Smartphone Addiction among University Undergraduates: A literature review

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Abstract

Purpose-This paper reviews the growing literature on Smartphone addiction among university undergraduates to identify trends.

Design/methodological approach- This paper is a meta-analysis literature review, for it synthesizes and analyzes the information into broad findings and draws summary conclusions based on the findings. It is based on literature published during the period 1996-2013. In the beginning, such concepts as the symptoms and levels of this addiction will be clarified. Afterwards, the underlying problems and methodological issues raised in the literature will be touched upon. The paper also reviews the relationship between Smartphone addiction among undergraduates and their academic achievement. Finally, significant differences in addiction among undergraduates according to their gender, field of study, parents educational level and family income level will be examined.

Findings- While some studies have shown gender differences in Smartphone addictive use, others have proved that gender and Smartphone use are not significantly related. A few studies have examined the relationship between addiction and students' field of study. Some of these have found that humanities students have a higher addiction level than physical science students. So far, little is known about the extent of the relationship between socio-economic factors (such as parental education and family income), mobile phone use behavior and addiction among university students. The results regarding Smartphone usage and family income had showed contrary indications. Nor is there agreement about the results regarding Smartphone use and parental education.

Practical implications- This state-of-art is useful for researchers and practitioners for understanding current trends and problems and methodological issues.

Originality/value- This paper identifies trends and problems and methodological issues.

1.Introduction

Terms such as "Smartphone addiction" (Casey, 2012; Kwon *et al*., 2013), "mobile phone addiction" (Abu-Jedy, 2008; Ahmed *et al*., 2011; Hong et al., 2012; Pawłowska and Potembska, 2011; Park, 2005; Szpakow *et al*., 2011), "problematic mobile phone use" (Billieux *et al*., 2008; Krajewska-Kułak *et al*., 2012; Takao, Takahashi and Kitamura, 2009), "mobile phone dependence" (Chóliz, 2012; Satoko *et al*., 2009), "compulsive mobile phone use" (Hassanzadeh and Rezaei, 2011; Matthews *et al*., 2009) and "mobile phone overuse" (Perry and Lee, 2007), have all been used to describe more or less the same phenomenon, that is, individuals engrossed in their Smartphone use to the extent that they neglect other areas of life. The most commonly used terms to describe this kind of addiction are "mobile phone addiction" and, recently, "Smartphone addiction". This literature review uses the latter term.

While Smartphone use has been increasing all across economic and age sectors, university students have been seen as one of the most important target markets and the largest consumers group of Smartphone services (Head and Ziolkowski, 2012).The technological revolution has provided the world with many inventions. However, every invention has brought with it both comforts and problems. This is so with Smartphones (Ahmed *et al*., 2011).

Smartphone use has become vital to students because they use them for several purposes not only for those similar to what the Internet provides, but also to explore applications which provide new functions. These functions allowing users not only to communicate with others face-to-face or instantly, which is a perfect way for shy students to communicate with others, but also to enjoy different kinds of entertainment like games. Users can also get information while surfing on the Internet which helps them to escape from uncomfortable situations. As a result, it seems that many students tend to rely heavily on their phones, which will inevitably lead to even heavier use (Casey, 2012). Hong *et al*. (2012) argue that mobile phones are popular among students because they increase their social communication and expand their opportunities for establishing social relationships.

However, Bianchi and Phillips (2005) reveal that the highest level of problematic mobile phone use is most found among younger users, from which it can be argued that this kind of addiction is most likely to occur among this group.

From surveying the literature on Smartphone addiction among undergraduates, a number of problems and methodological issues may be identified.

For example, there is no consensus among studies regarding a definition of Smartphone addiction because of: a) The variety of addiction symptoms associated with Smartphone use; b) The wide variety of new Smartphone functions; and c) The different problematic outcomes associated with Smartphone addiction (Takao *et al*., 2009). However, unlike material-related addictions, Smartphone addiction may not produce observable signs or symptoms, such as physiological indications of cravings. Indeed, the addicted individual may appear to be working in a normal and socially acceptable way (Griffiths, 1996; Lemon, 2002). According to Griffiths (1999) and Shaffer (1996), technological addiction involves extreme human-machine interaction which develops when people become dependent on the device to reduce negative mood states or increase positive consequences.

