

Linking Psychological Attributes to Smart Phone Addiction, Face-to-Face Communication, Present Absence and Social Capital

by

Bian Mengwei Casey

Graduation Project
Presented to the Faculty of Graduate School of
The Chinese University of Hong Kong
in Partial Fulfillment of Requirements
for the Degree of

Master of Science
in
New Media

Supervisor:
Professor Louis Leung

School of Journalism and Communication
The Chinese University of Hong Kong
May 2012

ABSTRACT

The purpose of this study is to (1) identify addiction symptoms that are uniquely associated with smart phone use among university students in mainland China; (2) examine the interrelationships among psychological attributes (such as shyness and loneliness), smart phone functions, addiction symptoms, face-to-face communication, and present absence; (3) explore how demographics, psychological attributes, and smart phone usage can predict addiction symptoms; and (4) explore how these attributes, smart phone addiction symptoms, smart phone functions, face-to-face communication, and present absence can predict individual's social capital. Data were gathered from a snow ball sampling of 414 university students aged under 30 in mainland China. Exploratory factor analysis identified five addiction symptoms: 'disregard of harmful consequences,' 'preoccupation,' 'inability to control craving,' 'productivity loss,' and 'feeling anxious and lost.' Results show that the higher one scored on loneliness and shyness, the higher the likelihood one would be addicted. In addition, students who reported the greater amount of smart phone used, the higher level of face-to-face communication and present absence they would report. The study also found that the smart phone addiction symptoms are significantly and negatively related to the level of face-to-face communication and positively related to present absence. Furthermore, the most powerful factors affect bonding social capital were gender, grade, and loneliness; while the most powerful factor affecting bridging social capital was face-to-face communication with friends.

Word count = 223

Key words: Addiction; Face-to-face communication; Loneliness; Mainland China; Present absence; Shyness; Smart phone; Social capital; University students

INTRODUCTION

The increase in the demand for interpersonal and mass communication technology boosts the powerful evolution of mobile phone devices during the last decade.

Smart phone, distinct from standard mobile phone in operation system, with mobile computer operating platform and its portability and simplicity of use, makes it a perfect tool for work and life and fosters highly participation and interaction. Smart phones with different operation systems are rapidly gaining popularity worldwide. For many people now, mobile phone is essential to their life. The number of smart phones sold worldwide in 2011 reached 472 million, accounting for 31% of the total sales of all mobile phones, an increase of 58% compared with 2010 (Silva, 2012). The smart phone penetration rate in China's urban areas reached 35% in 2011, ranked third in the Asia-Pacific region (Gu, 2011). Half respondents said they would rather give up TV than a smart phone (Gu, 2011). According to a report released from Analysis International, the penetration rate of smart phones in China among age 21 to 30 years old accounted for 68.4%, becoming the main users of smart phone market in China (Xinhua Net, 2011).

As these tremendous figures witness the wide spread of adoption and use of smart phone, there are some problems emerged with the over use of mobile phone or mobile phone addiction. The most serious problem is the face-to-face communication between people. Just as Turkle (2008) mentioned “contemporary professional life is rich in examples of people ignoring those they are physically ‘with’ to give priority to online others” (p.123), people now do not care who they are with in person, they just indulge themselves in their mobile phones, not only for connecting people but also for other features and functions on the phone

like reading e-books, surfing on the internet. Furthermore, the use of smart phones causes individuals to become invasive, impolite and disruptive (Rosen, 2004). People now can engage in a person-to-person conversation and simultaneously send a text message or have a conversation on a mobile phone. Some individuals even put the mobile phone on the table for all to see, implying that if the interaction is not interesting enough, they have alternatives.

Although the previous studies have placed much attention on mobile phone addiction and internet addiction, few researches has special concern on the exploration of smart phone addiction and its effect on face to face communication and present absence. In addition, past research has found that lonely people and shy people are more likely to be addicted to different substances. Thus this study is to examine quantitatively whether loneliness and shyness can explain addiction symptoms of smart phone use and also seeks to understand the role of the smart phone addiction to face-to-face communication, present absence, and social capital.

LITERATURE REVIEW

Smart phone addiction

Previous studies of mobile phone addiction articulated three characteristics of mobile phone addiction: “people who are addicted to cell phone always keep their mobile phones on; they tend to use their mobile phones even when they have a land-line phone at home; and they normally are confronted with financial and social difficulties due to their excessive mobile phone use” (Roos, 2001). Past studies also recognized the problematic dimension of excessive usage of mobile phone in young people (Bianchi & Phillips, 2005; Monk et al.,

2004; Palen et al., 2001; Paragras, 2005). In the meanwhile, past mobile phone addiction studies as a behavioral addiction study are mostly based on previous studies of internet addiction (Beard, 2002; Beard & Wolf, 2001; Chak & Leung, 2004; Leung, 2004; Scherer, 1997; Young, 1998), which indicates that behavioral addiction especially people who addicted to internet is just the same way that people who became addicted to gambling, drugs and alcohol. (Young, 1996) As the functions of the smart phone becomes more and more various, young people are becoming increasingly dependent or addicted to this device not only for mediated interpersonal communication, which is the initial function provided by mobile phone, but also as a tool for other functions. Bianchi and Phillips (2005) developed the mobile phone problem use scale which identified several signs mobile phone addicts would present. They found that addicts of mobile phones hide their actual use from family and friends; face financial crisis because of using mobile phone; feel preoccupied, anxious, depressed when out of range for some time; continuously fail to control or cut back mobile phone use; and use mobile phone to escape from problems and emergency.

This study seeks predictors other than leisure boredom, sensation seeking, and self-esteem (Leung, 2008), from the addiction literature and other psychological theories such as loneliness and shyness in order to differentiate the addicts and non-addicts among university students in mainland China and to explain the effect of mobile phone addiction.

Before reviewing the psychological literature, this study asks two research questions:

RQ1: What smart phone addiction symptoms can be identified among a group of university students in mainland China?

RQ2: To what extent are university students in mainland China addicted to smart phone use?

Loneliness

Loneliness is defined as perceived deficiencies in one's ongoing relationships in both numbers and quality (Peplau et al., 1979). Such deficiencies occur as "a person's network of relationships is either smaller or less satisfying than the person desires" (Peplau et al., 1979, p. 55). Past studies have found a significant relationship between loneliness and some deficits in social interaction, especially, when talking to others. Lonely people tend to talk less, have lower level of involvement and attention, and inappropriate levels of self-disclosure. In addition, lonely people are more likely to be relationally incompetent, and as a result, they spend less time on social activities but more time being alone.

Loneliness is common to see and especially severe during adolescence (Brennan, 1982; Gaev, 1976; Weiss, 1973; Woodward & Frank, 1988). According to Woodward (1988), adolescence is usually labeled as loneliness, distress, alienation and solitude. Loneliness is related to deviant drug and alcohol use, overeating and even suicide. Loneliness has also been found significantly associated with internet addiction. Engelberg and Sjoberg (2004) found that lonely people with poorer social skill tend to have frequent use of the internet.

When it comes to the mobile communication, the basic purpose of mobile phone is to connect people in two distant places to communicate instantly, and eliminates the primary human anxiety about loneliness (Townsend, 2000). On the other hand, lonely people might tend to use the cellular phone more to get rid of this kind of anxiety. Park (2005) found that loneliness is positively correlated with mobile phone addiction among college students in Korea. Lonely students are inclined to use a mobile phone to get away from current situations

or settings in which he/she is involved.

In line with these, this study expects that lonely people would be more likely to be addicted to smart phone and would have heavier use of smart phone since lonely people are not willing to talk to others in face-to-face communication, they would tend to contact people by texting or other social networking applications on smart phones. In the meantime, the smart phone is just like a computer now, and it can connect to the internet anywhere, anytime. Thus, lonely people are more likely to be addicted to smart phone--just like they are more likely to be addicted to the internet. As a result, the study proposes that:

H1.1: Subjects who score high on the level of loneliness will report a higher frequency of smart phone use.

