1988) and self-worth (Blanton & Christie, 2003).

A sense of community has elements to it which includes membership, influence, fulfillment of needs, and shared emotional connections (McMillan & Chavis, 1986). Seo and Jung (2016) conceptualize competitive gaming as an environment where individuals go far beyond their roles as players to create and sustain a culture. Such behavior changes individuals as they alter their lifestyles and associations via assimilation to gaming culture (Seo, 2016). In gaming, lifestyle changes can include social networks, dress such as cosplay, language, recreation outside of gaming, and more.

Identification with a brand community was positively related to the desires to both send and receive market information (Chang, Hsieh, & Lin, 2013). Since a key factor of GameAffinity is the conscious identification with the gaming community, we believe these social motivations will chiefly motivate those strongly identifying with the gaming community. Therefore, we believe that GameAffinity will positively influence both SendInfo (H3a) and ReceiveInfo (H3b).

H3a. GameAffinity will positively influence SendInfo.

H3b. GameAffinity will positively influence ReceiveInfo.

3.3.2. Susceptibility to informational influence

Susceptibility to informational influence (SusceptInfo) is a trait related to a person's tendency to accept information from others as representations of reality (Deutsch & Gerard, 1955), often through the use of products (Bearden, Netemeyer, & Teel, 1989). Those high in SusceptInfo gather information either by seeking out explicit information from others, or by observing others and deriving their own conclusions (Park & Lessig, 1977).

SusceptInfo was found to positively influence ReceiveInfo but no significant effect was found on SendInfo (Mowen et al., 2007). However, that study was not specific to a context. For many consumers, electronic Word of Mouth (eWOM) is one of the largest influences in online purchasing. Online shoppers see information from other consumers (vs. producers of a good) as more trustworthy and less biased (Berger, 2014; Bickart & Schindler, 2001). For those high in SusceptInfo, eWOM is perceived as the most useful source of brand information and has the highest influence on attitude toward a brand and, ultimately, purchase intentions (Chen, Teng, Yu, & Yu, 2016).

For gaming apps, sending and receiving market information is a key feature of game play. As described above, the nature of SusceptInfo relates to a willingness to engage and be influenced by others. In a gaming context, social exchange is incentivized with promises of advancement, but is not required to continue play. Players have the option of "going it alone" or making in-app purchases. As such, we believe those higher in SusceptInfo are more likely to seek to build their own influence as market mavens and should have higher desires to send (H4a) and receive (H4b) game-related information with their peers.

H4a. SusceptInfo will positively influence SendInfo.

H4b. SusceptInfo will positively influence ReceiveInfo.

Fig. 1 visualizes the hypothesized model of this research which examines the impact of social influence factors on information sharing and mobile gaming apps participatory behaviors.

4. Method

To test the hypotheses, a survey questionnaire was created using Qualtrics. The survey included existing measures for PayApp (Dinsmore et al., 2017), IAPs (Dinsmore et al., 2017), SendInfo (Mowen et al., 2007), ReceiveInfo (Mowen et al., 2007), and SusceptInfo (Bearden et al., 1989). Two new measures on SocialGaming and GameAffinity were developed for this study. Items for SocialGaming were operationalized by outlining common sharing behaviors surrounding gameplay which may or may not be directly incorporated into the game itself, including sharing scores, commenting on another's play, or seeking help from others.

The construct and measurement items for GameAffinity were focused on two primary markers of community: consciousness of kind (Bender, 1978) and functional participation (Hogg & Abrams, 1988). "Consciousness of kind," alludes to an individual's identification or connection to both the group as a whole, as well as its members. Items in the measure alluding to this consciousness describe explicit affiliation with the group ("I think of myself as part of the gaming community") or its members ("I have made some of my best friends from playing video games"; "It is easier for me to talk to someone about video games than most other topics"). Functional elements of a community refer to common rituals and behaviors associated with being a member of that community (Hogg & Abrams, 1988). Measures of such ritualistic behavior include frequency of gaming, enjoyment of gaming itself, and perceived knowledge of gaming. (**See** Table 1 for measure items and loadings).

