Antecedents of phubbing: from technological and psychological perspectives

Sheshadri Chatterjee

Department of Management Studies, Indian Institute of Technology Delhi, New Delhi, India

Abstract

Purpose – The purpose of this study is to identify the factors responsible for phubbing (PHU) from technological and psychological aspects.

Design/methodology/approach – From the literature review, some hypotheses have been formulated and a conceptual model has been developed. The model has been validated and the hypotheses have been tested by a statistical approach using a survey with involvement of 302 useable responses. The responses have been quantified and thereafter detailed statistical analysis has been adopted to verify the conceptual model and the hypotheses.

Findings – Smartphone addiction (SPA) is the principle component that is responsible for PHU, which is also the goal of the study.

Research limitations/implications – The study highlights that unless SPA behavior of individuals is reduced; it is not possible to control PHU behavior. For restricting SPA, self-control of the users of smartphone is necessary. Besides, imposition of appropriate rules and regulations can check the menace of SPA that in turn would control PHU.

Practical implications – Practitioners are to arrange to reduce SPA of people. The users are to be made known regarding the dark sides of SPA responsible for PHU. Besides, practitioners should conduct awareness programs to keep the users apprised regarding menace of SPA and PHU. Practitioners should arrange to execute consistently regulatory restrictions to control SPA. This would also be able to control individuals to exhibit PHU behavior.

Social implications – PHU inhibits quality of interpersonal communication. It lowers the esteem and exhibits negative relationship satisfaction among the interacting parties. PHU creates ostracism. Identification of factors responsible for PHU would help to provide a solution to check PHU.

Originality/value – Not much research on this issue is known to have taken place. In this regard, this attempt should be deemed to be a novel attempt.

Keywords Anxiety, Smartphone, Addiction, Psychological factors, Phubbing

Paper type Research paper

1. Introduction

We have experienced a thorough explosion of communication technology in the recent years. Devices are there that help one-to-one, one-to-many and even many-to-many inter communications (Huang *et al.*, 2009). This is achieved by smartphones. Smartphones have become our friends, philosophers and guides in our daily lives (Roberts *et al.*, 2014; Zhang *et al.*, 2017). Smartphone acts as a common device allowing access to internet (Buckle, 2016). People are found to prefer smartphones than computers (Ofcom, 2015). Smartphones help people in several ways. We use smartphones for research (Raento *et al.*, 2009; Jung and Hong, 2015), spending time for entertainment (Zhang *et al.*, 2014) and even for educational activities (Cummiskey, 2011; Gunesekera *et al.*, 2019).

There are several benefits that smartphones derive to the society. But it appears that it is causing adverse effects on physical and mental health and even on the quality of social interactions (Lee *et al.*, 2014). Smartphones are bringing people closer but sometimes smartphones are pulling people apart (Turkle, 2012; Tonacci *et al.*, 2019). It is now frequently observed that people are found ignoring others with whom they are involved in physical interactions because they are found to use their smartphones. This is called "phubbing" (PHU) which has become a common phenomenon in the communication activities (Chotpitayasunondh and Douglas, 2016; Guazzini *et al.*, 2019). PHU may be interpreted as an act of snubbing others during social interactions but profoundly focusing on one's smartphone (Haigh, 2015; Tonacci *et al.*, 2019). "Phubbing" is considered as a portmanteau of the two words "Phone and Snubbing." He who starts PHU is phubber and the recipient of PHU behavior is phubee. The PHU behavior is casting negative effect on the feelings of personal well-being as well as on the relationship satisfaction (Roberts and David, 2016; Abeele *et al.*, 2016; Vallespín *et al.*, 2017). Presumably, smartphone addiction (SPA) is deemed to be one of the root causes of helping "phubbing" (Karadağ *et al.*, 2015; Kim *et al.*, 2018). SPA is supposed to be responsible for advancement of technology use. It affects the psychological dimension of a human being (Turkle, 2012). However, there are very few studies to identify the factors responsible for PHU (Chotpitayasunondh and Douglas, 2016).

In this background, we strive to identify the factors responsible for PHU, formulate some hypotheses and develop a conceptual model explaining the factors. While proceeding to do so, we would try to address the following research questions:

RQ1. What are the technological factors associated with SPA responsible for PHU?

RQ2. Do psychological factors also contribute to smartphones addiction?

RQ3. Can we develop a model which can explain the phenomenon of PHU from technological and psychological perspectives?

2. Background study
We are interested in identifying the factors responsible for PHU. While doing so, we will try to analyze through literature review how technological advancements in the context of use of smartphone could contribute toward overuse of smartphone. We will try to investigate how the different psychological factors may cause depression that may provoke one to frequently use smartphone. Attempts will be taken by the study of literature to analyze how PHU is influenced by frequent use of smartphone causing SPA.