H1.2: Subjects who score high on the level of loneliness will have higher likelihood to be addicted to smart phone.

Shyness

Shyness is known as the lack of confidence to meet people and feel uncomfortable in the presence of others. The key of shyness is anxiety of being assessed by others (Pilkonis, 1977). Cheek and Buss (1981) defined shyness as “one’s reaction to being with strangers or casual acquaintances: tension, concern, feelings of awkwardness and discomfort, and both gaze aversion and inhibition of normally expected social behavior” (p. 330).

Shy people tend to regard their networks as less supportive and less satisfying and are happy and more comfortable to be by themselves (Parrott, 2000). Shyness is associated with problematic drug and alcohol use both in adolescence and adulthood (Brook et al., 1995;

Dobkin et al., 1995; Ensminger et al., 2002; Hawkins et al., 1992; Kellam et al., 1983).

Research has also showed that the computer-mediated medium provides shy people a perfect environment to perceive control over the communication process (Leung, 2003). Past researches (Caplan, 2002; Oforu, 1999) have found that deviant internet use is significantly correlated to shyness. However, Wei and Lo (2006) found that shyness was negatively associated with mobile phone use motives and with the amount of cell phone use.

But when it comes to the smart phone use, it provides a similar environment to what the internet provides. Smart phones not only have the functions and feature like texting, but also have other applications which provide functions for social networking. These functions let people not to communicate with others face-to-face or instantly which is a perfect way for shy people to communicate with others. In addition, other functions of smart phones which let people have entertainment like games or get information as surfing on the internet help shy people to escape from the uncomfortable situation while in public and indulge in a virtual, private mobile computing environment. As a result, it seems that shy people tend to rely more on it which will lead to heavier mobile phone use. Thus, the study proposes that:

H2.1: Subjects who score high on shyness will report a higher amount of smart phone use.

H2.2: Subjects who score high on the level of shyness will have higher likelihood to be addicted to smart phone.

H3: The higher the amount of smart phone use one report, the higher the likelihood one will be addicted to the smart phone.

RQ3: How can specific functions of smart phone use be predicted by demographics, loneliness, shyness, and smart phone addiction symptoms?

RQ4: How can smart phone addiction symptoms be predicted by demographics, loneliness, shyness, and smart phone usage?

Face-to-face communication

Using mobile phones is now an important part of people's daily social interaction.

Mobile phone use tends to occur within close relationships such as families, romantic couples, and friends in the past, (Ishii, 2006; Campbell et al., 2003) and mobile communication is used to be likely to strengthen established social relationships rather than extend them (Ishii, 2006).

But when it comes to the smart phone, people now do not care who they are with in person, they just indulge themselves in their smart phones, not only for connecting people but also for other features and functions on the phones like reading e-books and surfing on the internet.

Drawing on these findings and observations, it seems that overuse of mobile phone may destroy people's face-to-face communication. Thus, the study proposes that:

H4.1: A greater amount of smart phone addiction symptoms predicts lower level of face-to-face communication.

H4.2: A greater amount of smart phone use predicts lower level of face-to-face communication.

Present absence

Among young adults, relationships with peers are important both for generating offline benefits, commonly referred to as social capital, and for psychosocial development. Social

capital is an elastic construct used to describe the benefits one receives from one's relationships with other people (Lin, 1999).

The society is transformed by the internet as well as the telegraph and telephone since they provide person-to-person communication (Bargh & McKenna, 2004). Speed of communication and accessibility of information are seen as beneficial, but the internet also has a dark side in the use of the technology for bullying. In addition, Jarvenpaa and Lang (2006) label the antisocial behavior associated with mobile technology as engagement-disengagement or present-absent paradoxes. Such actions detract from face-to-face interpersonal contact resulting in negative or antisocial feelings, even with important family members (Rosman, 2006).

Present absence is known as “people apparently present in a given place are actually only half-present. They are present in body, but their attention, mind and senses can at any moment” (Fortunati, 2002). It means that “people today, when they are present, are not so completely; they are present, yes, with continuity in their physical part, but discontinuity in immaterial part” (Fortunati, 2002).

Just like people got used to talking while watching television in the past. Smart phone now attract people’s attention and make them shift away from natural communication to the virtual conversation, over a distance. The phenomenon of present absence happens when people stop interacting with or ignore someone they are physically with in order to interact with someone on the other end of a smart phone through calling, texting, instant message, emailing, and social networking or just indulge in other smart phone use like playing games and watching videos. As a result, the study proposes that:

H5.1: A greater amount of smart phone addiction symptoms predicts higher level of present absence.

H5.2: A greater amount of smart phone use predicts higher level of present absence.

H6: A higher level of present absence predicts lower level of face to face communication

Social Capital

Social capital has different definitions in various fields (Adler & Kwon, 2002), which can be both a cause and an effect (Resnick, 2001; Williams, 2006). Bourdieu and Wacquant (1992) define social capital as “the sum of the resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition” (p. 14).

Social capital was associated with a series of positive social outcomes, such as lower crime rates and much better public health (Adler & Kwon, 2002).

As for the individuals, social capital allows them to utilize from their own networks. These resources include personal relationships, useful information, or the capacity to organize groups (Paxton, 1999). Moreover, past studies have found that social capitals are related to psychological well-being, like self-esteem and being satisfied of life (Bargh & McKenna, 2004; Helliwell & Putnam, 2004).

Putnam (2000) distinguishes between bridging and bonding social capital. The former is linked to what network researchers refer to as weak ties, while bonding social capital is found between individuals in tightly-knit, emotionally close relationships, such as family and close friends.

The relationship between social capital and information and communication technologies (ICTs) seems to be not quite clear. High levels of social capital were proved to be a success factor of establishing electronic-based network (Fukuyama, 2001). In the meanwhile, the existence of ICTs has networking infrastructure which encourages the formation of social capital (Calabrese & Borchert, 1996). Thus, the relationship between social capital and ICTs seems to be mutual. Since social capital is about connections among people, less face-to-face communication may lead to less social capitals. In the meanwhile, people who are addicted to the smart phone or heavy smart phone users may also lead to few social capitals since the smart phone occupy the time which could be used to bridge or bond with other people. Therefore, this study proposes that:

H7.1: Intensity of face-to-face communication will be positively associated with subjects' perceived social capital.

H7.2: Intensity of present absence will be negatively associated with subjects' perceived social capital.

RQ5: To what extent can demographics, loneliness, shyness, smart phone usage, smart phone addiction symptoms, face-to-face communication, and present absence predict: (a) bonding social capital and (b) bridging social capital?

METHODOLOGY

Setting and Sampling

Online focus group was first conducted through university students from mainland

China in order to assess the usage and functions of smart phone. Data were later collected by online questionnaire on sojump.com, with a snow ball sampling of 565 university students in mainland China. The questionnaire was collected from March 13th to March 28th. Among the 565 completed questionnaires, 478 of them are smart phone users. In addition, 64 are excluded because: (1) repeated submission; or (2) finish the whole questionnaire within 120 seconds, which is impossible to finish reading each question normally; or (3) chose total different answers to two questions which are with the similar meaning; or (4) over 30 years old. And the total valid sample size was 414.

The valid sample consisted of 61.6% female and 38.4% male. Nearly 2 percent of respondents were aged under 18, 35.5 percent of respondents were aged from 19 to 22, 60.1 percent of respondents were aged from 23 to 26, and 2.4 percent of respondents were aged from 27 to 30. Among the 414 respondents, 4.1 percent of respondents were in Year 1, 7.2 percent were in Year 2, 5.8 percent were in Year 3, 37.4 percent were in Year 4, 44 percent were postgraduate students, and 1.4 percent of respondents were PhD students. In terms of household monthly income, 15 percent of respondents reported less than RMB3000, 31.2 percent were in the range of RMB3001-6000, 29.5 percent were in the range of RMB6001-10,000, 14.3 percent were in the range of RMB10,001-20,000, and 10.1 percent of respondents reported more than RMB20,000.

