ORIGINAL ARTICLE

Examining the antecedents and consequences of addiction to mobile games: an empirical study

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Abstract

Mobile games are video games that are typically played on any portable devices including mobile phones, such as feature phones or smartphones; tablets; personal digital assistants, which are able to handle game consoles; and portable media players with internet connectivity. Increasingly, people are becoming addicted to such mobile gaming. Not many studies are available that have investigated the factors responsible for such addiction, especially social influence and motivation aspects. There is a huge interest among practitioners, researchers, and academicians to understand the antecedents and consequences of people's addiction to mobile games. Therefore, the aim of this study is to investigate the antecedents and consequences of addiction to mobile games. With the help of social exchange theory, social networking theory, motivational theory and technology acceptance model, a theoretical model has been proposed, which is subsequently validated using partial least squares structural equation modelling on the feedback from 322 respondents who are mobile game players. The study finds that social influence has a significant positive impact on both hedonic and utilitarian attitudes of people towards playing mobile games. With different factors influencing them to play mobile games frequently, these players eventually become addicted to mobile games.

Keywords Mobile games · Dark side · Hedonic and utilitarian attitude · Social influence · Social exchange theory · Motivation theory

1 Introduction

Increasing usage of social networking sites has made the playing of mobile games very popular (Ahn et al., 2018; Park & Ko, 2022). This popularity has attracted users to use social networking platforms. Mobile games are video games which individuals play on internet-embedded portable devices, such as mobile phones (i.e., smart-

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phones or feature phones), portable media players, tablet computers, and personal digital assistants (PDA) that can handle a game console. Mobile games attract many players, as they are free to play (Alha et al. 2014; San-Martín and Jiménez 2021). According to Shalvey (2012), FarmVille, launched in 2009, and CityVille, launched in 2010, were considered two of the most used apps on Facebook. Casual game developers, web programmers, as well as mobile game developers have forged ahead with the help of social games (Xue et al., 2018; Oh & Oh, 2017; Jimenez et al., 2019; Al-Samarraie et al., 2021).

Social exchange theory (Homans, 1961) could be applied to explain the various social activities that influence individuals to play mobile games, as social influence is associated with the concept of that theory. Social networking theory also includes social influence in its model, whereas motivational theory can be applied to look at the factors that motivate people to play mobile games excessively (Chen and Roberts, 2019; Lee et al., 2019; Moon & Armstrong, 2020). Studies have demonstrated that social influence as well as extrinsic and intrinsic motivational factors are responsible for people frequently playing mobile games (Ryan and Deci, 2000; Gunter, 2019; Yang & Lee, 2009; Ortiz, 2019; Handa and Ahuja, 2020). It has been made clear that motivational factors as well as societal influence have considerable impacts on individuals' intention to play mobile games frequently (Ortiz, 2019). Studies also demonstrated that excessively playing mobile games can cause gamers to eventually become addicted to mobile games (Al-Samarraie et al., 2021). Since mobile game players perceive that it is not at all difficult to play mobile games, they frequently play them, which is the concept supplemented by the technology acceptance model (Davis, 1989). Earlier studies highlighted that a few studies have explored the bright side of using an online internet-based system. Those studies nurtured the issues of participation, engagement, as well as collectivist culture. However, no extensive studies have dealt with the motivation to play mobile games excessively and the consequences of becoming addicted to it. In this vein, the aim of this study is to address the below-mentioned research questions (RQs).

RQ1: What are the antecedents and consequences of players' addiction to mobile games?

RQ2: Do hedonic and utilitarian attitudes of mobile game players influence mobile games addiction?

To answer the above RQs, we analysed responses of 322 respondents. We then developed a conceptual research model that we tested by using the factor-based partial least squares structural equation modelling technique. To theoretically substantiate the empirical findings, social exchange theory, motivational theory, social networking theory, and technology acceptance model have been integrated, since with the synergy of all these theories, it is possible to explain how societal influence, through the help of some mediated contextual factors, has contributed to people's addiction to mobile games.

The remaining parts of the paper are organized as follows. Section 2 presents the literature review, followed by theoretical underpinnings and development of hypotheses in Sect. 3. Thereafter, Sect. 4 presents the research methodology, followed by data analysis and results in Sect. 5. Next, Sect. 6 discusses the findings and the the-

oretical and practical implications. It finally presents the limitations and suggests future scope of study.

2 Literature review

More than two decades ago, Muniz and O'Guinn (2001) argued that online communities are specific networks of non-geographically bound persons with shared goals as well as purpose. The popularity of social network services has given rise to special types of online games, including mobile games (Moon & Armstrong, 2020; Chen et al. 2022). In the context of the usage of social networking platforms, it is perceived that mobile games serve as a unique venue for playful socializing with hedonic benefits (Wang et al. 2021; Yang et al., 2021).