The literature also reveals that there is no consensus among studies regarding the effects of Smartphones addiction on students' academic achievement. Javid *et al*. (2011) emphasized a number of drawbacks and negative impacts of the technology on students' achievement. Students remained busy writing and sending useless messages, sending missed calls, listening to music and watching movies in a way that wasted their precious time and money. Additionally, one of the symptoms was found to be a lack of concentration among students during class. Smartphones provide free messengers and various kinds of social media applications, which are useful and fun. But these also have side effects, which enable students to send free messages and chat wherever they can get Wi-Fi (Wireless Fidelity) access.

On the other hand, although various factors have been proven to be significantly related to Smartphone addiction, some studies have focused on the relationships between personal factors such as gender and age. As a result, very little is known about the extent of the relationships between socio-economic factors (such as parents' education and family income) and Smartphone addiction among university students.

Moreover, the complexity of Smartphone addiction is reflected, among other things, by the levels at which it has been studied and the methods by which it has been investigated. Most studies on Smartphone addiction seem to focus either on the amount of time allocated for use by counting calls sent, calls received, messages sent, and messages received, or by counting the frequency of mobile addiction symptoms, whereas both are needed. Furthermore, most of these studies use qualitative data, which seems surprising, given the nature of

the topic which , in all its complexity, is inextricably bound up with meaning and values and that requires a great deal of interpretation and judgment. Hence, a mixed-approach investigation consisting of both quantitative and qualitative method is recommended to provide a comprehensive understanding of Smartphone addiction and its impact on undergraduates' academic achievement.

Hence, This literature review will focus on discussing the gaps identified in previous studies regarding the following:

1) Clarification of Smartphone addiction symptoms and levels among undergraduate.
2) Investigation of the relationship between Smartphone addiction among undergraduates and their academic achievement.
3) Discussion of the significant differences in Smartphone addiction among undergraduates according to their gender, field of study, parental educational level and family income level.

2. Smartphone addiction symptoms and levels among university students

In one of the earliest relevant studies, Bianchi and Phillips (2005) argued that the problem of mobile phone use may be a symptom of an impulse control deficit or depression. Addressing the underlying problem as well as inappropriate mobile phone use, They used some dependent variables to predict mobile phone addiction, such as reported time per week spent simply using the device problem use, reported percentage of use socially based, and reported percentage of business-based use. Other variables were also considered including reported percentage of use in other features. The results indicated that the technological addictions offer an appropriate starting point for a consideration of problem mobile phone use. The results also revealed that young people, in particular, appear to be susceptible to high use and problem use. They were the heaviest users of the SMS function and other features of mobile phones.

James and Drennan (2005) carried out research on Australian university students' mobile phone use and discovered a large use rate of 1.5-5 hours a day. Their findings showed a range of characteristics associated with addictive use. These were: impulsiveness, mounting tension prior to using the device, failure of control strategies and withdrawal symptoms. The results also identified some factors that correlated with consumer engagement in addictive or compulsive behavior. Situational factors affecting excessive use included special events, alcohol abuse and depressive circumstances. A wide range of other negative consequences from mobile phone addiction among consumers included financial issues, damaged relationships, emotional stress and falling literacy.

For Perry and Lee (2007), symptoms related to mobile phone addiction were found to be prevalent among Mauritius University students. Between 6% and 11% of students showed addiction symptoms related to tolerance, withdrawal, displacement of attention to school or work and the inability to diminish use. The number of messages sent and the perceived skill at using SMS were significant predictors of mobile phone addiction among students. Among the small percentage who revealed symptoms of addiction, use of text messaging was double to triple compared to the one found in the rest of the population sample studied.

Walsh *et al*. (2008) carried out a qualitative research to examine activities of university students regarding mobile phone usage. They also sought to establish addictive facts by using Brown's (1997) behavioral addiction criteria. Symptoms of behavioral and cognitive salience, conflict with other activities, euphoria, tolerance, withdrawal and relapse and reinstatement emerged at varying levels amongst participants' descriptions of their mobile phone use. The study concluded that university students were addictive to using mobile phone to an extent that they revealed the indication of behavioral obsession.