Measurement

Mobile phone addiction. The 27-item Mobile Phone Problem Use Scale (MPPUS) developed by Bianchi & Phillips (2005), 20-item Internet Addiction Test (Young, 1998) and

35-item Television Addiction Scale (Horvath, 2004) were adapted to measure smart phone addiction in this study. However, only nineteen items from all the three scale mentioned above, which contained eight revised items from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) for screening gambling problems, were used to create the composite smart phone addiction index (SPAI). The eight items adapted from DSM-IV were also used by Young (1996) to develop her screening instrument for addictive internet use which were also used by Leung (2008) for his screening instrument for addictive mobile phone use, were also included. A 5-point Likert-type scale will be used on the nineteen-item SPAI scale with “1” = “not true at all” to “5” = “extremely true”. The entire Cronbach’s alpha was high at .92.

Loneliness. To assess loneliness, a short-form of Revised UCLA Loneliness Scale, version 3 (Russell, 1996) was adopted. Respondents was asked to express how they feel about each statement with eight items picked from the original 20 questions (e.g., ‘You can find companionship when you want it’ and ‘People are around you but not with you’) using a 4-point Likert-type scale, ranging from “1” = “never” to “4” = “always”. The Cronbach’s alpha was .71.

Shyness. A short version of Cheek and Buss Shyness Scale (1981) was used to evaluate shyness. Respondents were asked to rank their agreement with 6 statements (e.g., ‘You are socially somewhat awkward’ and ‘You don’t find it hard to talk to strangers’) using a 5-point Likert-type scale, from “1” = “strongly disagree” to “5” = “strongly agree.” The Cronbach’s alpha was .73.

Smart phone usage. To assess smart phone usage, respondents were asked how often the

used 16 different functions of smart phone like texting, calling, gaming, using a 5-point Likert-type scale, ranging from “1” = “almost never” to “5” = “almost always”. After principal components factor analysis, we identified four major functions – information seeking (alpha = .79), utility (alpha = .68), fun seeking (alpha = .68), and sociability (alpha = .64).

(* Insert Table 1 about here *)

Face-to-face communication. Participants’ face-to-face communication was measured by two questions about the amount of time they spent face-to-face communicate with (a) their family and (b) friends respectively in a typical day. Respondents was asked to choose from “1” = “almost never” to “5” = “almost always”.

Present absence. To assess present absence, respondents were asked 5 questions: (a) how often do you “abandon” your physical surroundings to interact with someone else through your smart phone or managing other things with your smart phone; (b) how often do you keep you mobile phone on in inappropriate places such as in classes, meetings, and libraries; (c) how often do you have a person-to-person conversation and simultaneously send a text message or have a conversation on a cell phone; (d) how often do you and your friends gather around using you own smart phones instead of talking or charting; and (e) how often do you use your smart phone while in a meeting, lecture or class. Respondents were asked to choose from “1” = “almost never” to “5” = “almost always”. The Cronbach’s alpha was .73.

Social Capital. To measure social capital, a short version of bridging and bridging social capital measures constructed by Williams (2006) was employed. Respondents were asked to rank their agreement with several statements (e.g., ‘There is someone online/offline you can

turn to for advice about making very important decisions' and 'There are several people online/offline you trust to solve your problems') using a 5-point Likert-type scale, from "1" = "strongly disagree" to "5" = "strongly agree." The Cronbach's alpha for bonding social capital was .72 and for bridging social capital was .70.

FINDINGS

Smart Phone Addiction Symptoms

The smart phone addiction index (SPAI) scale was developed to collect responses from 414 university students in mainland China to identify smart phone addiction symptoms and, as a composite, to assess their overall level of smart phone addiction. The mean score for the nineteen-item SPAI was 48.48 and SD equals 12.75. As known in Table 2, principal components factor procedure yielded a five-factor smart phone addiction symptoms structure and accounted 70.09 percent of total variance. The first factor was "disregard of harmful consequences" (alpha = .88), reflecting university students in mainland China disregard of often being late for appointments or grades or school work suffered because of the amount of time spent on smart phone, and being in trouble because smart phone gone off during a meeting, lecture, or in a theatre. "Preoccupation" (alpha = .82) was the second factor. It included five items characterizing that university students in mainland China feel preoccupied with smart phone when they were not using it, or fantasized about using it, find themselves engaged on the smart phone for longer periods of time than intended, and anticipated to use smart phone again. "Inability to control craving" (alpha = .82) was the third factor. It contained four items illustrating the inabilities of university students in mainland

China to avoid complaints they received from friends and family about their obsessive smart phone use, to stop using smart phone, and to cut down on the amount of smart phone use.

“Productivity loss” (alpha = .86) was the fourth factor. It consisted of three items indicating that university students in mainland China found that excessive use of the smart phone has caused problems in their lives, decreased productivity, occupied time for other things and diverted attention from pressing issues that they should be facing. The fifth factor, “feeling anxious and lost” (alpha = .79) contained two items reflecting that university students in mainland China felt anxious, preoccupied when out of range for some time they cannot use the smart phone.

As a whole, this study identified five smart phone addiction symptoms which were conceptually consistent with the diagnostic criteria of pathological gambling described in DSM-IV. The original DSM measurement for pathological gambling was based on eight items; however, this study employed nineteen.

(* Insert Table 2 about here *)

Profile of the Smart Phone Addicts

To assess the extent to which university students are addicted to the smart phone, Young’s classic definition of internet addiction was adopted; in which a total of eight items from nineteen that are most conceptually equivalent to Young’s (1996) screening instrument in internet addiction which used by Leung (2008) to assess mobile phone addiction was employed. According to this classical measurement, 13.5 percent in the sample can be classified as smart phone addicts.

Hypotheses Testing

H1.1 predicted that subjects who score high on the level of loneliness will report a higher frequency of smart phone use. But as shown in Table 3, no significant relationship was found between loneliness and use smart phone for information seeking, utility, and fun seeking. In addition, loneliness ($r = -.22, p \leq .001$) was significantly related to use smart phone for sociability. Thus, H1.1 was rejected. H1.2 predicted that subjects who score high on the level of loneliness will have higher likelihood to be addicted to smart phone. As shown in Table 3, the relationship between loneliness and SPAI ($r = .31, p \leq .001$) was positively significant. Therefore, H1.2 was supported.

H2.1 proposed that subjects who score high on shyness will report a higher amount of smart phone use. But as shown in Table 3, no significant relationship was found between shyness and any of the four functions of smart phone use. Therefore, H2.1 was rejected as well. H2.2 proposed that subjects who score high on the level of shyness will have higher likelihood to be addicted to smart phone. As shown in Table 3, the relationship between shyness and SPAI ($r = .30, p \leq .001$) was positively significant. Therefore, H2.2 was supported.

H3 hypothesized that the higher the amount of smart phone use one report, the higher the likelihood one will be addicted to the smart phone. As shown in Table 3, the relationship between three of four functions of smart phone use and SPAI was positively significant. Only using smart phone for sociability ($r = -.11, p \leq .05$) was negatively and significantly related to SPAI. Thus, H3 was largely supported.

H4.1 hypothesized that a great amount of smart phone addiction symptoms predicts

lower level of face-to-face communication. Results in Table 3 indicate that two out of five smart phone addiction symptoms were negatively and significantly related to face-to-face communication. While no significant relationship between preoccupation, inability to control craving, feeling anxious and lost and face-to-face communication were found. As a result, H4.1 was partially supported. H4.2 proposed that a great amount of smart phone use predicts lower level of face-to-face communication. As shown in Table 3, three out of four functions of smart phone use were positively and significantly related to face-to-face communication while only the relationship between using smart phone for fun seeking ($r = -.13, p \leq .01$) and face to face communicating with friends was negatively significant. Therefore, H4.2 was not supported. In the contrary, the relationship were mostly positive suggesting that the function which provided by smart phone may give university students some topics they can discuss which may enhance their face-to-face communication.