2.1 Advancement of technology and use of smartphone
Information and communication technology (ICT) usage behavior has multiplied the use of smartphones. The users of smartphones are often found involved in instant messaging or in chatting activities. This habit comes from the contribution of high-level technology (Tural, 2011). Continuous usage of smartphones for instant messaging or for chatting induces the users to be addicted to smartphone (Chou and Ting, 2003). Instant messaging habits pull and isolate the individuals from many other activities, as this habit brings in addiction to smartphone ultimately. Besides, it is observed that people are fond of (especially youths) video games using smartphones (Weinstein, 2010). Without consideration of value of time, many people are found to be engaged in video games using smartphone by considering it as food for mental relaxation (Grüsser *et al.*, 2006; Kim *et al.*, 2008). People are found engaged in

popular video games, such as Candy Crush (Walsh *et al.*, 2008). Another famous video game is Angry Birds (Bohmer *et al.*, 2011). These games snatch huge valuable time of the people. Most important addiction behavior of smartphone comes from the internet addiction (Mok *et al.*, 2014). Some researchers argue that internet addiction may be deemed to be the most important predictor of SPA (Lin *et al.*, 2014). Internet addiction is defined as "Maladaptive pattern of internet use leading to clinically significant impairment or distress" (Goldberg, 1996, p.1). This ICT usage behavior brings in the habit of addiction of smartphone. It pulls individuals to use smartphones although sometimes it is discourteous to do so (Jones, 2014).

2.2 Psychological issues and smartphone usage

Researchers have studied that if a person feels depressed, then the person is engaged in using smartphone to avoid the stress (STR) of such depression intending to forget temporarily the reasons of such depression (Thomee *et al.*, 2011). Some people are found to be profoundly engaged in frequent use of smartphones to get relief from STR and loneliness (LON) (Yi and Choi, 2012; Kim and Kim, 2016). This eventually leads to SPA (Roberts and David, 2016). Besides, whenever a person becomes anxious, the person is found engaged more in the problematic smartphone usage. (Demirci *et al.*, 2015; Sanakulov *et al.*, 2018). This trait is associated with a tendency to be worried (Mehroof and Griffiths, 2010). To come out from that worriedness, the person is found engaged with smartphone. This also leads to SPA. Anxiety (ANX) comes from neuroticism (Fetterman *et al.*, 2010).

2.3 Addiction and phubbing

It has been argued that SPA can decrease the quality of interaction that takes place between the two individuals. The interacting parties eventually lose the art of face-to-face interaction (Habuchi, 2005). Research revealed that in case of face to face conversation, if smartphone is present, the quality of conversation appears to be not rich (Misra *et al.*, 2014). Even, the presence of smartphone in the occasion of face to face conversation lowers perceived relationship between the interacting parties (Roberts and David, 2016). Use of smartphone by one party, when involved in interpersonal face to face communication pulls the interacting parties apart (Turkle, 2016). Hence, addiction of smartphone may be deemed to be an important predictor of PHU (Chotpitayasunondh and Douglas, 2016). This technological aspect and psychological aspect have effective contributions toward SPA which in turn is responsible to induce people to exhibit PHU behavior (Chou and Ting, 2003; Grüsser *et al.*, 2006; Thomee *et al.*, 2011; Demirci *et al.*, 2015; Al-Saggaf and O'Donnell, 2019). The schematic showing the predictors of PHU is represented in Figure 1 considering technological and psychological aspects toward PHU.
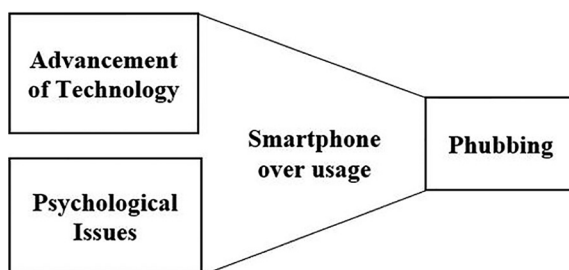

Figure 1.
Advancement of
technologu
psychological issues
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3. Development of hypotheses and conceptual model

With the inputs from background studies, we will try to develop a model by identifying the factors that could affect addiction of smartphone from the two aspects responsible for PHU. These aspects emerge from technological dimension and from psychological dimension. We will further investigate how addiction of smartphone may impact on PHU.

3.1 Information and communication-related habits

Smartphone users are found to be frequently engaged in the habit of instant messaging (Park and Lee, 2014). It is experienced that these individuals use instant messaging even on flimsy grounds that could have been avoided (Chou and Ting, 2003; Shah and Agarwal, 2020). The habit of being engaged in instant messaging leads one to be addicted in using smartphones. The habit of instant messaging with the help of smartphone takes away one's valuable time because this chatting habit disturbs one in doing many other important works of human daily lives (Park and Lee, 2014). Addiction of instant messaging (AIM) with smartphone is associated with SPA. This helps to formulate the following hypothesis:

H1. AIM is correlated with SPA.

Besides, another technological support invites the habit of playing video games at the cost of one's valuable time. This brings in SPA (Kim *et al.*, 2008). There are some people who are found to be engaged in video games. This causes addiction to video games (Wood, 2008). They do this presumably for getting mental relaxation (Weinstein, 2010). They play these games with the help of smartphone that eventually is concerned with SPA (Brañas-Garza *et al.*, 2018). This leads to hypothesize as follows:

H2. Addiction of video games is associated with SPA.