The survey also included 13 items for social desirability (Reynolds, 1982) as a control variable, as well as three items for attitude toward energy drink consumption as a marker variable (Weinberger, Swani, Yoon, & Gulas, 2017). Participants indicated whether they use mobile

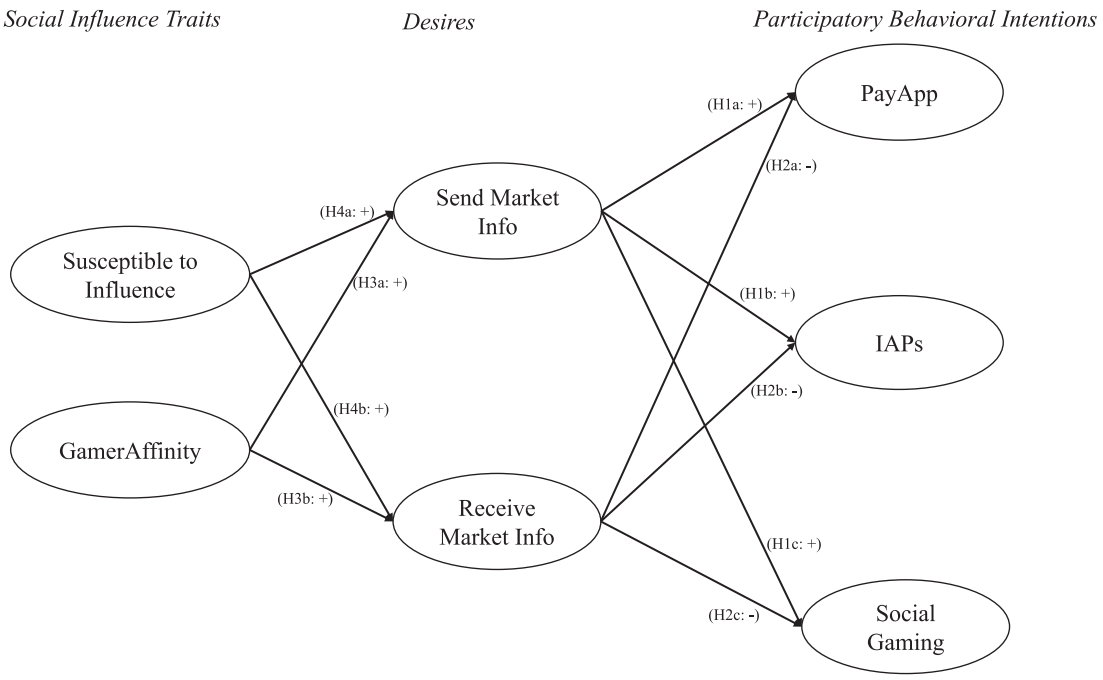

Fig. 1. The hypothesized model.

devices (e.g., smart phones and/or tablets) for gaming. All items were measured on a 7-point scale. Presentation order of the scales, as well as items within each scale, were randomized. At the end of the survey, participants were asked to report their sex and age. In addition, three attention check items were randomly placed in the survey. The attention check items required participants to select a specific response for each question.

4.1. Sample description

The U.S. participants for the research were recruited online via Amazon's Mechanical Turk and fairly compensated. A total of 409 participants completed the survey. Twenty-four respondents were eliminated because they missed at least one of the attention check questions. Given the focus on gaming apps, a further 120 respondents were eliminated because they indicated nonuse of mobile devices for gaming. The final dataset was comprised of 265 participants (M_{age} = 34.36 years, SD = 9.28; male = 51.30%).

5. Results

5.1. Validity of measures

We used MPLUS to run covariance-based structural equation modeling (maximum likelihood estimation (MLE)) for measurement and hypothesis testing. Confirmatory factor analysis (CFA) tested the validity and reliability of trait measures. To improve the model fit, three items from the PayApp scale with loadings of <0.469 were removed. The overall model fit improved after removing the selected items ($\chi^2_{(329)}$ = 558.289, CFI = 0.961, RMSEA = 0.051). Refer to Table 1 for standardized loading of items for various scales.

To assess the validity and reliability of latent measures, average variance extracted (AVE) and composite reliability (CR) were computed (Fornell & Larcker, 1981). The AVE for latent measures exceeded g50% (range: 53.76% - 79.05%). Furthermore, the square root of the AVE for latent variables exceeded the correlations among all the measures (refer to Table 2) and CR for all key measures exceeded 0.70. These results indicate adequate validity and reliability of measures (Bagozzi & Yi, 2012; Hair Jr, Babin, & Krey, 2017).