In another study, Walsh *et al.* (2010) examined the effects of involvement with mobile phone use on their use by people. The results revealed that a high frequency of mobile phone use differed from involvement with mobile phones as the association with frequency of use was relatively small. The predictors of each behavior differed too. Measures of frequency of mobile phone use generally assess the number of times a day people use their phone for calls or text messages as because many check their phone for missed messages or calls without actually using it. Self-identity and validation from others were explored as predictors of both

types of mobile phone behavior. However, only self-identity predicted frequency of use, while both self-identity and validation from others predicted mobile phone involvement.

Hassanzadeh and Rezaei (2011) defined text-message dependency as text-messaging-related compulsive behavior that causes psychological or behavioral symptoms resulting in negative social outcomes. Their study particularly focused on the relationship between psychosocial factors and psychological or behavioral symptoms, emerging from the process of text-message use among students. The findings showed that university students have SMS addiction.,. The study concluded that SMS addiction has currently become a serious mental and health problem among them . Moreover, problematic mobile phone use may complicate physiological and psychological problems.

To measure mobile phone addiction, Park (2005) asked respondents to report their minutes of mobile phone use and divided them into light user who reported less than nine minutes of use and heavy user (who reported more than nine minute of use) categories. Respondents who reported less than nine minutes of use were considered "light" users, while respondents who reported more than nine minute of use were considered "heavy" users. Mobile phone addiction was measured based on seven criteria of dependency. These were: tolerance, withdrawal, unintended use, cutting down, time spent, displacement of other activities and continued use. The results showed that mobile phone users grew tolerant of mobile phones despite the fact that they might cause such problems as high phone bills and public annoyance. Also, when the mobile phone was unavailable for a time, users became highly anxious and irritated. This behavior continued although these were troubling signs of addiction.

Likewise, Chóliz (2012) designed a questionnaire consisted of three factors: Lack of Control/Problems, Tolerance/Interference and Abstinence to evaluate mobile phone dependence in adolescents. This was based on criteria from the Diagnostic and Statistical Manual for Mental Disorders-Fourth Edition-Text Revision (DSM-IV- TR). These criteria included excessive use, problems with parents, difficulty in controlling use, interference with other activities and emotional discomfort when the mobile phone could not be used. The questionnaire consisted of three factors: Lack of Control/Problems, Tolerance/Interference and Abstinence. The results showed that with regard to gender and the age of the participants, girls had a higher degree of dependence on mobile phones than boys. Likewise, girls scored higher than boys on each of the factors in the questionnaire. They had higher levels of tolerance and experienced more interference with other activities. They were more likely to use mobile phones to avoid uncomfortable mood states and they felt bad if they could not use their phones. They also had greater economic and family problems as a result of costs associated with mobile phone use.

Billieux *et al*. (2008) studied the role of impulse in actual and problematic use of mobile phones. They reported four different components associated with impulsive behavior which were urgency, lack of premeditation, lack of perseverance and sensation seeking. The Problematic Mobile Phone Use Questionnaire (PMPUQ) measured four different dimensions of problematic use. These were: prohibited use, dangerous use, dependence, and financial problems. The results showed that, although each kind of impulse played a specific role in mobile use, "urgency" appeared to be the strongest predictor of problematic use.

In Japan, Igarashi *et al*. (2008) investigated how self-perception of text message dependency leads to psychological/behavioral symptoms among university students. They used a self-report questionnaire to measure the frequency of text messages, self-perception of text message dependency and psychological/behavioral symptoms. Self-perception of text-message dependency comprised three factors: perception of excessive use, emotional reaction and relationship maintenance. The findings showed that message frequency was significantly related to psychological/behavioral symptoms. Also, self-perception of text message dependency strongly affected psychological/ behavioral symptoms.

Abu-Jedy (2008) explored mobile phone addiction and its relationship with self-disclosure among university students in Jordan. The study also investigated the characteristics of addicted students, the main aspects of mobile phone addiction, the purposes of mobile use and the time spent in using them. The results revealed that addicted students comprised 25.8% of the total sample. The percentage of addicted females was

found to be twice that of males. There was also a higher level of addiction among private university students than public ones.

Hooper and Zhou (2007) explored the various types of behavior associated with mobile use. Six possible kinds arising from underlying motives were identified among university students. These were: addictive, compulsive, habitual, dependent, mandatory and voluntary behavior. A survey was conducted to test these categories. Findings indicated that mandatory behavior was the strongest type of use, while addictive behavior was the weakest. The result also showed that mobile phone use could be regarded more as mandatory, voluntary or dependent behavior than habitual, compulsive or addictive.