Smartphones have the facilities of access to internet. Users of smartphone are found to use internet for various reasons. This habit of frequent use of smartphone for the use of internet brings in internet addiction. It is deemed to be most important predictor of SPA (Lin *et al.*, 2014; Mok *et al.*, 2014). Internet addiction is considered as a maladaptive pattern of internet (Goldberg, 1996). This is related with SPA (Jones, 2014). We can, in this perspective, develop the following hypothesis:

H3. Mobile internet addiction (MIA) has a significant relation with SPA.

3.2 Psychological factors

There are various reasons that bring in depression in one's mind. The ingredients of depression provoke an individual to spare more time to smartphone to be relieved from the state of depression (Rubino *et al.*, 2012). STR is considered as one of the factors of depression. The environment of the place of work of an individual sometimes might cause STR in one's mind (Samaha and Hawi, 2016). Uncertainty in work condition brings in phobic traits responsible for causing STR in one's mind (King *et al.*, 2014). The STR provokes an individual to use smartphone frequently to get relief from the cause of STR. This habit is associated with SPA (Park and Park, 2014). Level of STR relates to uncertainty of environment, environmental control and opinion difference among individuals (Rubino *et al.*, 2012). This leads to the following hypothesis:

H4. STR of an individual can influence the individual toward SPA.

Some individuals want to live alone. It is their characteristics. This behavior of individual is concerned with the concept of LON (Zhang *et al.*, 2018). To feel alone is concerned with the concept of LON also (Kim and Oh, 2009). It is conceptualized by assessing the gap between the desired and actual social contact which is concerned with avoidant attachment trait of an individual (Drageset, 2004).

This characteristic of an individual provokes the individual to while away time by the smartphone usage. These characteristics of individuals are associated with SPA (Kim and Oh, 2009). This leads to develop the following hypothesis:

H5. Feelings of LON of an individual is correlated with SPA.

Besides, another psychological trait is there which is the feeling of uncertainty. This is ANX. ANX is defined as "The general tendency of an individual to be upset in stressful situations or as the mean level of ANX over a larger period" (Demyttenaere *et al.*, 1989, p. 943). This characteristic of an individual provokes the individual to use smartphone frequently. This is concerned with SPA as is evident from other studies (Kuss and Griffiths, 2011). With these inputs, the following hypothesis is formulated:

H6. Feelings of ANX of an individual are associated with SPA.

3.3 Studies on phubbing

Researchers argued that one of the most important predictors of PHU is SPA (Karadağ *et al.*, 2015). SPA sometimes pulls individuals apart (Turkle, 2012). Studies transpire that most of the individuals use smartphone during their other important social activities (Ranie and Zickuhr, 2015). Habit of using smartphone frequently brings in SPA and this habit persists even when one is engaged in face to face interactions with others (Chotpitayasunondh and Douglas, 2016). This leads to hypothesize as follows:

H7. SPA is significantly correlated with PHU activities.

After formulation of these hypotheses, the conceptual model is developed and shown in Figure 2.

It is noted that PHU creates resentful and negative reaction. It affects adversely the quality of communication. PHU leads to result in poorer interaction quality; it results less satisfaction with interactions, results less trust on interacting partners (Abeele *et al.*, 2016). PHU is associated with ostracism that means social exclusion (Williams, 2001). PHU affects adversely social norms, lowers the esteem of the interacting parties (Ferris *et al.*, 2015). PHU creates a corrosive effect on the relationship between the parties involved in PHU (Roberts and David, 2016). PHU creates negative interaction quality and creates negative relationship satisfaction (Ranie and Zickuhr, 2015).

4. Research methodology

The conceptual model has been shown in Figure 2. This is to be validated through statistical analysis. The conceptual model shows that number of independent variables is less than number of dependent variables. Hence, structural equation modeling (SEM) with the assistance of partial least square (PLS) analysis approach has been taken (Abdi, 2010). Here, PLS approach has been taken in as much as focus of this study is to identify the factors instrumental for PHU from technological and psychological perspectives (Hair *et al.*, 2016). To do this, Smart PLS 3.2.4 software (Ringle *et al.*, 2015) has been used.
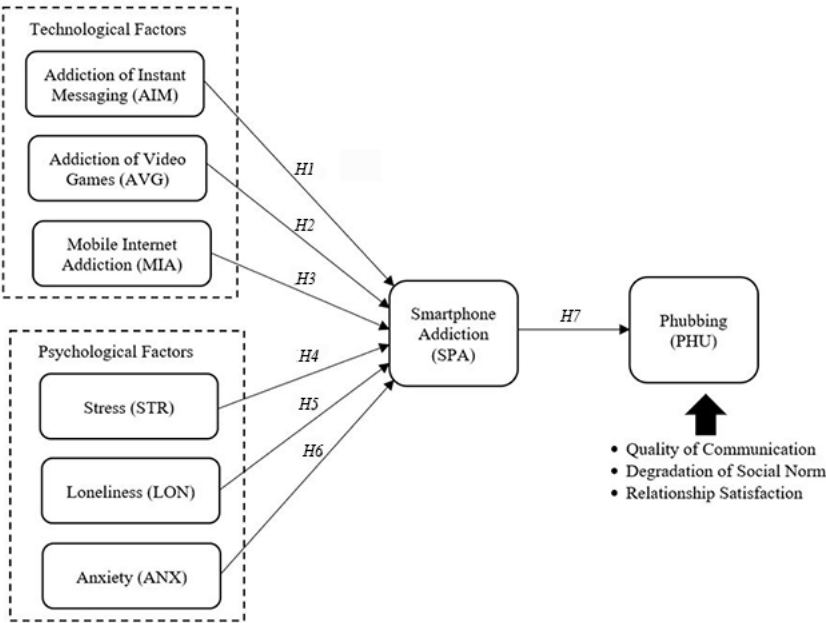
Figure 2.
Conceptual model