Prior studies have demonstrated that acceptance of mobile games, from the perspectives of social influence and extrinsic as well as intrinsic motivation, had the strongest impact on the behavioural intention of the players to play mobile games (Ryan and Deci, 2000; Xue et al., 2018; Gong et al., 2020a). Players' behavioural intention as well as their actual behaviour in playing mobile games has long been investigated from several perspectives like social interaction, shared identity, social norms from the societal perspective, along with utilitarian and playability concepts (Paavilainen et al., 2013; Chen et al., 2016; Prochnow et al., 2020).

Previous studies demonstrated that perceptions of usefulness with little effort, enjoyment, subjective norms, and so on play a critical role in driving behavioural intention (Shin and Kim, 2008; Ghazali et al., 2019). Mobile game players motivate other online players to create reciprocal experience (interaction) or simply to pass the time (Oh and Oh, 2017; Gong et al., 2020b).

Extrinsic motivation of mobile game players focuses on utility, ease to play, and so on (Davis, 1989; Chang and Chin, 2011; Tseng et al., 2015; Al-Samarraie et al., 2021). Users of mobile devices are now able to play greater varieties of games, which not only include simple embedded games but also games on downloaded apps (Feijoo et al., 2012; San-Martín and Jiménez 2021). Players of mobile games play these games with the intention to gain some shared value, corroborating the theme of social exchange theory (Homans, 1961), which explains that social behaviour is an immediate result of an exchange process. The aim of such exchange is to maximize the benefits while incurring minimum cost. By playing mobile games, players can interact with each other, helping them to enhance their networking capabilities, which is in consonance with the theme of social networking theory (Scott, 2000).

People play mobile games for the idea that they will achieve some substantive gain (utility) as well as for enjoyment (hedonic), which is supplemented by motivational theory (Ryan and Deci, 2000). Besides, gamers will intend to play mobile games if they believe that it would help them tangibly or intangibly and that they will not spend any effort. This idea coincides with the concept of technology acceptance model (Davis, 1989).

3 Theoretical underpinning and development of hypotheses

3.1 Theoretical underpinning

In the present study, we attempt to identify social influence factors which could motivate people to intend to play mobile games, inviting addiction (Park, 2014). As mentioned in the previous two sections, the present study bases the research on several theories and models. In the context of mobile games, players may perceive that they need to play mobile games, because their social peers want to do that. This idea emerges from the concept of social norms (Ahn et al., 2018).

Again, social influence estimates how other people's attitudes could influence an individual's decision-making process (Liang et al., 2011). In terms of social exchange theory, an individual would intend to behave in a way if that person thinks they would gain some benefit compared to loss. Therefore, players believe that, while playing mobile games, they do not feel isolated, which helps the players to have a shared identity with a group (Oh & Oh, 2017; Wang, 2022). Social exchange theory posits that persons will exchange resources because they expect to get something in return. This reciprocity motivates players to engage in group behaviour and leads them to play mobile games (Shiau and Luo, 2012). Social exchange theory (Scott, 2000) suggests that an individual feels positively or negatively about a relationship because of a combination of some of the factors such as comparison level, cost-benefit analysis, and so on. In the context of the present study, the players of mobile games play the games incurring minimum cost and they feel better in comparison to other mode of entertainment.

Moreover, studies of the extended technology acceptance model envisage that perceived enjoyment, perceived involvement, subjective norms, and perceived usefulness significantly influence individual intention. This posits that feelings of utility and enjoyment, coming under extrinsic (utilitarian) and intrinsic (hedonic) motivations, prompt an individual to intend to be involved in an action. This is the core idea behind the motivational theory (Deci & Ryan, 1985). The motivational theory posits that something is utilitarian when it has usability and practical attributes. Hedonic attitudes are the attributes which relate to users' experience. This dichotomy of utilitarian and hedonic attitudes emerges from the users' motivation (here players of the mobile games), which influences their actions (Vallerand, 1997; Ryan and Deci, 2000; Chaudhuri et al. 2022). Expectation of valued outcomes is related with utilitarian attitude, and hedonic motivation is related to performing a specific activity to experience something. Both these attributes motivate people intend to play mobile games (Heerink et al., 2010; Chatterjee, 2021a). Motivation is conceptualized as cognitive decision making where the intention of the individual is to achieve a specific goal through intention and monitoring. The individual intends to play mobile games for gaining hedonic pleasure which is enjoyment. This idea conforms motivational theory (Deci & Ryan, 1985).