Another study, by Takao *et al*. (2009), examined the correlation between problematic mobile phone use and some personality characteristics among university students. Separate multiple regressions were carried out for each dependent variable to determine whether they could be predicted from the independent variables. The predictor variables included gender, self-monitoring, approval motivation and loneliness. The dependent variables included the reported time per week spent using a mobile phone, the reported number of people with whom participants talk regularly, the reported time per week spent writing and reading text messages and the reported number of people with whom participants exchange text messages regularly. The findings indicated that problematic mobile phone use was a function of gender, self-monitoring and approval motivation but not of loneliness. These findings suggest that the measurements of these addictive personality characteristics would be helpful in terms of screening and intervention.

Satoko *et al*. (2009) carried out a study to clarify the relationship of personality and lifestyle to mobile phone dependence. They defined this dependence as an intermittent craving to use these phones or excessive use of them. The results of multiple regression analysis indicated that scores for extroversion and neuroticism were positively related to the score from the Mobile Phone Dependence Questionnaire (MPDQ), while the score for healthy practices was negatively related to that of the MPDQ. The findings also suggested that mobile phone dependence in female college students was associated with high traits of sociability and neuroticism as well as an unhealthy lifestyle.

In Pakistan, Ahmed *et al*. (2011) explored the pattern of mobile phone use among university students to delineate the extent of addictive behavior in its usage. Findings revealed that most students were able to set definite priorities for their responsibilities and commitments and their mobile phone use and. Their results also revealed that very few students (4.8 - 18.5%) always exhibited extreme addictive behavior. Thus, they concluded that university students used their mobile phones within reasonable limits and did not move towards extreme behaviors that lead to addictive mobile phone use.

By contrast, in Belarusian, Szpakow, *et al*. (2011) assessed the role of mobile phones in students' lives and evaluated the mobile phone addiction symptoms among university students. The results indicated that almost 1/10 of the students had symptoms of such addiction and thus 68.8% were convinced of the harmful effects of mobile phones. Nearly 1/3 believed that mobile phones should be switched off in a theatre (30%) and in a church (33.8%). Some 28.8% knew the definition the monophobia. Still most, (71.9%) had never switched off their phones.

In Taiwan, Hong *et al*. (2012) investigated the relationship between psychological characteristics, mobile phone addiction and the use of mobile phones among female university students. The result showed that social extraversion and anxiety had positive effects on addiction while self-esteem had negative effects. Also mobile phone addiction had a positive predictive effect on mobile phone use behavior. The results revealed too, that female university students with mobile phone addiction would make more phone calls and send more text messages. Males did.

In China, Casey (2012) identified addiction symptoms that were uniquely associated with Smartphone use among university students. Exploratory factor analysis of the Smartphone Addiction Scale identified five symptoms which were: disregard of harmful consequences, preoccupation, inability to control craving, productivity loss and feeling anxious and lost. The results showed that the higher one scored on loneliness and shyness counts, the higher the likelihood one would be addicted. The study also found that the Smartphone

addiction symptoms were significantly and negatively related to the level of face-to-face communication and positively related to present absence. Furthermore, the most powerful factors that affected bonding social capital were gender, grade and loneliness; while the most powerful factor affecting bridging social capital was face-to-face communication with friends.

Krajewska-Kułak *et al*. (2012) examined the role of having a mobile phone in the students' lives, signs of addiction and whether there were differences in using phones between the Polish and Belarusian students. The results showed that most students had mobile phones. They usually used them for sending text messages, taking photos and accessing the Internet. Of the Polish students 35.2% and 68.8% Belarusian were convinced of the harmful effects of mobile phone use. However, more respondents from Poland than Belarus knew that mobile phone users could become addicted. Almost 1/5 of Polish students and 1/10 Belarusian had the symptoms of mobile phone addiction.

Shambare *et al*. (2012) argued that the mobile phone has become the 21st century's icon. Their study described mobile phone use as addictive, compulsive and habitual, indeed possibly the biggest non-drug addiction of the 21st century. The study concluded that university students were among the heaviest users of mobile technologies.