This SEM-PLS analysis initially needs for quantification of feedbacks obtained from usable respondents through survey against some rational and effective set of questions in the form of statements (questionnaire). These questions have been put to those useable respondents. The feedbacks are to be anchored on a standard scale for quantification. Here, five-point Likert scale has been used wherein the useable respondents are to put tick mark in one option against 5 options, that is strongly disagree has been marked as 1 to strongly agree has been marked as 5. For preparation of questionnaire, scale development architecture with step-by-step approach (Carpenter, 2018) has been adopted. It contains many steps like obtaining experts' opinion, pre-test and so on. In this way eventually 32 questions in the form of statements (items) have been prepared. The questionnaire is shown in the Appendix.

We could collect email addresses of 392 respondents from conferences at different places covering the subject matter concerning to the domain of this study. Some key persons were contacted in those conferences that helped us to obtain those email addresses of 392 prospective respondents. Feedbacks were invited against those 32 questions from those prospective respondents. They were given one months' time to respond (November 2018). We received 318 responses in time. On scrutiny, we selected 302 respondents which were thought to be unbiased. Demographic information of the useable respondents is shown in Table I.

These 302 responses were quantified in five-point Likert scale. The quantified data have been subsequently analyzed through the following steps. The survey took three months (November 2018 to January 2019).

4.1 Measurement tables
For ascertaining reliability of items, loadings have been determined. For validity, reliability and rationality of the constructs, average variance extracted (AVE), composite reliability

	Category	No.	(%)
Gender	Male	192	63.3
	Female	110	36.4
Age	<20 years	51	16.9
	21-30 years	53	17.5
	31-40 years	56	18.5
	41-50 years	65	21.5
	51-60 years	52	17.2
	>60 years	25	8.4
Highest education	SE (secondary)	41	13.6
	HS (higher secondary)	51	16.9
	Gr (graduate)	91	30.1
	PG (post-graduate)	55	18.2
	Research scholar	64	21.2
Profession	Teaching staff	94	31.1
	Corporate	126	41.7
	Businessman	68	22.5
	Others	14	4.7

Table I.
Demographic information

(CR) and maximum shared variance (MSV) have been estimated for all the constructs. The results show that all the estimated values of different parameters are within permissible range. The entire results are shown in Table II.

For ascertaining the consistency of constructs and to verify multicollinearity defect, Cronbach's alpha (α) and variance inflation factor (VIF) of each construct have been estimated, respectively, and it is seen that both these parameters are within acceptable range. To verify internal consistency of the constructs, discriminant validity test has been conducted by estimation of average variance (AV) being square root of AVE. Estimation of Cronbach's alpha and VIF is seen to be within specified range. It confirms consistency of each construct and it confirms that the constructs are not encroached in multicollinearity defect because we know that if the values of VIFs lie between 3.3 and 5 (Kock and Lynn, 2012), the defect of multicollinearity does not exist. AV of each construct is found to be greater than the corresponding Pearson coefficients of that construct with reference to other constructs confirming discriminant validity. The results are shown in Table III.

With the help of AMOS 22, some fit indices goodness of fit index (GFI), adjusted goodness of fit index (AGFI), comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error (RMSE) and chi-square (χ^2)/degree of freedom (df) have been computed. They are 0.906, 0.858, 0.967, 0.961, 0.021 and 2.015, respectively, which are within their acceptable range. This confirms relative accuracy of the model fit. It also confirms that the structure after validation could accurately represent the data. The model fit summary with recommended values is shown in Table IV.