Social networking theory (Scott, 2000) focuses on the social relationship in the exchange of information, channelling media influence as well as personal influence. This theory posits that individuals have a usual tendency to be involved in social interaction, and this social interaction, in the context of the present study, leads them

to play mobile games. These theories and models supplement the outcomes of the literature review, which found that shared identity, social interaction, and social norms constitute the effects of social influence on the extrinsic and intrinsic attitudes of the players. These attitudes also impact players' intention to play mobile games, leading them to be involved in the actual action. However, frequently playing the mobile games, can cause addiction (Park, 2014; Chatterjee 2021b).

3.2 Development of hypotheses and conceptual model

After studying the literature and considering the theories, we were able to identify the contextual factors responsible for creating social influence, which could motivate people to intend to play mobile games frequently. The frequent playing of mobile games is perceived to cause addiction. All these factors will be explained here and will help us to formulate some hypotheses. After developing the hypotheses, we will also develop the theoretical model.

3.2.1 Shared identity (SHI)

Social network platforms provide users specific identities for playing mobile games. Usually, mobile game players play with others who are in their network, who may be co-workers, friends, or family members (Lee and Wohn, 2012). Playing within their networks would result in less anonymity among the players, and identity management needs to be considered more carefully (Chen et al., 2016). In playing mobile games, the players do not feel detached or isolated, but that they have a shared identity with their network (Vrontis et al. 2022; Chaudhuri et al. 2022). When people have a strong identification with their online group, they are more attracted to play mobile games (Yang & Lee, 2019; Chatterjee, 2020). People have a shared identity with other persons who they view as being members of a common social group. It makes it easier for members who have a shared identity to see their individual roles in societ.

y, which the construe as an advantage. The foregoing discussion illustrates the conception of social exchange theory (Homans, 1961). Accordingly, the following hypotheses are provided.

H1a: Shared identity (SHI) is positively correlated with hedonic attitude (HEA).
H1b: Shared identity (SHI) is positively correlated with utilitarian attitude (UTA).

3.2.2 Social interaction (SOI)

Mobile games are embedded within social platforms, such as microblogs and social networking sites (Chen and Chang 2010). This feature makes the interaction between mobile game players more dynamic, which seems to be different from other virtual games (Gunter, 2019; Handa and Ahuja, 2020). Some studies (Boyd and Ellison, 2008; Kar et al., 2019) have observed that players of mobile games are interested in expanding their social interaction boundaries. In the context of this study, social interaction means interaction between several mobile game players. This societal reason motivates people to play mobile games (Chen et al., 2016; Chatterjee, 2020). Players of mobile games try to interact with other friends to maintain social connections.

Mobile games are not designed to require intellectual thinking from players, but they help players to interact socially (Delistavrou et al., 2019). Interactions taking place between the players of mobile games involve multifarious aspects like encouragement, excitement, or frustration, as well as tips about how to succeed in the games. All these aspects are deemed to be highly reinforcing, and the interaction helps the players to assess the utility as well as enjoyment of playing the game, which is supplemented by the concept of motivational theory (Ryan and Deci, 2000). Accordingly, the following hypotheses are prescribed.

H2a: Social interaction (SOI) is positively correlated with hedonic attitude (HEA).

H2b: Social interaction (SOI) is positively correlated with utilitarian attitude (UTA).

3.2.3 Social norm (SON)

Rogers (2003) argued that social context plays a critical role in someone accepting a technology at the earlier stage of the adoption, though few empirical studies have investigated the underlying factors impacting normative beliefs (Fisher and Price, 1992). The social normative component is one of the important factors of normative beliefs. Social norms encompass the belief of individuals regarding the likelihood as well as social consequence of performing a specific behaviour. However, literature on technology acceptance focuses mainly on the normative concepts of social status as well as influence (Chatterjee 2015; Al-Zyoud and Mert, 2019). If a person finds that other people support a behavioural action like playing mobile games, then that person perceives and believes that playing mobile games will help elevate their status in that group (Venkatesh and Devis, 2000). This is the concept of social norms supported by the extended perception of technology acceptance model. The concept of social norms is also perceived to impact on mobile game players' thinking regarding the utility and enjoyment of the action (playing the mobile games) (Ryan and Deci, 2000). Accordingly, it is hypothesized as follows.

H3a: Social norm (SON) is positively correlated with hedonic attitude (HEA).

H3b: Social norm (SON) is positively correlated with utilitarian attitude (UTA).