In Korea, Kwon *et al*. (2013) developed the first scale of Smartphone addiction. It is a self-diagnostic scale based on the Korean self-diagnostic program for Internet addiction that can distinguish Smartphone addicts. Subjects were divided into three groups: a high-risk group, a low- to medium-risk group and the general group. Findings showed that Smartphone addiction rates of the high- risk group and low-to medium-risk group were 2.2 and 9.3% respectively in adolescents and 1.0 and 6.7% in adults. Based on factor analysis results, the subscale for the Smartphone Addiction Scale (SAS) was divided as follows: Daily-life disturbance, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse and tolerance.

In Oman, although no previous studies have been conducted on mobile phone addiction, Belwal and Belwal (2009) analyzed mobile phone usage among university students. The results revealed that these students spent more than 10 Omani Rials per month on mobile services, made less than 10 calls but more than 10 SMS daily. They also depended on their parents for payment of their bills. It was also significantly found that students had a preference for expensive models. They felt uncomfortable without their mobile phones, so they kept them switched on 24 hours a day.

3. **Smartphones addiction and university students' academic performance**

The literature reveals that some studies highlighted the positive role of Smartphones in advancing students' learning. In this regard, Cheon, *et al*. (2012) reported that advancements in mobile technology are rapidly widening the scope of learning in areas outside formal education by allowing flexible and instant access to rich digital resources. Also, mobile learning can play a significant and supplemental role within formal education. Markett *et al*. (2006) observed the positive effects of mobile phone usage among students and recommended using SMS in classrooms. They found that knowledge can be gained through enhanced interactivity in students throughout the lecture by using SMS which increased this interactivity.

Interestingly, Javid *et al*. (2011) investigated the effects of mobile phone on the performance of university students. In this study, most of the students claimed that they used mobile phones to contact their teachers and classmates to discuss matters related to their study. They also utilized the mobile phone to share useful information with their classmates and to consult a dictionary and thesaurus for educational purposes. Nevertheless, they agreed that the mobile phone wastes their precious time and money.

On the other hand, many studies correlated Smartphone usage with the decrease in academic achievement. Based on their findings, a lot of scholars highlighted the negative consequences of mobile phones usage among university students. In reference to this, Bianchi and Phillips (2005); Monk, et al. (2004); Palen *et al*. (2001) recognized the challenging dimension of mobile phones usage among university students. Kubey *et al*. (2001) suggested that the heavy use of technology for recreational purposes is highly correlated with reduced academic performance. Sheereen and Rozumah (2009) found that mobile phones have been hugely accepted by Malaysian university students. However, results showed that personal and family factors influenced the

university students' usage behavior. Although the students in the study depicted a good mobile phone computing behavior, factors that may contribute to activate the intensity of their mobile phone usage are worth noting. As a result, they indicated that "although mobile phones has become vital to many college students, it may also affect students' academic performance" (Sheereen and Rozumah, 2009, p.206). Casey (2012) found that male students and higher grade students tended to use Smartphone for information seeking.

Similarly *et al*. (2003) proclaimed that a lot of students in the United States normally make calls at night, which results in less sleep and other problematic issues that may affect their performance. Also *et al*. (2008) explored the impact of using mobile communication technologies such as SMS, emails and online forums on students' learning motivation, pressure and performance. The results showed that instant messaging helped bonding the two roles of a student and an instructor in the instruction process effectively. When combined with Internet communication media, it can significantly increase students' extrinsic motivation without causing higher pressure. It is worth pointing out here that communication media demands public expression rather than private dialogue which should be adopted with careful consideration since it may raise students' pressure that may ultimately affect their performance.

Devís-Devís *et al*. (2009) assessed the negative consequences of maladaptive use of both the Internet and the mobile phone. Three hundred and sixty-five undergraduate university students majoring in four different studies (Psychology, Education, Journalism and Broadcasting and Health Studies) replied to scales. The results indicated that psychological distress was related to maladaptive use of both the Internet and the mobile phone; females scored higher than males on the mobile phone questionnaire, showing more negative consequences of its maladaptive use. With respect to major study, Journalism and Broadcasting students showed a more maladaptive pattern of Internet use than students of other majors.