We used SPSS to test for data normality and multi-collinearity issues. Using the means scores for the key variables, we tested the normality using Kolmogorov-Smirnova test. The results indicate that the key variables have a non-normal distribution ($p < 0.01$). We tested for multi-collinearity by running three regression models for the key dependent measures: PayApp, IAPs, and SocialGaming. The VIF values for their predictors were below 2.5 value suggesting that multi-correlatability is not a concern.

5.2. Common method bias

To test for common method bias, Harman's single-factor test, and the marker variable approach (Lindell & Whitney, 2001; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) were used. Harman's single-factor test was conducted by running a CFA where all latent Likert scale items were loaded on one factor (Podsakoff et al., 2003). The one factor fit was poor ($\chi^2_{(350)}$ = 3824.445, CFI = 0.408, RMSEA = 0.194). Overall variance explained by this model was 31.69%. The marker variable technique compares the partial correlations between the marker variable (attitude toward energy drink consumption) and variables with their zero-order correlations (refer to Table 2) (Podsakoff et al., 2003). Results from these procedures indicate minimal issues of common method bias.

5.3. Hypothesis testing

To test the hypotheses, the hypothesized paths were added to the CFA model. Sex, social desirability scores, and age were also included as control variables as they have been shown to impact the dependent measures (Dinsmore et al., 2017). Refer to Fig. 1 for final hypothesized model. Model fit was sufficient ($\chi^2_{(405)}$ = 805.919, CFI = 0.933, RMSEA = 0.061). Adjusted theoretical model fit index (ATFI) was computed (Hair Jr et al., 2017) with lower index scores indicating a better fit. ATFI indicated only a 3.59% drop in fit. R^2 value for the dependent variables were: PayApp (R^2 = 14.90%), IAP (R^2 = 17.40%), SocialGaming (R^2 = 32.80%), SendInfo (R^2 = 53.90%), and ReceiveInfo (R^2 = 71.90%).

Significant results between control variables and dependent measures are first reported (refer to Table 3 for results). There were significant, positive effects of social desirability on SocialGaming (β = 0.138, $p < 0.05$), and SendInfo (β = 0.137, $p < 0.01$). Results indicate a

Table 1
Items and factor loadings for key constructs.

PayApp (Anchor: 1 = Never; 7 = All of the time)	Loadings
If I see an app available either for free (with ads) or for a fee like ninety-nine cents ($0.99), I will pay to avoid the ads.	0.671
I am comfortable paying for apps even when free alternatives are available.	0.715
I have paid money to download apps.	0.807
IAPs (Anchor: 1 = Never; 7 = All of the time)	Loadings
If I enjoy an app, I will pay to enhance the app in some way.	0.884
I have made "in-app" purchases.	0.852
I avoid "in-app purchases."(r)	0.621
SocialGaming (Anchor: 1 = Never; 7 = All of the time)	Loadings
I share my scores and game statuses with my friends.	0.892
If a game enables me to ask friends for tools or abilities to help my game, I will take advantage of that.	0.775
I like seeing updates on how my friends are doing on their game.	0.865
I will often comment to a friend on their performance in a video game.	0.869
I enjoy video games more when I can share the experience with friends.	0.771
SendInfo (Anchor: 1 = Strongly disagree; 7 = Strongly agree)	Loadings
I like introducing new brands and products to others.	0.898
I like helping people by providing information about many kinds of products.	0.914
I frequently tell others about new products and brands.	0.833
I enjoy helping people find products that fit their needs.	0.909
ReceiveInfo (Anchor: 1 = Strongly disagree; 7 = Strongly agree)	Loadings
I like to have others introduce me to new brands and products.	0.854
I like to have others provide me with information about many different kinds of products.	0.868
I ask other people about products, places to shop or sales.	0.891
I like to ask people, who can give an informed opinion, questions about products.	0.874
GameAffinity (Anchor: 1 = Strongly disagree; 7 = Strongly agree)	Loadings
I think of myself as part of the gaming community.	0.932
Video games are one of my primary forms of entertainment.	0.848
I have made some of my best friends from playing video games.	0.785
Playing video games is a lifestyle I enjoy	0.793
I know more about video games than the average person.	0.883
It is easier for me to have a conversation with someone about video games than most other topics.	0.872
SusceptInfo (Anchor: 1 = Strongly disagree; 7 = Strongly agree)	Loadings
To make sure I buy the right product or brand, I often observe what others are buying or using.	0.742
If I have little experience with a product, I often ask my friends about that product.	0.787
I frequently gather information from friends or family about a product before I buy.	0.891
(r) - Item was reverse-scored	

negative, significant impact of age on SocialGaming ($\beta = -0.207$, $p < 0.01$), positive, significant effects of sex on PayApp ($\beta = 0.191$, $p < 0.01$), and SocialGaming ($\beta = 0.137$, $p < 0.05$), and a negative, significant effect of sex on SendInfo ($\beta = -0.135$, $p < 0.01$). The results suggest that male gamers display higher PayApp and SocialGaming characteristics than females, whereas females display higher SendInfo characteristics than males.