3.2.4 Hedonic attitude (HEA) and utilitarian attitude (UTA)

The attitudinal belief structure is involved with favourable as well as unfavourable assessments that a person makes of a specific behaviour (Ajzen and Fishbein 2005). It is argued that, in the context of preferring to play social games, there are utilitarian as well as hedonic aspects of the attitudinal belief structure. Utilitarian aspects are conceptualized with attributes that are concerned with the usability as well as practicality of playing mobile games (Ayandele et al., 2020; Khan and Khan 2021; Rana and Dwivedi 2021; Tamilmani et al., 2021). Hedonic attributes are concerned with the experience players have when they play mobile games. Both these attitudinal aspects emerge from motivational theory (Ryan and Deci, 2000).

The concept of motivational theory principally deals with classifying motivations to be either extrinsic or intrinsic depending on and individual's distinct goals that encourage an action. Extrinsic motivation is associated with the concept of doing

something that leads to a valuable outcome. Intrinsic motivation is associated with the idea that someone prefers to do a specific activity with no expectation of apparent reinforcement except that the process of performing that behaviour is considered a powerful enough incentive (Deci and Ryan, 1985). These discussions lead to formulate the following hypotheses.

H4a: Hedonic attitude (HEA) positively impacts behavioural intention to play mobile games (BIM).

H4b: Utilitarian attitude (UTA) positively impacts behavioural intention to play mobile games (BIM).

3.2.5 Behavioural intention to play mobile games (BIM)

A study by Fishbein and Ajzen (1980) argued that intention and actual use behaviour are interlinked. This was supplemented by the extended technology acceptance model. Intention is conceptualized as a person's cognitive representation of readiness as they intend to perform a particular behaviour (Hsiao, 2017; Dwivedi & Rana, 2020; Piccolo et al., 2021). The study of Van der Heijden (2003) is perceived that the best predictor of actual use behaviour should be the behavioural intention of the individual. That study also ascertained that an individual who intends to play mobile games would be aligned to exhibit actual playing behaviour. All these inputs lead us to formulate the following hypothesis.

H5: Behavioural intention to play mobile games (BIM) positively impacts actual playing of mobile games (APM).

3.2.6 Actual playing of mobile games (APM) and addiction to mobile games (AMG)

Addiction to mobile games may be interpreted as an unhealthy habit of excessively playing them (Hsiao, 2017). It is known that the concept of addiction is a manifestation of actual excessive use by an individual. This is explained as a loss of self-control to restrict oneself from excessively performing an action that results in harmful consequences (Collier, 1993). Addiction is interpreted as a behavioural as well as motivational dislocation of an individual which is associated with a psychiatric disorder (Varshney, 2004; Bouwman et al., 2009; Oh and Oh, 2017; Chatterjee, 2019). This psychiatric disorder accrues because of excessive use of a system. Frequent involvement in playing mobile games contributes to a person developing a habit which is responsible for causing addiction (Park, 2014; Kim et al., 2017). All these inputs lead to the following hypothesis.

H6: Actual playing of mobile games (APM) positively impacts a mobile game player's addiction to mobile games (AMG).

With all these inputs a theoretical model is developed which is provided in Fig. 1.

(Adopted from Social Exchange Theory, Motivational Theory, Social Networking Theory, and Technology Acceptance Model.)
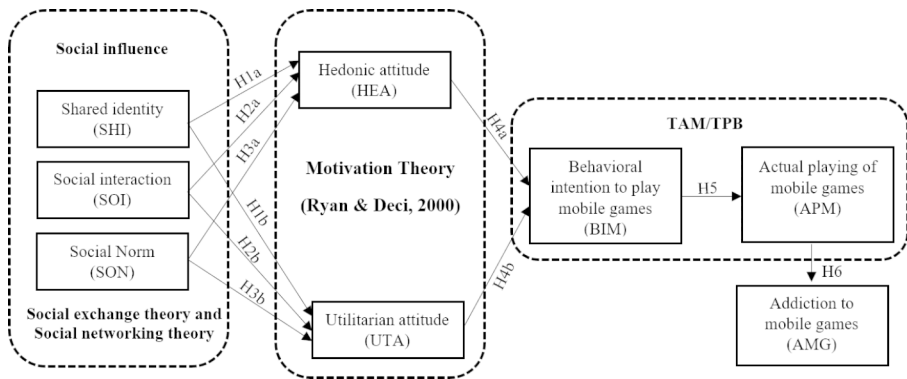
Fig. 1 The conceptual model