4.2 Common method variance
The study is based on the data which are self-reported. As such, we have analyzed these data to check their biasness through common method variance (CMV) (Podsakoff *et al.*, 2003). For minimizing the probability of CMV, we assured all the respondents toward maintenance of confidentiality and anonymity (Chang *et al.*, 2010). A post hoc single factor test (Harman, 1976) has been performed. It has shown that first factor accounts to the extent of 33.2 per cent which appears to be less than the highest cutoff value (50 per cent) as recommended by Podsakoff *et al.* (2003). Further, we have conducted marker-variable

Constructs/Items	LF	CR	AVE	MSV
Addiction of instant messaging (AIM)		0.914	0.825	0.173
AIM1	0.900			
AIM2	0.914			
AIM3	0.905			
AIM4	0.914			
Addiction of video games (AVG)		0.916	0.827	0.173
AVG1	0.912			
AVG2	0.914			
AVG3	0.905			
AVG4	0.906			
Mobile internet addiction (MIA)		0.891	0.815	0.169
MIA1	0.911			
MIA2	0.914			
MIA3	0.908			
MIA4	0.878			
Stress (STR)		0.810	0.752	0.216
STR1	0.799			
STR2	0.912			
STR3	0.886			
5Loneliness (LON)		0.817	0.809	0.249
LON1	0.900			
LON2	0.915			
LON3	0.921			
LON4	0.944			
LON5	0.812			
Anxiety (ANX)		0.910	0.840	0.194
ANX1	0.916			
ANX2	0.917			
ANX3	0.911			
ANX4	0.921			
Smartphone adduction (SPA)		0.901	0.838	0.240
SPA1	0.911			
SPA2	0.915			
SPA3	0.916			
SPA4	0.920			
Phubbing (PHU)		0.915	0.839	0.240
PHU1	0.914			
PHU2	0.916			
PHU3	0.911			
PHU4	0.923			

Table II.
Estimation of LFs, CRs, AVEs and MSVs

	AIM	AVG	MIA	STR	LON	ANX	SPA	PHU	AVE	α	VIF
AIM	0.908								0.852	0.912	3.4
AVG	0.411	0.909							0.827	0.901	3.6
MIA	0.416	0.366	0.903						0.815	0.911	4.2
STR	0.403	0.416	0.326	0.868					0.752	0.869	3.9
LON	0.399	0.411	0.351	0.403	0.899				0.809	0.821	4.1
ANX	0.405	0.409	0.345	0.405	0.417	0.916			0.840	0.912	4.6
SPA	0.366	0.404	0.317	0.407	0.499	0.404	0.915		0.838	0.906	3.8
PHU	0.391	0.304	0.411	0.465	0.403	0.317	0.490	0.916	0.839	0.941	4.8

Table III.
Discriminants validity test, computation of Cronbach's (α) and VIF

technique for verification of CMV-validity check. The results highlight that the original and CMV-adjusted correction bears a very small difference (<0.06) so far as all the constructs are concerned (Lindell and Whitney, 2001). From all these inputs, it can be inferred that the CMV could hardly distort the prediction.

The validated model is shown in Figure 3.

The results after validation are also shown in Table V.

5. Results of the study

Results show that all the hypotheses have been supported. As seen in Table IV and in Figure 2, PHU behavior has been affected positively by AIM ($\beta = 0.34$), addiction of video games (AVG) ($\beta = 0.47$), MIA ($\beta = 0.57$), STR ($\beta = 0.42$), LON ($\beta = 0.35$) and ANX ($\beta = 0.43$) through the endogenous mediating variable SPA, whereas SPA itself impacts PHU behavior with $\beta = 0.59$. The exogenous variables could explain the mediating variable SPA to the tune of 61 per cent ($R^2 = 0.61$). The mediating endogenous variable SPA could explain PHU, the goal of the study, to the tune of 76 per cent ($R^2 = 0.76$). The explanative power of the model is 76 per cent which is very high.

We have also estimated the fit indices that represent the effective contribution of each belief to the model. It has been created for establishing causal relations between PHU with other exogenous variables and with the endogenous variable. We have computed GFI, AGFI, CFI, TLI, RMSE and chi-square: degree of freedom. The value of RMSE is 0.021 which may be deemed enough for goodness of fit. The value of chi-square: degree of freedom is 2.015. This ratio gives an idea of goodness of fit in between the observed and covariance matrix (increased). The value of CFI has been estimated as 0.967. It indicates that all the latent variables remain uncorrelated. It indicates a comparison between co-variance matrix and the null hypotheses. All the fit indices highlight that the theoretical model is in order. So far as technological habits of the users are concerned in the context of smartphone usage, it appears that the impact of MIA on the mediating variable SPA is the maximum ($\beta = 0.57$) with level of significance level ***$p < 0.001$. With respect to psychological dimension containing STR, LON and ANX, it appears that the effect of ANX on SPA is the maximum as the path coefficient is maximum 0.43 among these three beliefs.

The hypotheses have been formulated in a correct way. That is why all the hypotheses have been supported after validation.