Test results for direct effect hypotheses are reported in Table 3. Six of the ten hypotheses were supported. The four unsupported hypotheses included being ReceiveInfo having no significant effect on PayApp (H2a) or SocialGaming (H2c) and GameAffinity having no significant effect on either SendInfo (H3a) or ReceiveInfo (H3b).

Given the key variables follow a non-normal distribution we ran the analysis using maximum likelihood with robust standard errors (MLR) estimation ($\chi^2_{(405)} = 729.751$, CFI = 0.936, RMSEA = 0.055, Scaling Correction Factor = 1.104). The results are the same as those in the model using MLE. See Table 4 for results.

5.4. Indirect effects

As Dholakia et al.'s (2004) model found desires mediating the effect of social influence traits on participatory behaviors, an exploratory analysis of potential mediation of the desire variables (SendInfo, ReceiveInfo) was conducted in order to better understand potential causal relationships between variables in the model (Rozeboom, 1956).

The indirect effects of SusceptInfo on PayApp, IAPs, and SocialGaming were explored by adding direct relationships from SusceptInfo on PayApp, IAPs, and SocialGaming in the previous hypothesized model using bootstrapping technique ($N = 5000$) (Hayes, 2009). Model fit was adequate ($\chi^2_{(402)} = 794.214$, CFI = 0.935, RMSEA = 0.061) and ATFI for the model was 3.30%. The indirect model has a slightly lower theoretical

Table 3
Model results – hypotheses testing.

Path	Effect (β)	T value	Hypothesis
SendInfo → PayApp	0.357	3.809**	H1a - Supported
SendInfo → IAPs	0.475	5.608**	H1b - Supported
SendInfo → SocialGaming	0.486	6.454**	H1c - Supported
ReceiveInfo → PayApp	−0.019	−0.203	H2a - Not supported
ReceiveInfo → IAPs	−0.180	−2.041*	H2b - Supported
ReceiveInfo → SocialGaming	0.008	0.102	H2c - Not supported
GameAffinity → SendInfo	0.069	1.218	H3a - Not Supported
GameAffinity→ ReceiveInfo	−0.075	−1.468	H3b - Not supported
SusceptInfo →SendInfo	0.686	16.689**	H4a - Supported
SusceptInfo → ReceiveInfo	0.860	29.257**	H4b - Supported
Social Desirability → PayApp	0.071	1.057	NA
Social Desirability → IAPs	0.043	0.685	NA
Social Desirability → SocialGaming	0.138	2.493*	NA
Social Desirability → SendInfo	0.137	2.836**	NA
Social Desirability → ReceiveInfo	0.046	1.083	NA
Age → PayApp	−0.020	−0.303	NA
Age → IAPs	−0.114	−1.851	NA
Age → SocialGaming	−0.207	−3.861**	NA
Age → SendInfo	−0.037	−0.745	NA
Age → ReceiveInfo	−0.031	−0.690	NA
Sex → PayApp	0.191	2.904**	NA
Sex → IAPs	0.034	0.546	NA
Sex → SocialGaming	0.137	2.524*	NA
Sex → SendInfo	−0.135	−2.729**	NA
Sex → ReceiveInfo	−0.033	−0.748	NA

**$p \leq 0.01$; *$p \leq 0.05$; NA = Non-applicable.

Table 2
Means, composite reliability, correlations, and average variance extracted.