4 Research methodology

The conceptual model is required to be validated and the hypotheses need to be tested. For this, we used the partial least squares-structural equation modelling technique. We preferred to use this technique because it can analyse any complex model in a simple process without imposing any restriction on the sample size (Willaby et al., 2015). Moreover, this technique can easily analyse a model with data which are not normally distributed (Kock and Hadaya, 2018). This facility is not available in covariance-based structural equation modelling (CB-SEM) technique (Sarstedt et al., 2014). Besides, this technique is recommended for analysing preliminary studies, such as this one (Peng and Lai, 2012). PLS-SEM can analyse an exploratory study and it is helpful for prediction whereas CB-SEM is mostly used to test the existing theory. For strengthening the predictive power of the proposed theoretical model, the PLS-SEM technique is more helpful than CB-SEM (Rigdon et al., 2017; Hair et al., 2020). PLS-SEM is also advantageous over CB-SEM because PLS-SEM has lower sample size requirements, easy to test the moderating relationship, and is helpful for improving the built-in capability to handle the formative indicators (Kock & Hadaya, 2018). Here, we followed the survey method, where the inputs from the respondents were analysed by quantifying the inputs on a standard scale. In this study, we used a 5-point Likert scale with anchors at "strongly disagree" (SD), which was 1 on the scale, and "strongly agree" (SA), which was 5. Here, a 5-point Likert scale has been used, as it can be applied in a simpler way, and by following this scale, it is possible for the respondents to take a neutral position by choosing the "neither disagree nor agree" option.

4.1 Research instruments

To prepare the instruments, we used inputs from the extant literature. The initial questionnaire was pretested with a convenience sample of 40 respondents. The results of this pre-test were then analysed to help simplify the wordings of the questions and to improve their understandability. Some of the formats of the questions were also corrected. After the pre-test stage, we conducted a pilot test to ascertain the reliability

of the scale. The outcomes of the pilot test informed us to omit some of the items because they did not improve the reliability of the corresponding constructs. Finally, to enhance the comprehensiveness of the instruments, we consulted seven people who are experts in the field of the present study for their opinions of the questions were contained in the questionnaire. Out of these seven experts, five came from academia and have PhD degrees and more than 10 years of academic and research experience in the domain of this study. The remaining two experts came from industry, and have more than 15 years of experience in the domain of this study. With all these steps, we prepared 35 items.

4.2 Data collection strategy

To collect the data, we conducted a web-based survey and attempted to reach the mobile game players on Facebook. We chose Facebook because it provides a variety of social and mobile games, like Bejewelled, FarmVille, Little Big Planet, Wii Play, Caneyville, PUBG Mobile, Billionaire Casino, Run Race, and Homescapes. Facebook is also considered to be the most popular, open, as well as best-financed network.

The survey was conducted during December 2021. To attract the participants, a survey hyperlink was placed in Facebook forums for 10 days. Each respondent was requested to provide screenshots of mobile games which they played the most. By this process, it was possible to collect the details of 711 potential respondents who are mobile game players. We took this approach because it is cost effective due to its simplicity, and it took less time. All 711 prospective respondents were assured that their confidentiality and anonymity would be strictly preserved. They were further requested to respond within one month (January 2022) against 35 instruments.

We informed them to put one tick mark in one of five options in each question, and we also provided them with a detailed guideline for their reference. Within the stipulated time, 331 responses were received. The response rate was 46.55%. In this context, the non-response bias test was performed following the recommendations from Armstrong and Overton (1977) by conducting the chi-squared test and independent t-test considering the inputs of the first and the last 100 responses. No marked deviation of results was noted. Hence, non-response bias could not pose a major concern in this study.

We again asked some experts in the domain of the present study to review those 331 responses. According to their opinion, nine responses were defective, so we did not consider them. Therefore, we set out to analyse 322 responses against 35 items. This is within the allowable range (Deb and Lomo-David, 2014). It is worth mentioning here that the study was conducted by dividing the respondents into two age groups, young adult (age ≤ 35 years) and old adult (age > 35 years), following Cameron's (1969) suggestion. The details of 322 respondents are provided in Table 1.

Table 1 Detail information of the respondents (N=322)

Particular	Category	Number	Percentage (%)
Gender	Male	200	62
	Female	122	38
Education level	School level	109	34
	Bachelor level	145	45
	Masters / PG level	68	21
Age	≤35 years (young adult)	232	72
	>35 years (old adult)	90	28
Profession	Unemployed	68	21
	Students / academicians	122	38
	Employees of private organizations	58	18
	Employees of government organizations	45	14
	Retired employees	29	9

5 Data analysis and results

5.1 Measurement properties and discriminant validity test

To verify the convergent validity of each instrument, it is essential to estimate the loading factor (LF) of each instrument. Moreover, to examine the validity of each construct, we estimated the reliability of each construct, and to verify the internal consistency of each construct, we estimated the average variance extracted (AVE), composite reliability (CR), and Cronbach's alpha (α). It can be observed in the results shown in Table 2 that all the estimated values are within allowable range.

The results also show that the square roots of the average variance extracted (AVEs) are greater than the respective bifactor correlation coefficients, which satisfies the conditions envisaged in Fornell and Larcker (1981). It confirms that the constructs possessed discriminant validity. The results are provided in Table 3.