Rodrigues (2011) explored the impact of Smartphone usage on the performance of senior managers in South Africa. A number of paradoxes linked to Smartphone use emerged, such as connection/ disconnection, efficient/ inefficient, informed/ uninformed, multi-functional/ dysfunctional, balance/ imbalance and safe/ unsafe paradoxes. One of the strongest themes that arose from the analysis was the potential imbalance that Smartphone use brings in terms of the work-life stability. For those addicted to using their Smartphones, personal self-discipline may not be sufficient.

Pierce and Vaca (2008) examined the differences in academic performance between teen users and non-users of various communication technologies. The results revealed that approximately ¾ of the students had a MySpace account and a mobile phone and more than ½ had an IM account. The results also showed that those who had a MySpace account, mobile phone and IM had significantly lower grades than those who did not. Results also revealed that students who used their MySpace, mobile phone and IM while doing their homework reported having lower grades than those who did not use technology while doing their homework. Finally, the results revealed that 28% of students sent text messages during class lectures from always to frequently and 5% reported text messaging during an exam from always to frequently.

Similarly, Srivastava (2005) found that UK students used mobile phones during lectures and some of them said that they cannot leave home without their mobile phone. Szpakow *et al*. (2011) found that most students were convinced on the harmful effect of the mobile phone usage on their lives. Also, Hong *et al*. (2012) found that mobile phone usage affected their academic performance including time management and other related problems.

Moreover, there were cross-national differences in students' beliefs about mobile phone usage and how it affects their learning. In this regard, Sung and Mayer (2012) compared college students in the United States and South Korea in their beliefs about mobile devices Vs. desktop computers. They found that American students rated desktop computers higher than mobile devices on positive features such as being fast, sharp, meaningful, good and realistic; whereas the South Koreans rated mobile devices higher than desktop computers on positive features such as being open, attractive, changeful, stimulating, immediate and exciting.

4. Factors influencing Smartphone addiction

Since this literature review aims to explore the factors influencing Smartphone addiction, such as gender, field of study, parents educational level and family income level among university students, the following section discusses these factors:

4.1. Gender differences in Smartphone addiction

A theme of interest for many researchers relates to gender differences in Smartphone addiction. There is no agreement on which group is at the higher risk of addiction, some studies have revealed gender-related differences. Turner *et al*. (2008) suggest that "user personality and individual attributes such as age and gender were found to be differentially associated with some aspects of phone-related behaviors" (p. 1).

Billieux *et al*. (2008) tested gender differences in both teams of impulsion and problematic mobile phone use among the young. The results showed that men use their mobile phones more frequently in dangerous situations whereas women are more dependent on them. The results on impulsion, showed that men exhibit significantly higher levels of sensation seeking and lower levels of perseverance, while women reveal significantly higher levels of urgency. Walsh, *et al*. (2011) found that gender was associated with mobile phone involvement but not frequency of use. Howell *et al*. (2008) investigated gender differences related to their mobile phones and users' perception and attitude towards their use in public and private places. They concluded that while females perceived the service very positively, there was a persistent trend for males to dislike the service, regardless of location.

Similarly, Hakoama and Hakoyama (2011) studied gender differences in multiple aspects of mobile phone use. Their results revealed that females, especially whites, were more likely to depend heavily on their phones to maintain social relationships. Chóliz (2012) found that girls generally used their phones more than boys and also were more likely to engage in phone abuse and experience problems with their parents due to excessive use. Chung (2011) tried to understand the causes of girls' excessive use of mobile phones. He predicted that there would be a close relationship between them and the maintenance of interpersonal solidarity among their adolescent contemporaries. He found that those who had a greater tendency to become addicted sent numerous text messages from places such as schools, where excessive use of mobile phones can be a problem.

However, mobile phones use showed different results in the study by Devís-Devís *et al*. (2009). They compared girls' and boys' usage and found that boys spent more time on this. They also found that university students used these communication tools more on weekends than on week days. This showed that there were different factors responsible for phone usage. Confirming this, Villella et al. (2011) found that behavioral addiction was more common among boys than girls.

On the other hand, there were also gender differences in user motivation. Pawłowska and Potembska (2011) found that women used their phones more frequently than men to satisfy their need for acceptance and closeness, to establish and sustain social relationships, and to express their emotions. Moreover, women were characterized by a higher severity of addiction to voice calls and text messages than men, who liked to use their phones to listen to music, take photographs, make videos, play games, and connect to the Internet more frequently than women. Likewise, Balakrishnan and Raj (2012) examined the motives of use among Malaysian university students and found that female students used their mobile phones more to socialize, gossip and as a safety device.