H5.1 hypothesized that a great amount of smart phone addiction symptoms predicts higher level of present absence. As shown in Table 3, all smart phone addiction symptoms were positively and significantly related to present absence. Thus, H5.1 was fully supported. H5.2 proposed that a great amount of smart phone use predicts higher level of present absence. Correlational results in Table 3 showed that two out of four functions of smart phone use were positively and significantly related to present absence. Thus, H5.2 was partially supported. H6 hypothesized that a higher level of present absence predicts lower level of face-to-face communication. But as shown in Table 3, no significant relationship was found between present absence and face to face communication. Therefore, H6 was rejected.

H7.1 hypothesized that intensity of face to face communication will be positively

associated with subjects' perceived social capital. As shown in Table 3, both face-to-face communication with friends and family members were positively and significantly related to both bonding and bridging social capital. Thus, H7.1 was fully confirmed. Finally, H7.2 predicted that intensity of present absence will be negatively associated with subjects' perceived social capital. But as shown in Table 3, present absence was positively and significantly associated with bonding social capital ($r = .11, p \leq .05$) and no significant relationship was found between present absence and bridging social capital. As a result, H7.2 was rejected.

(* Insert Table 3 about here *)

Predicting Smart Phone Use

To access how demographics, shyness, loneliness, and smart phone addiction symptoms influence the smart phone use, a linear regression analysis was run. Results in Table 4 show that smart phone addiction symptoms of inability to control craving ($\beta = .19, p \leq .001$), preoccupation ($\beta = .13, p \leq .01$), gender ($\beta = .14, p \leq .01$) and grade ($\beta = .15, p \leq .05$) were positively and significantly associated with using smart phone for information seeking. This means that the higher the likelihood university students in mainland China would exhibit addiction symptoms – such as inability to control craving and preoccupation, the more they would use smart phone for information seeking. Moreover, male students and higher grade students are tend to use smart phone for information seeking. However, loneliness ($\beta = -.12, p \leq .05$) was negatively and significantly related to using smart phone for information seeking which indicates that subjects who score high on loneliness are less likely to use smart phone

for information seeking.

Smart phone addiction symptoms – such as preoccupation ($\beta = .14, p \leq .01$) and inability to control craving ($\beta = .10, p \leq .05$), and grade ($\beta = .28, p \leq .001$) were positively and significantly associated with using smart phone for utility. This means that the higher the likelihood university students in mainland China would exhibit addiction symptoms – such as preoccupation and inability to control craving, and the higher grade the students in, the more they would use smart phone for utility. Nevertheless, age ($\beta = -.21, p \leq .001$) and gender ($\beta = -.16, p \leq .01$) were negatively and significantly related to using smart phone for utility which indicates that older students and female students are more likely to use smart phone for utility.

Smart phone addiction symptoms – such as disregard of harmful consequences ($\beta = .21, p \leq .001$), preoccupation ($\beta = .16, p \leq .001$) and inability to control craving ($\beta = .12, p \leq .05$) were positively and significantly associated with using smart phone for fun seeking. This means that the higher the likelihood university students in mainland China would exhibit addiction symptoms – such as disregard of harmful consequences, preoccupation and inability to control craving, the more they would use smart phone for fun seeking. Nevertheless, feeling anxious and lost symptom ($\beta = -.11, p \leq .05$) was negatively and significantly related to using smart phone for fun seeking which indicates that students who experienced feeling anxious and lost symptom are less likely to use smart phone for fun seeking.

Loneliness ($\beta = -.20, p \leq .001$) was negatively and significantly associated with using smart phone for sociability. This means that subjects who score high on loneliness are less

likely to use smart phone for sociability.

(* Insert Table 4 about here *)

Predicting Smart Phone Addiction

Regression results in Table 5 show that loneliness ($\beta = .21, p \leq .001$) was one of the strongest predictors in influencing smart phone addiction followed by shyness ($\beta = .20, p \leq .001$). This means that those university students in mainland China who are most vulnerable or easily become addicted to the smart phone are generally those who scored high in loneliness and shyness. In examining the predictive power of the two psychological variables on the five dimensions of smart phone addiction symptoms, data show that shyness was more influential than loneliness. Specifically, shyness was predictive of inability to control craving ($\beta = .11, p \leq .05$), productivity loss ($\beta = .13, p \leq .05$), and feeling anxious and lost ($\beta = .12, p \leq .05$) while loneliness was significantly linked to symptom as disregard of harmful consequences ($\beta = .23, p \leq .001$) alone. In addition to psychological variables, three out of four functions of smart phone use and smart phone addiction index were also linked – the more they used smart phone for information seeking ($\beta = .16, p \leq .001$), utility ($\beta = .13, p \leq .01$) and fun seeking ($\beta = .17, p \leq .001$), the higher the likelihood that they would become addicted. As regard to addiction symptoms, regression analyses the more they used smart phone for information seeking, the higher the likelihood that they would exhibit addiction symptoms – such as preoccupation ($\beta = .12, p \leq .05$), and inability to control craving ($\beta = .18, p \leq .001$). Moreover, results in Table 5 showed that the more they used smart phone for utility, the higher the likelihood that they would exhibit addiction symptoms like preoccupation (β

= .14, $p \leq 0.01$) and inability to control craving ($\beta = .10, p \leq .05$). Furthermore, as shown in Table 5, the more university students in mainland China used smart phone for fun seeking, the higher the likelihood that they would exhibit addiction symptoms like disregard of harmful consequences ($\beta = .19, p \leq .001$), preoccupation ($\beta = .14, p \leq .05$), inability to control craving ($\beta = .11, p \leq .05$), and feeling anxious and lost ($\beta = -.12, p \leq .01$). Demographically, being male seemed to indicate having more vulnerability to exhibiting symptom of disregard of harmful consequences ($\beta = .16, p \leq .001$) while being female seemed to indicate having more vulnerability to exhibiting symptoms like preoccupation ($\beta = -.13, p \leq .05$) and inability to control craving ($\beta = -.12, p \leq .05$). Results in Table 5 also indicate that the lower the grade the students in, the higher the likelihood that they would become addicted to smart phone ($\beta = -.12, p \leq .05$). The amount of variance explained ranged from 8 to 20 percent.

(* Insert Table 5 about here *)

Predicting Social Capital

Finally, to compare the relative influence of shyness, loneliness, smart phone usage, smart phone addiction symptoms, face-to-face communication and present absence on bonding and bridging social capital, a pair of hierarchical regression analyses were run. Results in Table 6 show that gender ($\beta = -.24, p \leq .001$) and grade ($\beta = .21, p \leq .001$) were two significant predictors of bonding social capital under the demographics block. It shows that female and the higher grade the students in, the higher level of bonding social capital they would feel. The first block accounted for 10 percent of the variance.

Psychological variables were entered into the equation next. Results showed that

loneliness ($\beta = -.33, p \leq .001$) was the only significant predictor of bonding social capital. The negative link between loneliness and bonding social capital reveals that subjects who score high on the level of loneliness will feel lower level of bonding social capital. This variable contributed 10 percent of the variance.

The four functions of smart phone use were the next entries in the equation. Using smart phone for information seeking ($\beta = .20, p \leq .001$) and sociability ($\beta = .15, p \leq .001$) contributed significantly to the regression equation which explained a total of 6 percent of the variance. This reveals that the more one used smart phone for information seeking and sociability, the higher level of bonding social capital they would feel. Five variables from the smart phone addiction symptoms block were entered next. Disregard of harmful consequences ($\beta = -.10, p \leq .05$), preoccupation ($\beta = .19, p \leq .001$) and feeling anxious and lost ($\beta = .14, p \leq .001$) were three significant predictors that accounted for another 5 percent of the variance. The positive links between preoccupation, feeling anxious and lost and bonding social capital indicate that a greater amount of smart phone addiction symptoms of preoccupation and feeling anxious and lost predicts higher level of bonding social capital one would feel. But the negative link between disregard of harmful consequences and bonding social capital reveals that a greater amount of smart phone addiction symptom as disregard of harmful consequences predicts lower level of bonding social capital one would feel.