6. Theoretical contribution

The study highlights how the use of advanced technology in the context of usage of smartphone (instant messaging, video games and mobile internet) could influence SPA responsible for PHU. This study highlights that ingredients of some psychological dimension of human beings (STR, LON and ANX) have effective contributions toward SPA. These two separate aspects, technological contribution and contribution of psychological

Fit index	Recommended value	Value in the model
Chi-square (χ^2)/degree of freedom (df)	≤ 3.000 Kline (2005)	2.015
Goodness of fit index (GFI)	≥ 0.900 Hoyle (1995)	0.906
Adjusted goodness of fit index (AGFI)	≥ 0.800 Segars and Grover (1993)	0.848
Comparative fit index (CFI)	≥ 0.930 Hair *et al.* (2006)	0.967
Tucker–Lewis index (TLI)	≥ 0.950 Sharma *et al.* (2005)	0.961
Root mean square error (RMSE)	≤ 0.070 Steiger (2007)	0.021

Table IV.
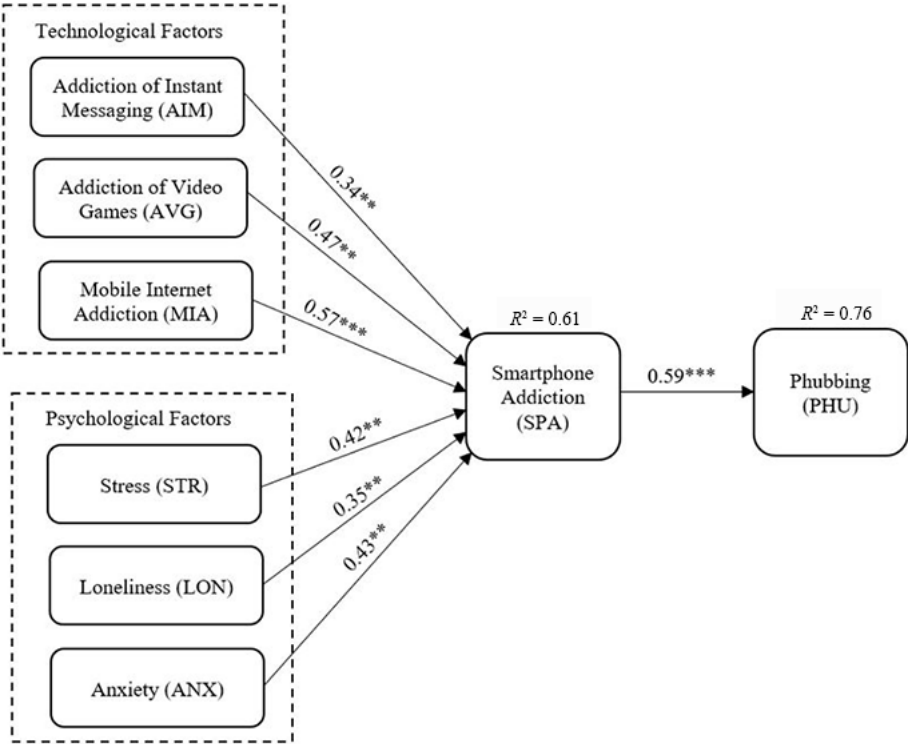Model fit summery
relating to the
research model

Figure 3.
Structural model with
path weights, R^2 and
level of significance

Path	Hypothesis	Path coefficient	R^2	p-values	Remarks
Effect on SPA			0.61		
By AIM	*H1*	0.34		** $p < 0.01$	Supported
By AVG	*H2*	0.47		** $p < 0.01$	Supported
By MIA	*H3*	0.57		*** $p < 0.001$	Supported
By STR	*H4*	0.42		** $p < 0.01$	Supported
By LON	*H5*	0.35		** $p < 0.01$	Supported
By ANX	*H6*	0.43		** $p < 0.01$	Supported
Effect on PHU			0.76		
By SPA	*H7*	0.59		*** $p < 0.001$	Supported

Table V.
Path weights,
hypotheses and R^2

dimension simultaneously have been considered in this study to interpret the several
determinants that could affect SPA which in turn is concerned with PHU character of
human beings. Such consideration of two types of aspects toward explaining SPA issue has
been able to theorize an enriched, effective and comprehensive understanding toward
interpreting the possible reasons of SPA responsible for PHU. This is a novel attempt, and,
in that respect, it is claimed to be a special theoretical contribution of this study. In
identifying the possible determinants of technological aspects toward smartphone overuse,
the theoretical model has considered factors, such as AIM, addiction of video games and

MIA which separately impact on SPA. Again, in identifying the possible ingredients of psychology-centric issues of human beings in the context of overuse of smartphones, we have identified factors, such as STR, LON and ANX. All these factors have been rightly chosen in this theoretical model. For such consideration of these beliefs as exogeneous variables, it could explain SPA to the tune of 61 per cent as the value of concerned coefficient of determinant is 0.61. This theoretical model has been able to explain how SPA is responsible to the major extent to contribute toward PHU that brings in adverse effect on the different aspects of social issues including ostracism with many other undesirable social issues. PHU contributes to lower one's social esteem, creating corrosive effect on relationship between phubber and the phubee. This has been supported in earlier studies (Roberts and David, 2016).