	Mean (SD)	Composite reliability	1	2	3	4	5	6	7	8	9	10
PayApp (1)	3.557 (1.466)	0.776	*0.733*									
IAPs (2)	3.390 (1.532)	0.834	0.601**	*0.794*								
SocialGaming (3)	3.586 (1.551)	0.920	0.268**	0.312**	*0.836*							
SendInfo (4)	4.740 (1.415)	0.938	0.277**	0.312**	0.482**	*0.889*						
ReceiveInfo (5)	4.721 (1.339)	0.927	0.193**	0.120	0.330**	0.637**	*0.872*					
GameAffinity (6)	4.350 (1.679)	0.941	0.281**	0.296**	0.472**	0.189**	0.142*	*0.854*				
SusceptInfo (7)	4.570 (1.375)	0.850	0.150*	0.085	0.382**	0.587**	0.722**	0.231**	*0.809*			
Social desirability (8)	4.275 (2.813)	NA	0.112	0.144*	0.210**	0.209**	0.109	0.100	0.074	NA		
Sex (Male = 1) (9)	NA	NA	0.144*	−0.007	0.095	−0.091	−0.013	0.301**	0.041	−0.071	NA	
Age (10)	34.355 (9.279)	NA	−0.034	−0.108	−0.221*	−0.032	−0.002	−0.298**	0.012	0.028	−0.108	NA

**p < 0.01; *p < 0.05, Square root of average variance extracted along the diagonal. $N = 265$.

Table 4
Results - MLR estimator.

Path	Effect	T value	Hypothesis
SendInfo → PayApp	0.357	3.419**	H1a - Supported
SendInfo → IAPs	0.475	5.128**	H1b - Supported
SendInfo → SocialGaming	0.486	6.306**	H1c - Supported
ReceiveInfo → PayApp	−0.019	−0.183	H2a - Not supported
ReceiveInfo → IAPs	−0.180	−1.841[a]	H2b - Supported
ReceiveInfo → SocialGaming	0.008	0.103	H2c - Not supported
GameAffinity → SendInfo	0.069	1.032	H3a - Not Supported
GameAffinity→ ReceiveInfo	−0.075	−1.361	H3b - Not supported
SusceptInfo →SendInfo	0.686	11.875**	H4a - Supported
SusceptInfo → ReceiveInfo	0.860	18.863**	H4b - Supported
Social Desirability → PayApp	0.071	1.035	NA
Social Desirability → IAPs	0.043	0.682	NA
Social Desirability → SocialGaming	0.138	2.476*	NA
Social Desirability → SendInfo	0.137	3.122**	NA
Social Desirability → ReceiveInfo	0.046	1.154	NA
Age → PayApp	−0.020	−0.272	NA
Age → IAPs	−0.114	−1.755	NA
Age → SocialGaming	−0.207	−3.742**	NA
Age → SendInfo	−0.037	−0.745	NA
Age → ReceiveInfo	−0.031	−0.573	NA
Sex → PayApp	0.191	2.904**	NA
Sex → IAPs	0.034	0.551	NA
Sex → SocialGaming	0.137	2.501*	NA
Sex → SendInfo	−0.135	−2.699**	NA
Sex → ReceiveInfo	−0.033	−0.728	NA

**p ≤0.01; *p ≤0.05; [a] p ≤0.07; NA = Non-applicable.

model fit index than that of the previous hypothesized model, and only significant indirect effects are reported. The indirect effect of SusceptInfo (via SendInfo) on PayApp was significant (β = 0.253, SE = 0.092, 95% CI [0.072, 0.434]). The main effect of SusceptInfo on PayApp was not significant (β = −0.027, t = −0.043, $p > 0.05$), suggesting full mediation.

The indirect effect of SusceptInfo (via SendInfo) on IAPs was significant (β = 0.335, SE = 0.083, 95% CI [0.172, 0.498]). The main effect of SusceptInfo on IAPs was not significant (β = −0.027, t = −0.034, p > 0.05), suggesting full mediation. Similarly, the indirect effect of SusceptInfo (via SendInfo) on SocialGaming was significant (β = 0.243, SE = 0.069, 95% CI [0.107, 0.378]). The main effect of SusceptInfo on SocialGaming was not significant (β = 0.504, t = 0.577, p > 0.05), suggesting full mediation.

5.5. Ad-hoc model

To test the robustness of the results and the hypothesized model, an ad-hoc model was run which included significant missing paths (paths from GameAffinity to PayApp, IAPs, and SocialGaming). Since GameAffinity did not have a significant impact on PayApp, IAPs, and SocialGaming through SendInfo and ReceiveInfo, it appeared there might be a direct effect of GameAffinity on PayApp, IAPs, and SocialGaming, despite such a direct path from social identity to participatory behaviors not explicitly stated or tested in Dholakia et al.'s (2004) model.