Face-to-face communication block with two variables was entered into the equation next. Face to face communicating with friends ($\beta = .24, p \leq .001$) was a significant predictor that accounted for 4 percent of the variance. This indicates that higher level of face to face communication with friends predicts higher level of bonding social capital one would feel.

Present absence was not a significant predictor for bonding social capital.

The equation explained 35 percent of the variance in total. And demographic predictors and loneliness were both the strongest predictors, but use of smart phone properly or being addicted do have an impact on bonding social capital.

Likewise, results in Table 6 show that grade ($\beta = .17, p \leq .001$) was the only significant predictor of bridging social capital under the demographics block. It shows that the higher grade the students in, the higher level of bridging social capital they would feel. The first block accounted for 3 percent of the variance.

Psychological variables were entered into the equation next. Results showed that loneliness ($\beta = -.20, p \leq .001$) and shyness ($\beta = -.12, p \leq .05$) were both significant predictors of bridging social capital. The negative link between loneliness, shyness and bridging social capital reveals that subjects who score high on the level of loneliness and shyness will feel lower level of bridging social capital. This variable contributed 6 percent of the variance.

The four functions of smart phone use were the next entries in the equation. Using smart phone for information seeking ($\beta = .18, p \leq .001$) and utility ($\beta = .14, p \leq .01$) contributed significantly to the regression equation and explained 5 percent of the variance. This reveals that the more one used smart phone for information seeking and utility, the higher level of bridging social capital they would feel. Five variables from the smart phone addiction symptoms block were entered next. Preoccupation ($\beta = .20, p \leq .001$) and feeling anxious and lost ($\beta = .12, p \leq .05$) were only two significant predictors that accounted for another 4 percent of the variance. The positive links between preoccupation, feeling anxious and lost and bridging social capital indicate that a greater amount of smart phone addiction symptoms of

preoccupation and feeling anxious and lost predicts higher level of bridging social capital one would feel.

Face-to-face communication block with two variables was entered into the equation next. Face-to-face communicating with friends ($\beta = .33, p \leq .001$) was a significant predictor that accounted for 9 percent of the variance. This indicates that higher level of face-to-face communication with friends predicts higher level of bridging social capital one would feel. However, present absence had no significant impact on bridging social capital.

The equation explained 27 percent of the variance in total. And face-to-face communication with friends was the strongest predictor which is showed to be positively and significantly related to smart phone use and negatively and significantly associated with smart phone addiction symptoms. This reveals that use of smart phone properly or being addicted do have an impact on bonding social capital no matter directly or indirectly.

(* Insert Table 6 about here *)

CONCLUSIONS AND DISCUSSIONS

Smart Phone Addiction Scale

One of the major aims of this research was to identify the underlying structure of smart phone addiction symptoms among university students in mainland China. Specifically, our data yield five clearly identifiable factors: disregard of harmful consequences, preoccupation, inability to control craving, productivity loss, and feeling anxious and lost. Principal components factor analysis results appeared to present construct validity of the Smart Phone Addiction Scale (SPAS) and accounted for 70.09 percent of the variance. Moreover, not only

is the 19-item SPAS able to provide a wealth of contextual information relating to smart phone addiction, but the data also yielded clear evidence for the multi-factorial nature of smart phone addiction symptoms – five distinct factors representing an series of Chinese university students’ behavioral consequences from smart phone addiction. As a whole, SPAS (both the index SPAI and the five-symptom subscales) correlated mostly with measures of psychologically meaningful constructs such as shyness and loneliness and smart phone usage. These constructs contain a wide series of theoretically and practically important factors for influencing smart phone addiction in general.

Moreover, SPAS differentiate from mobile phone addiction scale (MPAS) (Leung, 2007) for two different addiction symptoms – disregard of harmful consequences and preoccupation. This may be because that Leung’s research was focus on adolescent, while this study was focus on university students. Since university students have more free time and less control from parents than adolescent, they may lead to cause the addiction symptoms which caused more by spending more time on smart phone especially disregard of harmful consequences and preoccupation. Moreover, past research found preoccupation and disregard of harmful consequences as internet addiction symptoms (Tao et al., 2010; Leung, 2004). Smart phone with operation system and computing platform, provides user a similar experience of computer. Furthermore, smart phone let user to connect to the internet anywhere anytime. Thus it has more chance to have smart phone addiction symptoms as preoccupation and disregard of harmful consequences than standard mobile phone.

Effects of Psychological Attributes on Smart Phone Addiction

In line with the hypotheses, the smart phone addiction index (SPAI) and addiction symptom subscales were directly related to shyness and loneliness. This means that the higher one scored on shyness and loneliness, the higher the likelihood one would be addicted to the smart phone. While those who scored high on shyness reported more addiction symptoms, those who scored high on loneliness experienced only disregard of harmful consequences. These results in line with past research (Park, 2005) that lonely people tend to use mobile phone more and loneliness is positively correlated with smart phone addiction among college students in Korea. But they go against with the results from Wei and Lo (2006), that they found that shyness was negatively associated with mobile phone use motives and with the amount of cell phone use. When it comes to the smart phone, shy people are more likely to be addicted to smart phone may be because smart phone provide shy people a similar condition as the internet, which gave them a perfect environment to perceive control over the communication process. Smart phone also provides shy people an alternative to get away from current situations or settings in which he/she is involved and to get rid of primary human anxiety about loneliness (Townsend, 2000)

In addition, it is interesting to note that although psychological factors and smart phone usage both played large role in smart phone addiction, for symptoms such as disregard of harmful consequences, preoccupation, and inability to control craving, smart phone usage was a more powerful predictor which may indicates that these three symptoms are more likely to be presented because of excessive use of smart phone. But as for the productivity loss, psychological attribute especially shyness was the only predictors which indicates that this symptom is more likely to be happened on shy people. Furthermore, it is interesting to

note that shyness was positively and significantly related to feeling anxious and lost while using smart phone for fun seeking was negatively and significantly related to feeling anxious and lost. This may be because that using smart phone for fun seeking may distract people and make them get fully involved in the fun seeking functions like games which may help university students get rid of the anxious or lost situation and feeling.

Effects of Smart Phone Use and Smart Phone Addiction on FTF communication and Present Absence

As opposite to what was hypothesized, three out of four functions of smart phone use were positively and significantly related to face-to-face communication with both family members and friends while there is no significant relationship between using smart phone for fun seeking and face-to-face communicating with family members, and the relationship between using smart phone for fun seeking and face-to-face communicating with friends was negatively significant. It is easy to understand that the more information people found on the internet, the more they have topics to chat about with others no matter with family members or friends. Moreover, past research showed that people who are less anxious with face to face communication will use internet as a convenient means of seeking information (Papacharissi & Rubin, 2000). Likewise, some features of using smart phone for utility, especially, using email, are for interpersonal communication, not to mention using smart phone for sociability. Texting and making phone call are direct way of interpersonal communication, which may actually enhance face-to-face communication. As for using smart phone for fun seeking, no matter watching videos, listening to music, watching e-book or playing games are more enjoyed by oneself. Thus, the more university students using smart phone for fun seeking, the

less they would have face-to-face communicating with their friends. Past research has shown that CMC has increased the frequency and intensity of overall contact. Rather than replacing face-to-face contact, CMC adds to it, filling gaps between the fuller range of information and emotion in interpersonal encounters (Wellman, 2005). In addition, mobile communication used to be likely to strengthen established social relationships rather than extend them (Ishii, 2006). These results provide new evidence to prove that normal use of smart phone actually can enhance university students' face-to-face communication. Nevertheless, data shown that subjects who are more vulnerable become addicted to smart phone will have less face-to-face communication with both family members and friends. Furthermore, as hypothesized, two out of five smart phone addiction symptoms were negatively and significantly related to face-to-face communication. While no significant relationship between preoccupation, inability to control craving, feeling anxious and lost and face-to-face communication were found. This means that university students in mainland China have the addiction symptoms, such as disregard of harmful consequences and productivity loss, their face-to-face communication will decrease correspondingly.