5.2 Common method variance (CMV)

As the study results depend on survey data, we could not rule out the possibility of CMV, and so we included some procedural techniques to discount that it happened. At the beginning, one step was to make the items simpler, so the respondents would be unbiased in their replies. Moreover, the respondents were assured that their anonymity and confidentiality would be strictly preserved. Once the surveys were completed, to verify the degree of CMV, Harman's Single Factor Test (SFT) was conducted by entering all the constructs in the unrotated principal component analysis. The results showed that the most significant factor explained the variance to the tune of 26.12%, which is less than the highest cut-off value of 50%, as provided by Podsakoff et al. (2003). However, since Harman's SFT is not a robust test for CMV, as opined by Ketokivi and Schroeder (2004), the marker variable technique was performed. The results indicate that the difference between the original CMV and marker-based CMV

Table 2 Measurement properties

Constructs / Items	LF	AVE	CR	α	t-values
SHI		0.87	0.91	0.94	
SHI1	0.94				21.12
SHI2	0.97				27.17
SHI3	0.95				34.01
SHI4	0.93				37.77
SHI5	0.89				35.12
SOI		0.75	0.79	0.83	
SOI1	0.91				22.11
SOI2	0.78				27.17
SOI3	0.85				37.04
SOI4	0.87				26.17
SOI5	0.90				19.81
SON		0.85	0.89	0.92	
SON1	0.90				36.17
SON2	0.94				39.74
SON3	0.95				37.02
SON4	0.96				19.97
SON5	0.85				23.08
HEA		0.88	0.94	0.96	
HEA1	0.90				22.10
HEA2	0.97				26.77
HEA3	0.92				39.01
HEA4	0.96				37.06
UTA		0.83	0.87	0.91	
UTA1	0.89				19.11
UTA2	0.96				34.77
UTA3	0.95				26.12
UTA4	0.93				39.92
BIM		0.86	0.89	0.92	
BIM1	0.90				23.17
BIM2	0.96				26.19
BIM3	0.75				39.31
BIM4	0.85				38.11
BIM5	0.97				30.22
APM		0.81	0.84	0.90	
APM1	0.95				33.77
APM2	0.90				26.12
APM3	0.85				35.04
AMG		0.80	0.84	0.87	
AMG1	0.96				29.77
AMG2	0.89				36.11
AMG3	0.95				27.26
AMG4	0.93				36.17

Table 3 Discriminant validity test (Fornell and Larcker criteria)

Constructs	SHI	SOI	SON	HEA	UTA	BIM	APM	AMG	AVE
SHI	0.93								0.87
SOI	0.37	0.87							0.75
SON	0.31	0.27	0.92						0.85
HEA	0.33	0.20	0.37	0.94					0.88
UTA	0.19	0.31	0.17	0.30	0.91				0.83
BIM	0.22	0.37	0.33	0.32	0.26	0.93			0.86
APM	0.28	0.24	0.29	0.39	0.17	0.27	0.90		0.81
AMG	0.23	0.33	0.31	0.23	0.38	0.32	0.35	0.89	0.80

correlations were considerably small (≤ 0.06) (Lindell & Whitney, 2001; Mishra et al., 2018) for all the concerned constructs. Hence, CMV did not distort the results or the prediction of this study (Wamba et al., 2019; Galati et al., 2021).

5.3 Hypotheses testing

To test the hypotheses, the bootstrapping procedure was adopted to analyse 5000 resamples, in terms of the recommendations from Henseler er al. (2014). With consideration of separation distance 7, cross-validated redundancy was assessed by estimating the Q^2 value, which emerged as 0.057 (positive). Hence, the results confirm that the model has predictive relevance (Mishra et al., 2018). To verify that the model is fit, we used SRMR (Standardized Root Mean Square Residual) as a standard index, and its values came out to be 0.033 and 0.061 for PLS and PLSc respectively. Both values are less than the highest cut off value of 0.08 (Hu and Bentler, 1999) and confirm that the model does have predictive value.

This process also helps to compute the path coefficients of different linkages along with the p-values and coefficients of determination (R^2) values. The results are shown in Table 4.

With all these inputs, the validated model is provided in Fig. 2.