The ad-hoc model fit was adequate ($\chi^2_{(402)}$ = 752.587, CFI = 0.941, RMSEA = 0.057, ATFI = 2.54%) and provided a better fit ($\Delta\chi^2_{(3)}$ = 53.33, $p < 0.01$) than that of the previous hypothesized model. Refer to Table 5 for results and Fig. 2 for the alternate model. The results indicate significant and positive direct paths from GameAffinity to PayApp (β = 0.257, $p < 0.01$), IAPs (β = 0.321, p < 0.01), and SocialGaming (β = 0.384, p < 0.01). The ad-hoc model indicated similar hypotheses test results (see Table 5) to those of the previous model. The results were similar when using MLR estimation ($\chi^2_{(402)}$ = 680.942, CFI = 0.945, RMSEA = 0.051, Scaling Correction Factor = 1.105). See Table 6 for results of MLR estimation.

Table 5
Ad-hoc model results.

Path	Effect (β)	T value	Hypothesis
SendInfo → PayApp	0.299	3.183**	H1a - Supported
SendInfo → IAPs	0.398	4.747**	H1b - Supported
SendInfo → SocialGaming	0.404	5.533**	H1c - Supported
ReceiveInfo → PayApp	−0.017	−0.176	H2a - Not supported
ReceiveInfo → IAPs	−0.175	−2.084*	H2b - Supported
ReceiveInfo → SocialGaming	0.012	0.167	H2c - Not supported
GameAffinity → PayApp	0.257	3.526**	NA
GameAffinity → IAPs	0.321	4.994**	NA
GameAffinity → SocialGaming	0.384	6.915**	NA
GameAffinity → SendInfo	0.048	0.847	H3a - Not Supported
GameAffinity → ReceiveInfo	−0.073	−1.436	H3b - Not supported
SusceptInfo →SendInfo	0.690	16.781**	H4a - Supported
SusceptInfo → ReceiveInfo	0.860	29.250**	H4b - Supported
Social Desirability → PayApp	0.051	0.766	NA
Social Desirability → IAPs	0.017	0.285	NA
Social Desirability → SocialGaming	0.109	2.078*	NA
Social Desirability → SendInfo	0.140	2.871**	NA
Social Desirability → ReceiveInfo	0.046	1.077	NA
Age → PayApp	0.044	0.660	NA
Age → IAPs	−0.033	−0.536	NA
Age → SocialGaming	−0.112	−2.100*	NA
Age → SendInfo	−0.042	−0.848	NA
Age → ReceiveInfo	−0.030	−0.679	NA
Sex → PayApp	0.115	1.662	NA
Sex → IAPs	−0.061	−0.987	NA
Sex → SocialGaming	0.026	0.471	NA
Sex → SendInfo	−0.129	−2.602**	NA
Sex → ReceiveInfo	−0.034	−0.761	NA

**p ≤0.01; *p ≤0.05; NA = Non-applicable.

6. General discussion

6.1. Implications for theory

The current magnitude and continued growth of the gaming apps industry requires a deeper understanding of factors that drive downloads, purchases, and word-of-mouth (Hsu & Lin, 2015; Tang, 2019). This research helps extend knowledge in this realm in several ways.

First, these findings suggest vast differences in motivations between SendInfo and ReceiveInfo in gaming app play. ReceiveInfo in this context appears to be motivated by acquiring relevant information about others' behaviors and experiences for one's own use (Berger, 2014), rather than satisfying a social need. Exchanges of information such as game play advice or "hacks" promote the interests of the receiver in the form of game advancement without having to make IAPs. It also potentially hurts the interests of the sender whose relative performance or standing in the game may be diminished by helping other players.

Such a self-serving motivation for receiving market information might explain, at least in part, why those higher in ReceiveInfo were significantly less likely to make IAPs. Perhaps the desire to receive gaming information from others is motivated by the desire to avoid IAPs. It may be that those high in the trait view other players' information as a potential substitute or "work-around" for the potential game advancement that would be provided by such a purchase.

The non-significant effect of ReceiveInfo on the other two gaming app behaviors (PayApp & SocialGaming) supports not only this notion, but also that—while related—there are distinct influencers to each of these three gaming behaviors. On the other hand, SendInfo, which is significantly and positively related to all three behaviors, appears to be motivated by self-enhancement with other players as a means to find emotional support. Social Exchange Theory (Blau, 1968) states that, rather than altruism, giving is often based on the potential for benefit to be enjoyed by the giver and that may be the case here.