From these data, we can know that normal use of smart phone can enhance students' face-to-face communication while addicted to smart phone may cause the decreasing of face-to-face communication between family members and friends. Past research showed that the amount of face-to face-interaction was positively associated with the participants' cell-phone use and their interpersonal motives for using cell phones: the more the participants engaged in face-to-face interaction with other people, the higher their motives were and the more frequent cell-phone use was (Ishii, 2006). Therefore, face-to-face communication and

mobile phone communication are bidirectional related.

Effects of Smart Phone Use, Smart Phone Addiction, FTF communication, and Present Absence on Social Capital

The most powerful items affect bonding social capital was gender, grade and loneliness. It shows that female and the higher grade the students in, the higher level of bonding social capital they would feel. And subjects who score high on the level of loneliness will feel lower level of bonding social capital. These first two factors accounted for 10 percent of the variance and loneliness contributed 10 percent of the variance.

The most powerful items affect bridging social capital was face-to-face communication with friends which accounted for 9 percent of the variance. This indicates that higher level of face-to-face communication with friends predicts higher level of bridging social capital one would feel. Face-to-face communication with family members did not affect social capital. This maybe because that family members may live in different province which lead them cannot communicate with each other face-to-face very often. Furthermore, the relationship between family members is much solid compared with relationship between friends. Thus they can bond or bridge their relationship through ways other than face-to-face communication.

Smart phone usage and smart phone addiction symptoms together contributed 11 percent of the variance for bonding social capital and 9 percent of the variance for bridging social capital. In the meanwhile, face-to-face communication with friends, the strongest predictor for bridging social capital, is showed to be positively and significantly related to smart phone use and negatively and significantly associated with smart phone addiction symptoms. This

reveals that use of smart phone properly or being addicted do have an impact on bonding social capital no matter directly or indirectly.

LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

First, it is important to note that since the addiction questionnaire may contain some questions that may make respondents feel embarrassing, the overall result may have been affected. Second, due to the snow ball sampling, the gender and grade distribution showed in questionnaire may not exactly reflect the real gender and grade ratio of university students in mainland China. Future research should compare results of different age groups or broaden the geographical background. Furthermore, the significant links between smart phone usage, loneliness, shyness, and smart phone symptoms have clear implications for treatment and intervention.

Intervention strategies should be focus on helping addicts have more physical activities so that they can pay less attention to and use their smart phone. Treatment also should assist addicts to improve their communication skill to let them feel comfortable when talking with others, which may lead to less addiction tendency.

REFERENCES

- Adler, P., & Kwon, S. (2002). Social capital: Prospects for a new concept. *Academy of Management Review*, 27(1), 17–40.
- Bargh, J.A., & McKenna, K.Y.A. (2004). The Internet and social life. *Annual Review of Psychology*, 55, 573-590.
- Beard, K. W. (2002). Internet addiction: Current status and implications for employees. *Journal of Employment Counseling*, 39, 2-11.
- Beard, K. W., & Wolf, E. M. (2001). Modification in proposed diagnostic criteria for Internet addiction. *CyberPsychology and Behavior*, 4(3), 377-383.
- Bianchi, A., & Phillips J. (2005). Psychological predictors of problem mobile phone use. *CyberPsychology & Behavior*, 8, 39-51.
- Bourdieu, P., & Wacquant, L. (1992). *An Invitation to Reflexive Sociology*. Chicago: University of Chicago Press.
- Brennan, T. (1982). Loneliness at adolescence. In Peplau, L.A., & Perlman, D. (Eds.), *Loneliness: A Sourcebook of Current Theory, Research and Therapy* (pp. 269-290). New York: Wiley.
- Brook J.S., & Newcomb, M.D. (1995). Childhood aggression and unconventionality: Impact on later academic achievement, drug use, and workforce involvement. *J Genet Psychol*, 156, 393–410.
- Calabrese, A., & Borchert, M. (1996). Prospects for electronic democracy in the United States: Rethinking communications and social policy. *Media, Culture, and Society*, 18, 249–268.

- Campbell, S.W., & Russo, T.C. (2003). The social construction of mobile technology: An application of the social influence model to perceptions and uses of mobile phones within personal communication networks. *Communication Monographs, 70*, 317–34.
- Caplan, S.E. (2002). Problematic Internet use and psychosocial well-being: development of a theorybased cognitive-behavioral measurement instrument. *Computers in Human Behavior, 18*, 553–575.
- Chak, K., & Leung, L. (2004). Shyness and locus of control as predictors of internet addiction and internet Use. *CyberPsychology and Behavior, 7*(5), 559-570.
- Cheek, J.M., & Buss, A.H. (1981). Shyness and sociability. *Journal of Personality and Social Psychology, 41*, 330–339.
- Dobkin, P., Tremblay, R., Masse L., & Vitaro, F. (1995). Individual and peer characteristics in predicting boys' early onset of substance abuse: A seven-year longitudinal study. *Child Development, 66*, 1198–1214.
- Engelberg, E., & Sjoberg, L. (2004). Internet use, social skills and adjustment, *CyberPsychology & Behavior, 7*, 41-47.
- Ensminger, M.E., Juon, H.S., & Fothergill, K.E. (2002). Childhood and adolescent antecedents of substance use in adulthood. *Addiction, 97*, 833–844.
- Fortunati, L. (2002). The Mobile Phone: Towards New Categories and Social Relations. Information. *Communication and Society, 5*(4), 513–528.
- Fukuyama, F. (2001), Social capital, civil society and development. *Third World Quarterly, 22*(1), 7-20.
- Gaev, D. (1976). *The psychology of loneliness*. Chicago, Illinois: Adams Press.

- Gu, X.B. (2011). *Google reported that China's smart phone penetration rate in urban area has reached 35%*. Retrieved from http://tech.ifeng.com/internet/detail_2011_11/07/10469114_0.shtml
- Hawkins, J.D., Catalano, R.F., & Miller, J.Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychol Bull*, *112*, 64–105
- Helliwell, J. F., & Putnam, R. D. (2004). The social context of well-being. *Philosophical Transactions of the Royal Society*, *359*(1449), 1435–1446.
- Horvath, C. (2004). Measuring Television Addiction. *Journal of Broadcasting & Electronic Media*, *48*, 378-398.
- Ishii, K. (2006). Implications of mobility: The uses of personal communication media in everyday life. *Journal of Communication*, *56*, 346–65.
- Jarvenpaa, S.L., & Lang, K.R. (2005). Managing the paradoxes of mobile technology. *Information Systems Management*, *22*(4), 7-23.
- Kellam, S.G., Simon, M.B., & Ensminger, M.E. (1983). Antecedents in first grade of teenage substance use and psychological well-being: A ten-year community-wide prospective study. In D.F. Ricks & B.S. Dohrenwend (Eds.), *Origins of Psychopathology* (pp. 17–42). Cambridge: Cambridge University Press.
- Leung, L. (2004). Net-Generation Attributes and Seductive Properties of the Internet as Predictors of Online Activities and Internet Addiction. *CyberPsychology & Behavior*, *7*(3), 333-348.
- Leung, L. (2008). Leisure boredom, sensation seeking, self-esteem, addiction symptoms and

- patterns of mobile phone use. In E. Korini, S. Utz, M. Tanis, & S. Barnes (Eds.), *Mediated interpersonal communication*. New York: Routledge.
- Lin, N. (1999). Building a network theory of social capital. *Connections*, 22, 28–51.
- Monk, A., Carroll, J., Parker, S., & Blythe, M. (2004). Why are mobile phones annoying? *Behaviour & Information Technology*, 23, 33-41.
- Oforu, H.B. (1999). *Heavy Internet use: a proxy for social interaction*. Windsor, Canada: University of Windsor.
- Palen, L., Salzman, M., Youngs, E. (2001). Discovery and integration of mobile communications in everyday life. *Personal and Ubiquitous Computing*, 5, 109-122.
- Papacharissi, Z., & Rubin, A. M. (2000). Predictors of Internet use. *Journal of Broadcasting & Electronic Media*, 44, 175-196.
- Paragas, F. (2005). Being mobile with the mobile: Cellular telephony and renegotiations of public transport as public sphere. *Mobile Communications*, 31(2), 113-129.
- Park, W. K. (2005). Mobile phone addiction. In R. Ling & P. E. Pedersen (Eds.), *Mobile communications: Re-negotiation of the social sphere* (pp. 253-272). London, England: Springer.
- Parrott, L. (2000). *Helping the struggling adolescent: a guide to thirty-six common problems for counselors, pastors, and youth workers*. Grand Rapids, Michigan: Zondervan.
- Paxton, P. (1999). Is social capital declining in the United States? A multiple indicator assessment. *American Journal of Sociology*, 105(1), 88–127.
- Peplau, L.A., Russell, D., & Heim, M. (1979). The experience of loneliness. In Frieze I, Bar-Tal D, Carroll JS (Eds.), *New approaches to social problems: Applications of*