This theoretical model has been able to realize how SPA acting as an endogenous mediating variable could interpret its major contribution toward PHU. The consideration of this mediating variable, that is SPA, is claimed to be a special theoretical contribution of this study. This inclusion is claimed to have enriched the theoretical model because it could achieve high explanative power like 76 per cent. This theoretical model has provided an effective mechanism to check PHU which appears to be inimical to the society especially in the environment of interaction mechanism in the traditional form. This theoretical model highlights that once the SPA of the individuals is reduced, it would considerably check the individual to exhibit PHU characteristics which the society does not sanction (Bicen *and Arnavut,* 2015). In this context, it is appropriate to study the determinants responsible to cause PHU. In that sense, this theoretical model may be considered as an effective instrument to check the individuals to exhibit PHU behavior as a consequential effect of SPA.

7. Practical implication
The study has revealed that PHU characteristics are responsible to fetch many undesirable adverse effects in the society specially to affect the traditional interaction mechanisms keeping the interacting parties apart. Study also transpires that SPA is principally responsible to ignite the PHU behavior as has been supported in earlier study (Ranie and Zickuhr, 2015). The model provided shows that this SPA depends on many factors. Slight study highlights that the use of internet has a maximum effect on SPA (*H3*), as the concerned path weight is high (β = 0.57). If the users have self-control, then it may reduce the frequency of use of smartphones that leads to cause SPA. Once an individual is addicted, the individual can hardly control its own behavior toward the action (Hong *et al.*, 2012). Thus, if a mechanism is formulated to restrict the overuse of smartphone by the users, then this might provide an effective solution to keep this menace in check. The policymakers may frame congenial policy to restrain the users to overuse the smartphones. This may be achieved by limiting the users to use it for a limited period per day. Policymakers should also think to arrange to censor applications of smartphone. Recent studies highlight that for imposing restriction toward use-behavior of smartphone, a self-controlling mechanism has been devised (Ko *et al.*, 2015). The policymakers may investigate the applicability, viability and feasibility of this controlling device. If it is otherwise executable, then it will provide an effective and meaningful solution in this context.

Technology has advanced a lot. Different applications are available in smartphones. Overuse of smartphone may cause addiction. Addiction is correlated with PHU. The model shows like this. But after all, users are human beings. Hence, it is submitted that the policymakers or the authority should arrange to improve the individuals' self-controlling skill toward use of smartphone. This might be perhaps one of the best treatments to nurse

this ominous ailment. The policymakers should arrange for conducting awareness programs to make the users realize about the dark side of overuse of smartphone. That might ignite the sense of the users toward restricted use of smartphone.

The users of smartphone appear to use the device from their early age. This is the common scenario. It will not be an exaggeration to suggest, from the knowledge of the model so provided, that there should be a reasonable control over the use of smartphone by the children from their early age. In this context, awareness campaign should be augmented by the authority to guide the guardians. They are needed to focus attention on this issue. This might be an effective treatment to save the users from being the victims of SPA. Once SPA behavior of individuals is controlled, there will be considerable control over the individuals to exhibit the PHU behavior which is the goal of this study.

8. Limitations and future scope

In all research studies, there are some limitations. Our study is not free from limitations too. In validating the model, we adopted survey. The survey was not conducted separately on men and women for realizing how genderism can affect the result. This point has not been dealt with. This could have transpired the reasons why women are more prone to SPA in comparison to men (Chotpitayasunondh and Douglas, 2016). In the survey, we have considered 302 number of useable respondents and conducted our survey for a limited period. Hence, the result is not expected to project a generic scenario. Future researchers may nurture this issue considering more useable respondents with a longitudinal period. The survey was conducted covering participants of India. This cannot project a general scenario globally, especially, in the context of variation of cultural dispositions. Future researchers may focus on this untouched point. Another important issue deserves worth mentioning. PHU is always considered as inimical to the society and the discussions in this article have covered only the risk factors of PHU. The study appears to be silent regarding protective factors of PHU outcomes. If we widen our sense, we can definitely say that PHU sometimes acts as an instrument to bridge connection with someone through texting or through social media if the parties are far apart and immediate interaction becomes necessary. In this sense, PHU is construed to bear some advantages in some specific situations. This study appears to be silent to nurture this point. It is, as such, left for the future researchers to nurse this untouched point.

The model could achieve 76 per cent explanative power. This has been achieved by consideration of some variables. We could have considered other boundary conditions to examine if by such further consideration, the power of the model could be strengthened. However, it is fact that we cannot remove all the limitations of a study from the angle of ground reality. We can minimize the defects or drawbacks. However, as our model could achieve explanative power as high as 76 per cent, it is submitted that our model and the research must not be undermined.