Second, this research creates the concept of identification with the gaming community (GameAffinity) as a social influence factor and finds

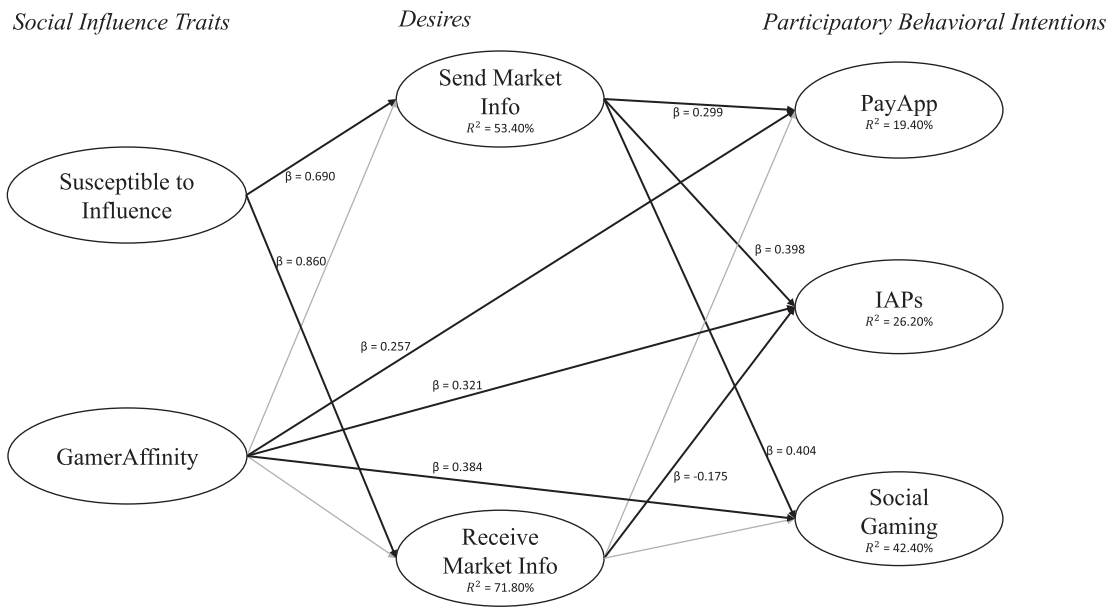

Fig. 2. Alternate model.

Table 6
Alternate model results - MLR estimator.

Path	Effect	T value	Hypothesis
Send Market Info → PayApp	0.299	2.870**	H1a - Supported
Send Market Info → IAPs	0.398	4.426**	H1b - Supported
Send Market Info → Social Gaming	0.404	5.242**	H1c - Supported
Receive Market Info → FreeApp	−0.017	−0.165	H2a - Not supported
Receive Market Info → IAPs	−0.175	−1.991*	H2b - Supported
Receive Market Info → Social Gaming	0.012	0.179	H2c - Not supported
Game Affinity → PayApp	0.257	3.216**	NA
Game Affinity → IAPs	0.321	4.852**	NA
Game Affinity → Social Gaming	0.384	6.598**	NA
Game Affinity → Send Market Info	0.048	0.732	H3a - Not Supported
Game Affinity → Receive Market info	−0.073	−1.361	H3b - Not supported
Susceptible to Influence →Send Market Info	0.690	11.903**	H4a - Supported
Susceptible to Influence → Receive Market info	0.860	18.857**	H4b - Supported
Social Desirability → PayApp	0.051	0.764	NA
Social Desirability → IAPs	0.017	0.290	NA
Social Desirability → Social Gaming	0.109	2.154*	NA
Social Desirability → Send Market Info	0.140	3.164**	NA
Social Desirability → Receive Market Info	0.046	1.146	NA
Age → PayApp	0.044	0.613	NA
Age → IAPs	−0.033	−0.504	NA
Age → Social Gaming	−0.112	−2.147*	NA
Age → Send Market Info	−0.042	−0.848	NA
Age → Receive Market Info	−0.030	−0.739	NA
Sex → PayApp	0.115	1.669	NA
Sex → IAPs	−0.061	−1.039	NA
Sex → Social Gaming	0.026	0.485	NA
Sex → Send Market Info	−0.129	−2.594**	NA
Sex → Receive Market Info	−0.034	−0.741	NA

**p ≤0.01; *p ≤0.05; NA = Non-applicable.

GameAffinity having a direct, positive relationship with all three gaming app behaviors. As community-building is a stated goal of many game designers, the need to not only build communities, but have players consciously identify as a member of that community, appears to have direct impact on behaviors desired by these companies to drive sales and word-of-mouth.