5.4 Results

We formulated 10 hypotheses to test in our study. On statistical analysis, we observe that all of the hypotheses have been supported. The results demonstrate that SHI impacts HEA and UTA significantly and positively, since the path coefficients are 0.17 and 0.22, respectively, with levels of significance as $p < 0.05$(*) and $p < 0.001$(***). We also find that SOI impacts HEA and UTA significantly and positively, as the respective path coefficients are 0.29 and 0.31 and the respective levels of significance are $p < 0.01$(**) and $p < 0.05$(*). SON is found to impact HEA and UTA significantly and positively, because the respective path coefficients are 0.26 and 0.33 with levels of significance as $p < 0.01$(**) and $p < 0.001$(***). The results of this study highlight that BIM impacts HEA and UTA significantly and positively because the corresponding path coefficients are 0.39 and 0.35 respectively with levels of significance as $p < 0.01$(**) and $p < 0.001$(***). BIM also impacts APM significantly and positively since the path coefficient is 0.28 and the level of significance is $p < 0.05$(*). Finally,

Table 4 Structural equation modelling (SEM)

Linkages	Hypotheses	Path coefficients	p-values	Remarks
SHI→HEA	H1a	0.17	p<0.05(*)	Supported
SHI→UTA	H1b	0.22	p<0.001(***)	Supported
SOI→HEA	H2a	0.29	p<0.01(**)	Supported
SOI→UTA	H2b	0.31	p<0.05(*)	Supported
SON→HEA	H3a	0.26	p<0.01(**)	Supported
SON→UTA	H3b	0.33	p<0.001(***)	Supported
HEA→BIM	H4a	0.39	p<0.01(**)	Supported
UTA→BIM	H4b	0.35	p<0.001(***)	Supported
BIM→APM	H5	0.28	p<0.05(*)	Supported
APM→AMG	H6	0.43	p<0.001(***)	Supported
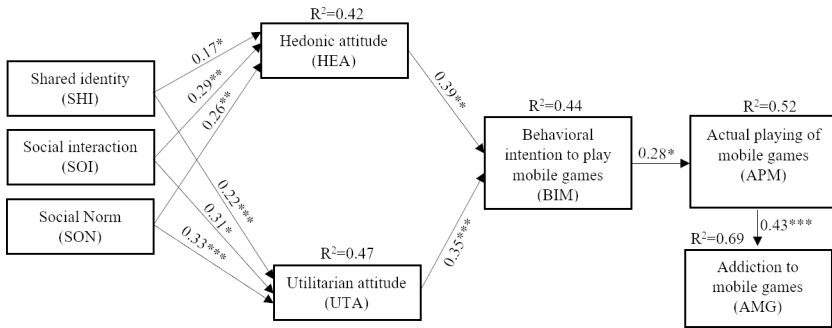
Fig. 2 Validated model (SEM)

APM impacts AMG significantly and positively because the concerned path coefficient is 0.43, with level of significance p<0.001(***). Our analysis of the coefficients of the determination (R^2) revealed that SHI, SOI, and SON can simultaneously predict HEA as much as 42% ($R^2=0.42$), whereas these three exogenous constructs could explain UTA to the tune of 47% ($R^2=0.47$). Again, HEA and UTA simultaneously could explain BIM as much as 44% ($R^2=0.44$). APM could be explained by BIM to the extent of 52% ($R^2=0.52$), whereas APM could predict AMG 69% of the time ($R^2=0.69$), which is the predictive power of the proposed theoretical model. We should mention that the coefficient of determination is an assessment to interpret how much variability of one factor could be caused through its relationship with another related factor.

6 Discussion

The present study has demonstrated that Web 2.0 brought a paradigm shift in the online information environment. Now users are not considered to be only passive receivers of online information, but they have also become active participants. Online communities are a direct product of the information sharing culture, and though these communities are gaining traction and the users have become more empowered than before, they are gradually being overloaded with data.

The study has documented that the online environment offers several benefits to society, but issues pertaining to users' privacy as well as cyber-fraud are exacerbated (Jordan, 2019). In addition, with the progress of internet enabled applications, the scope of online game playing on mobile games has caused players to become addicted, which is inimical to society. In this context, we have attempted to identify the factors of social influence which could prompt people to more frequently play mobile games. Our study has documented that shared identity, social interaction, and social norms constitute the effects of social influence. Our findings are supported by the concepts of social exchange theory and social networking theory. This idea has been also supported by a study by Chatterjee, 2020.

In applying the theme of motivational theory (Ryan and Deci, 2000), our results have demonstrated that social influence, mediated through the individuals' hedonic and utilitarian attitudes, could impact their behavioural intention to play mobile games. In reference to the study by Fishbein and Ajzen (1980), the present study has further documented that behavioural intention of individuals to play mobile games impacts significantly and positively their actual playing of those games. We have further highlighted that people who play mobile games frequently could become addicted to them, which has received support from another study (Park, 2014).