- attribution theory* (pp. 53–78). San Francisco, United States: Jossey-Bass.
- Pilkonis, P.A. (1977). Shyness, public and private, and its relationship to other measures of social behavior. *Journal of Personality*, 45, 585–595.
- Putnam, R. D. (2000). *Bowling Alone*. New York, United States: Simon & Schuster.
- Resnick, P. (2001). Beyond bowling together: Sociotechnical capital. In J. Carroll (Ed.), *HCI in the New Millennium* (pp. 247–272). Boston, MA: Addison-Wesley.
- Roos, J. P. (2001, August). *Postmodernity and mobile communications*. Paper presented at the European Sociological Association on 5th Conference of the ESA, Helsinki, Finland.
- Retrieved from <http://www.mv.helsinki.fi/home/jproos/mobilezation.htm>
- Rosen, C. (2004). Our cell phones, ourselves. *New Atlantis*. 2004(6), 26-45.
- Rosman, K. (2006, December 8). Blackberry orphans: the growing use of e-mail gadgets is spawning a generation of resentful children: a look at furtive thumb-typers, the signs of compulsive use and how kids are fighting back. *Wall Street Journal*, p. W1.
- Russell, D. (1996). The UCLA Loneliness Scale (Version 3): reliability, validity, and factor structure. *Journal of Personality Assessment*, 66, 20–40.
- Scherer, K. (1997). College life on-line. Healthy and unhealthy Internet use. *Journal of College Student Development*, 38, 655-665.
- Silva, V.C. (2012). *iPhone sales boost smartphone market in 2011: Gartner*. Retrieved from <http://www.mis-asia.com/tech/mobile-and-wireless/iphone-sales-boost-smartphone-market-in-2011-gartner/>
- Tao, R., Huang, XQ., Wang, JA., Zhang, HM., Zhang, Y., & Li, MC. (2010). Proposed diagnostic criteria for internet addiction. *Addiction*, 105(3), 556-564

- Townsend, A.M. (2000). Life in the real-time city: mobile telephones and urban metabolism. *Journal of Urban Technology*, 7, 85–104.
- Turkle, S. (2008). Always-On/Always-On-You: The Tethered Self. In James E. K. (Ed.), *Handbook of Mobile Communication Studies* (pp.121-138). Cambridge, Massachusetts: The MIT Press.
- Wei, R., & Lo, V. H. (2006). Staying connected while on the move: Mobile phone use and social connectedness. *New Media & Society*, 2006(8), 53–72.
- Weiss, R. S. (1973). *Loneliness: The experience of emotional and social isolation*. Cambridge Massachusetts: MIT Press.
- Wellman, B. (2005). Community: From Neighborhood to Network, *Communications of the ACM*, 48(10), 53–55.
- Williams, D. (2006). On and off the net: Scales for social capital in an online era. *Journal of Computer-Mediated Communication*, 11(2), article 11.
- Woodward, J. & Frank, B. (1988). Rural adolescent loneliness and coping strategies. *Adolescence*, 24(2), 559-565.
- Xinhua Net. (2011). *Smart phone is become a close partner to Chinese people*. Retrieved from http://news.xinhuanet.com/tech/2011-12/04/c_111215700.htm
- Young, K. S. (1996, August). *Internet addiction: the emergence of a new clinical disorder*. Paper presented at the 104th Annual Convention of the American Psychological Association, Toronto, Canada.
- Young, K. S. (1998). Internet addiction: the emergency of a new clinical disorder. *CyberPsychology & Behavior*, 1(3), 237-244.

Table 1: Factor Analysis of Smartphone Usage (Smart phone user only; N=414)

How often do you use the smartphone for?	Factors				Mean	SD
	1	2	3	4		
<i>Information seeking</i>						
Surfing on the internet	.85				3.77	.98
Using search engine	.68				3.59	1.05
Checking information about daily life	.64				3.33	1.05
Viewing news	.63				3.26	1.14
Using instant message	.62				3.84	1.01
Using social networking services	.48	.45			3.85	1.02
<i>Utility</i>						
Functions related to efficiency		.72			3.06	1.05
Dictionary		.71			3.23	1.06
Email		.64			2.66	1.22
Taking photos and videos		.61			3.53	.86
<i>Fun Seeking</i>						
Watching videos			.78		2.54	1.07
Listening to music			.75		3.29	1.15
Ebook			.64		2.82	1.19
Game			.60		2.98	1.09
<i>Sociability</i>						
Making phone call				.84	4.15	.78
Texting				.83	3.96	.92
Eigenvalue	2.80	2.30	2.16	1.55		
Variance explained (%)	17.52	14.40	13.47	9.70		
Cronbach's alpha	.79	.68	.68	.64		

Scale used: 1 = almost never, 2 = seldom, 3 = sometimes, 4 = often, and 5 = very often

Table 2: Factor Analysis of Smart Phone Addiction

	Factors					Mean	SD
	1	2	3	4	5		
<i>Disregard of harmful consequences</i>							
1. You are often late for appointments because you are engaged on the smart phone when you shouldn't be. (mobile)	.87					1.92	.95
2. Your grades or school work suffer because of the amount of time you spend on smart phone. (internet)	.80					2.04	.90
3. More than once you have been in trouble because your smart phone has gone off during a meeting, lecture, or in a theatre. (mobile)	.75					2.15	.98
4. You have tried to hide from others how much time you spend on your smart phone. (mobile) (7)*	.66					2.13	.98
5. You have attempted to spend less time on your smart phone but are unable to. (mobile) (3)*	.61					2.26	1.01
<i>Preoccupation</i>							
6. You find yourself anticipating when you will use smart phone again. (internet)		.83				2.91	1.02
7. You feel preoccupied with smart phone when you are not use it, or fantasize about using it. (internet)		.76				2.46	1.06
8. When you are unable to use smart phone, you miss it so much that you could call it "withdrawal". (TV)		.69				3.10	1.06
9. You have used your smart phone to make yourself feel better when you were feeling down. (mobile) (8)*		.55	.47			3.00	1.00
10. You find yourself engaged on the smart phone for longer periods of time than intended. (mobile) (5)*		.52	.44			3.25	1.08
<i>Inability to control craving</i>							
11. You have been told that you spend too much time on your smart phone. (mobile)			.73			2.43	1.12
12. You can never spend enough time on your smart phone. (mobile) (2)*			.70			2.61	1.15
13. You often think that you should cut down on the amount of smart phone that you use. (TV)			.61			2.91	1.00
14. Your friends and family complain about your use of the smart phone. (mobile)			.56			2.54	1.07
<i>Productivity loss</i>							
15. Your productivity has decreased as a direct result of the time you spend on the smart phone. (mobile)				.83		2.42	1.05
16. You find yourself occupied on your smart phone when you should be doing other things, and it causes a problem. (mobile) (6)*				.82		2.32	0.97
17. There are times when you would rather use the smart phone than deal with other more pressing issues. (mobile)				.65		2.41	1.09
<i>Feeling anxious and lost</i>							
18. When out of range for some time, you become preoccupied with the thought of missing a call. (mobile) (1)*					.86	2.82	1.09
19. You feel anxious if you have not checked for messages or switched on your smart phone for some time. (mobile) (4)*					.86	2.81	1.10
Eigenvalue	3.65	2.74	2.65	2.53	1.76		
Variance explained (%)	19.1	14.39	13.96	13.31	9.24		
	9						
Cronbach's alpha	.88	.82	.82	.86	.79		

Notes: Scale used: 1= not true at all; 2= not true; 3= ordinary; 4= true; 5=extremely true. N=414

*Items resemble or are equivalent to the 8-item Young's Internet addiction diagnostic scale.