The lack of a relationship between GameAffinity and either desire suggests there being significant differences between gaming communities and other virtual communities. Specifically, since Chang et al. (2013) had found a relationship between community identification and those same two desires in online brand communities, it seems likely that context is a critical factor. Perhaps identification with certain types of communities is inherently more social than others.

6.2. Implications for practice

The findings of this research can be leveraged by developers of gaming apps to segment the gaming market, tailor app design, and increase the efficacy of promotions.

Given the negative effect of ReceiveInfo on IAPs and the positive effect of SendInfo on all three behaviors, such social components should be designed accordingly. Namely, strong incentives should be offered to players to send information about their own game play to their social networks, while the ability to receive information about others' play need not be incentivized as much. Further, as players send more and more information to others through the game, it may make sense for the game to increase the number of buying opportunities for that player. Additionally, given that impression management is likely a motivating factor for those who desire to send their market information to others, promotional offers to these consumers should be framed accordingly and highlight how such purchases will enhance a player's status among other gamers.

The direct effect of GameAffinity on all three behaviors provides an opportunity for gaming app companies to target product design and promotional activities to encourage purchases by those strongly identifying as members of the gaming community. As gamers spend an average of six hours per week playing (Limelight Networks, 2018), there appears to be ample opportunity to foster social connections and community-building in games which should then lead to more sharing and purchasing. Online and social media components of games encouraging social exchange should increase a feeling of identification with a community of players. In addition, game designers should create opportunities for players to identify as members of that gaming community. Giveaways of community-branded goods to players would likely foster a sense of identification. Other promotional ideas could include competitions rewarding stories of either the strongest act of

participation in or benefits (friendships, advice, etc.) derived from that community.

Additionally, there may well be recursive relationships between gaming app behaviors in this model (PayApp, IAP, SocialGaming) and the degree to which a person identifies as a member of the gaming community. So, while the causal chain of this model is in keeping with social influence theory, these three behaviors may also strengthen or reinforce an individual's identification with the gaming community. As such, marketers should monitor the consumer's in-game journey and adapt promotions for consumers as their ties to the gaming community gain or lose strength as signaled by purchases, sharing of information, and other factors.

6.3. Limitations and future research

This research has certain limitations. Namely, the single survey of self-reported behaviors could be subject to certain biases. In terms of the sample used, online samples from sources such as Mechanical Turk (mTurk) have some limitations, yet they tend to be more diverse and reliable than student samples (Buhrmester, Kwang, & Gosling, 2011). Such samples also exhibit risk aversion—including aversion to social and financial risks—at levels consistent with other populations (Goodman, Cryder, & Cheema, 2013). In addition, a community of online workers such as mTurk is likely more representative of the diverse, online community found in mobile gaming apps. That being said, validation with an offline, or alternative online, sample would be valuable. Similarly, replication of these findings with observed purchase and sharing data for mobile gamers would also be worthwhile.

This work highlights a number of new research directions which would be valuable to academics and practitioners. There is a high likelihood that the nature of the relationships between personality and mobile gaming app behaviors vary across several factors. These factors could include app category (gaming, health, productivity, social media, etc.), culture, or internet speed.

Further, voice (vs. keyboard-based) interfaces continue to be deployed rapidly throughout consumer electronics. Voice interfaces and natural language queries have already been shown to dramatically affect consumer behavior in tasks such as web searches (Sentance, 2016). It stands to reason that the interface used (voice vs touch) for purchase will likely affect consumer choice. Along those same lines, different forms of authentication for purchases including traditional passwords and biometrics could also influence gamers' behaviors and decision-making.

Lastly, the relationships of other traits and gaming behaviors in a social influence model would be worthy of examination. For instance, game advancement and self-efficacy beliefs (Sherer et al., 1982) would likely impact purchasing and other gaming behaviors. Gamification of learning has been shown to increase an individual's belief in self-efficacy (Pakarinen, Parisod, Smed, & Salanterae, 2017) about the topic being studied. It would be interesting to discern how a mobile gaming environment affects a player's inclination to connect and share the gaming experience with others.

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Declaration of Competing Interest

The authors state that there is no conflict of interest.

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