6.1 Theoretical contributions

The present study has provided several theoretical contributions. Primarily, it has demonstrated that three constituents of social influence, which are shared identity, social interaction, and social norms, eventually impact individuals' behavioural intention to play mobile games when mediated through their utilitarian and hedonic

attitudes. We found that behavioural intention leads a person to exhibit actual behaviour, and by actually playing mobile games frequently, that person could become addicted to them. No other studies have analysed so many salient issues simultaneously to successfully interpret how players of mobile games are becoming victims of addiction. This attempt is considered as a unique attempt and this study has provided some effective theoretical contributions to the extant literature.

Social exchange theory and social networking theory have provided inputs that are effective for identifying the several salient factors of social influence. In this context, it is worth mentioning that social exchange theory posits inter alia that individuals possess a tendency to discharge a behaviour if they perceive that, by doing so, the derived benefits outweigh the risks. The core idea behind social exchange theory has been extended in this research by arguing that when individuals play mobile games, they perceive to enjoy a shared identity with the members of a group, which they perceive overweighs the risk.

Moreover, social networking theory posits that an individual establishes a network by interacting with more people, which could raise the social status of the individual. This idea has been extended in the present study by arguing that, through playing mobile games, a player has an opportunity to expand the zone of social interaction, which is perceived to enhance one's social status. Again, by including two motivational factors like hedonic attitude and utilitarian attitude, the present study was able to develop a theoretical model with high explanative power. We claim that, by considering the extrinsic and intrinsic attitudes of individuals, in consonance with the concept of motivational theory, this study contributes value to the extant literature.

The concept of the extended technology acceptance model has been able to document in this study that intention is the best predictor of actual use, and it has added unique value to the knowledge of extant literature. A recent study by Chatterjee (2020) investigated the dark side of online social games using the Facebook platform. The idea of that study has been extended in the present study to investigate how social influence along with motivational attitude could impact the players of mobile games to be more involved in playing the games, which eventually could invite addiction. This is claimed to have added valuable inputs to the extant literature. Also, a study of Al-Samarraie et al. (2021) investigated the issue of social media addiction and inferred that excessive usage of social media could bring addiction to young users and it is harmful for society. The idea of this study has been extended in the present study to take up for investigation how playing of mobile games is responsible to make the players addicted to mobile games which brings harms to society. Another study (Ayandele et al., 2020) investigated how Nigerian female undergraduates are becoming gradually addicted towards usage of smartphones due to depression and anxiety for multifarious reasons. The idea of this study has been extended in the present study to extensively investigate how social influence could motivate the players of mobile games to play the games excessively causing addiction to it. Both the inputs of these studies as enumerated above are claimed to have enriched the body of extant literature.

6.2 Implications to practice

The results of the present study can provide several implications to practice. We have demonstrated that excessive playing of mobile games invites addiction, as players are unable to control themselves from playing the games excessively (Chen et al. 2022; Park & Ko, 2022). This implies that policymakers need to articulate appropriate policy to restrict people from playing excessively. One way this could be executed is by fixing a maximum time allowed per day. It has been observed that an application has already been developed that can restrict the excessive usage of mobile phones (Ko et al. 2015). The policymakers could borrow from this idea to devise a similar application capable that restricts excessive playing of mobile games, that can lead to addiction. At the same time, policymakers should think how to support individuals to develop their self-controlling skills themselves to avoid playing mobile games excessively. In this context, proper regulation should be articulated that would penalize those that violate it, and it needs to be enforced with good governance.

Policymakers and government agencies should arrange frequent awareness programmes to inform society appropriately about the menace of such addiction. For example, there should be a warning message that appears on the screen of the mobile phone before someone starts playing a game that states that excessive and uncontrolled mobile game playing may lead the person to experience addiction and other health issues. This might motivate the habitual players of mobile games to consent to restrict themselves from excessively playing mobile games. In this context, the mobile game makers cannot shirk their responsibility (Bae et al., 2019), and they should caution the players who excessively engage in playing mobile games. The game makers need to develop a comprehensive and executable policy in this matter.

6.3 Limitations and future scope

The study is not free from all limitations. The findings of this study depend on the inputs of 322 respondents. To make the results more generalizable, the study ought to have considered more responses. This is left for future researchers to investigate this matter. This study has been conducted with consideration of a single social media platform, Facebook. It is suggested that future researchers should examine the playing behaviours of mobile game players on other social media platforms to project the generalizability of the results.

The foundation of this study is based on self-reported data. Though some necessary processes have been undertaken to check for bias, we suggest that a longitudinal study could avoid such endogeneity defects. The present study did not analyse a rival model, which is considered another limitation. Future researchers may nurture this point by comparing the proposed theoretical model with a rival model to substantiate the former's superiority. The explanative power of the model is 69%. It is suggested that future researchers should consider including other constructs and boundary conditions to examine if they could strengthen the explanative power of the proposed theoretical model.

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