9. Concluding remarks

The study has transpired that PHU can be restricted if SPA is controlled. Secret of success in controlling PHU behavior is to ensure restrictions of the individuals for being addicted in smartphone. In this study, the model has formulated a device to control SPA by identifying some effective technology-based and human-centric beliefs and traits. Control over addiction of smartphone can be effective if appropriate rules and regulation can be formulated and implemented with good governance consistently. The users are to be made aware regarding the menace of SPA. The study has highlighted some laudable mechanisms to control SPA in the practical implication section. Smartphones have become an integral part of the society. It

is difficult to restrict its overuse because many things can be achieved through its applications. As already stated, the users are to be made aware regarding the dark side of smartphone over usage that leads to PHU. Control of SPA would not only reduce PHU but also would reduce cyber-loafing (Andreassen *et al.*, 2014). STR, LON and ANX are the human-centric traits that aggravate SPA responsible for PHU. In this context, the need of the society is to ensure that the youths, (among whom this disease, that is addiction of smartphone is dominant) should not become victims of STR, LON and ANX. The family members are required to be vigilant as well as amiable to act accordingly. The menace of PHU causes irreparable harms to the society especially in the context of interaction activities. This menace of PHU leads to social exclusion to the phubbers. To keep this in check, overuse of smartphone instrumental to cause PHU is to be restricted to a considerable extent. This model has provided an effective instrument to identify the factors responsible for SPA that is associated with PHU. If the users reduce the habit of using instant messaging, control themselves to be involved in video games and censor their self-control ability and skill to use mobile internet, they might avoid them of being victims of SPA that is correlated with PHU habits. Besides, the society needs to ensure that the people do not become the victims of depression that provokes them to be addicted in smartphone leading them to eventually exhibit the habit of PHU which the society does not sanction. Thus, this model is seemed to have developed an effective and meaningful architecture to identify the factors that affect SPA mainly responsible for PHU.

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Appendix

Questionnaire

Items	Statements	Response [SD][D][N][A][SA]
AIM1	I check mobile message every 10 minutes	[1][2][3][4][5]
AIM2	I am afraid that the use of mobile messaging hampers my communication skill	[1][2][3][4][5]
AIM3	Addiction of instant messaging provokes one to use smartphones frequently	[1][2][3][4][5]
AIM4	I always use mobile messaging even that can be done through face to face	[1][2][3][4][5]
AVG1	Frequent use of video games adversely affects quality of my concentration	[1][2][3][4][5]
AVG2	I think excess use of smartphone video games is a bad habit	[1][2][3][4][5]
AVG3	I do not prefer to be always engaged in playing smartphone video games	[1][2][3][4][5]
AVG4	Frequent playing video games would cause smartphone addiction	[1][2][3][4][5]
MIA1	I think frequent use of mobile internet is considered as a bad habit	[1][2][3][4][5]
MIA2	I do not frequently use mobile internet because it snatches my valuable time	[1][2][3][4][5]
MIA3	I agree that excessive use of mobile internet may cause smartphone addiction	[1][2][3][4][5]
MIA4	I dislike using mobile internet frequently as it diverts my attention	[1][2][3][4][5]
STR1	I get very small amount of time for my relaxation	[1][2][3][4][5]
STR2	I do not get time for doing physical exercise	[1][2][3][4][5]
STR3	Most of the days I sleep less than six hours	[1][2][3][4][5]
LON1	I have no friends and I consider smartphone as my only friend	[1][2][3][4][5]
LON2	I always feel isolated from others	[1][2][3][4][5]
LON3	I always feel shaky to communicate with those who are around me	[1][2][3][4][5]
LON4	I am uncomfortable to make friends	[1][2][3][4][5]
LON5	I do not believe that only use of smartphone can remove my loneliness	[1][2][3][4][5]
ANX1	Whenever I do anything, I automatically become tensed	[1][2][3][4][5]
ANX2	In doing something, I feel tension and think that smartphone would help me	[1][2][3][4][5]
ANX3	I feel always difficulties even in performing any simple task	[1][2][3][4][5]
ANX4	I do not believe that use of smartphone can only give me relief from anxiety	[1][2][3][4][5]
SPA1	I cannot stay even for a moment without smartphone	[1][2][3][4][5]
SPA2	I agree that frequent use of smartphone is harmful for health	[1][2][3][4][5]
SPA3	I believe that use of smartphone isolates one from the society	[1][2][3][4][5]
SPA4	I am not able to control myself from frequent smartphone usage	[1][2][3][4][5]
PHU1	I cannot concentrate in interpersonal communication activities	[1][2][3][4][5]
PHU2	I feel uncomfortable when I interact face to face with others	[1][2][3][4][5]
PHU3	I believe frequent use of smartphones hampers interpersonal communication	[1][2][3][4][5]
PHU4	Frequent use of smartphone is inimical for relationship satisfaction	[1][2][3][4][5]

Figure A1.

About the author

Dr Sheshadri Chatterjee is a Post-Doctoral Research Scholar at Indian Institute of Technology, Kharagpur, India. He has completed PhD from Indian Institute of Technology, Delhi, India. He has work experience in different multinational organizations, such as Microsoft Corporation, Hewlett Packard Company and IBM. He has published research articles in several reputed journals, such as *Government Information Quarterly, Information Technology and People, Journal of Digital Policy and Regulation and Governance*. Sheshadri Chatterjee can be contacted at: sheshadri.academic@gmail.com