Table 3: Zero-order Pearson Correlation Matrix for Observed Variables

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Psychological Attributes																
1. Loneliness	.40***	-.09	-.02	.08	-.22***	.31***	.31***	.09	.05	.18***	.04	-.30***	-.39***	.14**	-.37***	-.27***
2. Shyness		.05	.02	.01	-.06	.30***	.11*	.15**	.14**	.18***	.12*	-.12*	-.14**	.26***	-.17***	-.21***
Smartphone Functions																
3. for information seeking			--	--	--	.13**	-.11*	.11*	.17***	.06	.11*	.19***	.21***	.18***	.23***	.20***
4. for utility				--	--	.11*	-.06	.15**	.11*	-.02	.08	.13**	.16***	.17***	.13**	.16***
5. for fun seeking					--	.20***	.24***	.14**	.12*	.003	-.13**	.07	-.13**	.04	-.10*	-.06
6. for sociability						-.11*	-.13**	.05	-.09	-.10*	.06	.21***	.26***	-.05	.24***	.12*
Smartphone Addiction																
7. Smart phone addiction index (SPAI)							.52***	.46***	.49***	.44***	.31***	-.14**	-.21***	.51***	-.06	-.03
8. Disregard of harmful consequences								--	--	--	--	-.28***	-.35***	.16***	-.28***	-.15**
9. Preoccupation									--	--	--	.08	.05	.26***	.20***	.19***
10. Inability to control craving										--	--	.02	-.03	.35***	-.05	-.04
11. Productivity loss											--	-.11*	-.12*	.15**	-.10*	-.12*
12. Feeling anxious and lost												.02	.06	.24***	.17***	.12*
FtF communication																
13. with family													.67***	-.07	.34***	.34***
14. with friends														-.06	.45***	.43***
15. Present absence															.11*	.05
Social Capital																
16. Bonding																.52***
17. Bridging																

Notes: * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$; N = 414.

Table 4: Regression of Demographics, Shyness, Loneliness and Smart Phone Addiction Symptoms on Smart Phone Usage

Predictors	Smart phone usage							
	Information seeking		Utility		Fun seeking		Sociability	
	r	β	r	β	r	β	r	β
Demographics								
Age	.05	-.05	-.06	-.21***	-.14**	-.06	-.02	-.04
Gender (male=1)	.05	.14**	-.22***	-.16**	.08	.06	-.13**	-.08
Grade	.13**	.15*	.17***	.28***	-.21***	-.11	.04	-.01
Family Monthly Income	.04	.04	.09	.04	-.04	0.02	.05	.01
Psychological variables								
Shyness	.05	.15	.02	-.03	.01	-.04	-.06	.03
Loneliness	-.09	-.12*	-.02	.02	.08	-.01	-.22***	-.20***
Smart phone addiction symptom								
Disregard of harmful consequences	-.11*	-.08	-.06	.02	.24***	.21***	-.13**	-.05
Preoccupation	.11*	.13**	.15**	.14**	.14**	.16***	.05	.06
Inability to control craving	.17***	.19***	.11*	.10*	.12*	.12*	-.09	-.09
Productivity loss	.06	.08	-.02	.003	.003	-.001	-.10*	-.07
Feeling anxious and lost	.11*	.09	.08	.05	-.13**	-.11*	.06	.07
<i>R</i> ²		.11		.13		.13		.08
Adjusted <i>R</i> ²		.08		.11		.11		.06

Notes: Figures are Pearson's *r* and standardized beta coefficients. *R*² is expressed in percent of variance accounted for.

p* ≤ .05; *p* ≤ .01; ****p* ≤ .001; N = 414.

Table 5: Regressing Smart Phone Addiction on Demographics, Shyness, Loneliness, and Smart Phone Usage

Predictors	Smart Phone Addiction Index (SPAI) ^a		Smart phone addiction symptoms									
			Disregard of harmful consequences		Preoccupation		Inability to control craving		Productivity Loss		Feeling anxious and lost	
	r	β	r	β	r	β	r	β	r	β	r	β
Demographics												
Age	-.06	.06	-.05	.04	.01	.10	-.09	.01	-.05	-.02	.07	.00
Gender (male=1)	.02	-.01	.22***	.16***	-.13**	-.13*	-.11*	-.12*	.05	.03	-.02	.03
Grade	-.13**	-.12*	-.18***	-.10	-.002	-.06	-.10	-.12	-.07	-.05	.15**	.11
Family Monthly Income	-.08	-0.03	-.12*	-.06	-.03	-.04	-.01	-.01	-.04	-.01	.09	.08
Psychological variables												
Shyness	.30***	.20***	.11*	.01	.15**	.10	.14**	.11*	.18***	.13*	.12*	.12*
Loneliness	.31***	.21***	.31***	.23***	.09	.07	.05	-.003	.18***	.11	.04	.05
Smart phone usage												
Information seeking	.13**	.16***	-.11*	-.09	.11*	.12*	.17***	.18***	.06	.07	.11*	.09
Utility	.11*	.13**	-.06	.004	.15**	.14**	.11*	.10*	-.02	-.01	.08	.06
Fun seeking	.20***	.17***	.24***	.19***	.14**	.14**	.12*	.11*	.003	-.02	-.13**	-.12*
Sociability	-.11*	-.04	-.13**	-.05	.05	.06	-.09	-.09	-.10*	-.06	.06	.07
<i>R</i> ²		.22		.19		.10		.10		.06		.07
Adjusted <i>R</i> ²		.20		.17		.08		.08		.04		.05

Notes: Figures are Pearson's *r* and standardized beta coefficients. *R*² is expressed in percent of variance accounted for.

^aThis is a composite measure of all 19 smart phone addiction symptom items; the higher the score, the higher the tendency of one to have the symptoms.

* *p* ≤ .05; ** *p* ≤ .01; *** *p* ≤ .001; N = 414.

Table 6: Hierarchical Regression Analysis of Social Capital Using Demographics, Shyness, Loneliness, Smart Phone Usage, Addiction Symptoms, Face-to-Face Communication, and Presence Absence as Predictors

Predictors	Social Capital					
	Bonding			Bridging		
	r	β	ΔR^2	r	β	ΔR^2
Demographics						
Age	.06	-.06		.05	-.08	
Gender (male=1)	-.25***	-.24***		-.05	-.04	
Grade	.23***	.21***		.17***	.17***	
Family monthly income	.09	.04	.10***	.06	.05	.03***
Psychological variables						
Shyness	-.17***	-.05		-.21***	-.12*	
Loneliness	-.37***	-.33***	.10***	-.27***	-.20***	.06*
Smart phone usage						
Information seeking	.23***	.20***		.20***	.18***	
Utility	.13**	.06		.16***	.14**	
Fun seeking	-.10*	-.04		-.06	-.03	
Sociability	.24***	.15***	.06***	.12*	.07	.05**
Smart phone addiction symptoms						
Disregard of harmful consequences	-.28***	-.10*		-.15**	-.04	
Preoccupation	.20***	.19***		.19***	.20***	
Inability to control craving	-.05	-.06		-.04	-.04	
Productivity Loss	-.10*	-.03		-.12*	-.06	
Feeling anxious and lost	.17***	.14***	.05*	.12*	.12*	.04*
Face-to-Face communication						
with family	.34***	.05		.34***	.07	
with friends	.45***	.24***	.04***	.43***	.33***	.09***
Present absence						
	.11*	.08	.00	.05	.04	.00
Adjusted R^2			.35	.27		

Notes: Figures are Pearson's r and standardized beta coefficients. R^2 is expressed in percent of variance accounted for.

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$; N=414.