Interestingly, Iqbal (2010) divided mobile phone users into three groups-casual, moderate and excessive. At the casual and moderate levels, young adult females had a stronger drive to fulfill their interpersonal motives, but at the excessive level men had greater motivation in nearly all contexts. The results showed that males between 21-23 years in particular made and received more voice calls than girls. As far as text messaging frequency was concerned, males in the 21-23 age were at the forefront.

Osman *et al*. (2011) explored the attitude and the behavior of Malaysian consumers towards the such of Smartphone types of use such as application software, e-mail, Internet browsing, ringtones and so on. Their findings indicated that young consumers, especially males, were generally a greater target market. By contrast, female consumers had a higher tendency to adopt or purchase ringtones and wallpapers, which were meant to decorate or personalize their Smartphone. In other words, male consumers seemed to prefer those mobile contents that were practical and useful in fulfilling their information needs.

On the other hand, some studies found that females were more addicted to their phones than males. In one of the most cited studies Bianchi and Phillips (2005) found that tendencies to individual types of mobile

phone addiction were mostly gender-related. Indeed, they pointed out that women overused the mobile phone to maintain social relationships more frequently than men, while men used it to make business calls. Nevertheless, they found no statistically significant differences between men and women in the number of text messages sent. However, Igarashi *et al*. (2005) reported that girls established interpersonal relationships through text messages more often than boys.

Similarly, Wilska (2003) emphasized that girls overused mobile phones to send text messages and to make phone calls more frequently than boys, who focused more on the stylish looks and technical features of a phone because they were more interested in new technologies. By contrast, Ling (2001) found that during the period between 1997 and 2001, mobile phones were more often used by boys than girls, as they first treated them as a technical innovation. However, after 2001 girls started to use mobile phones significantly and more frequently than boys, as they became their main tool for developing interpersonal relationships.

According to Geser (2006) while boys were somewhat slower than girls in adopting the mobile phone universally, they tend to use it on the same scale by producing the same monthly bills. In other words, both genders were rather similar in the quantitative intensity of use, but they still differ significantly in the qualitative patterns and purposes of use. In fact, men and women have always been found to maintain quite different attitudes toward mobile phones.

Other studies prove that gender and mobile phone usage are not significantly related. Perry and Lee (2007) found no gender differences for addiction measures among developing world university students, although males were heavier users of text messaging than females.

By contrast, Takao *et al*. (2009) claimed that gender appeared to be a weak predictor of problematic mobile phone use, though females seemed likely to experience problems more frequently. They argue that cultural or ethnic background might influence this addictive behavior in females. In western countries, gender differentiation is not as severe as that in Asian countries, including Japan, where females inexplicitly still behaved modestly.

In Pakistan, Kamran (2010) investigated university students mobile phone calling and texting patterns. He found that the majority were extremely heavy users especially of text messaging, regardless of gender. Results showed that the average received calls by male students were (4.3) and (4.1) per female students on the diary day. Also, the average number of dialed calls by male students remained (3.9) and by female students (3.4). However, students reported an incredibly high rate of SMS communication on the diary day. The average number of SMS received by a male student remained at (98.4) and by a female (85.7). Similarly, the average number of text messages sent remained almost the same among male and female students. Male students sent (109.5), while female students sent (98.2) on the diary day.

4.2. Smartphone addiction and students' field of study

A few studies have examined the relationship between Smartphone addiction and students' field of study.

In reference to this, Abu-Jedy (2008) investigated the addiction to mobile phones and its relationship with self-disclosure among a sample of students selected from the university of Jordan and Amman Al-Ahliyya University. He found that there was a significant difference in terms of addiction related to the students' field of study. Specifically, he found that humanities students of had a higher level of addiction than natural science students. Also, there was a higher level of addiction among a private university students than public university ones.

Likewise, Oliver (2005) studied Australian university students and found that business students used mobile phones very extensively in their courses. Both older and postgraduate students used PDAs even if they had previously not used them, but they were also acutely aware of the technical issues which could accompany their use. Also, Ruiz-Olivares *et al.* (2010) observed habits related to addictive behavior among university students and its relationship with their macro-field of study (arts/sciences). It would seem that being a science student was a risk factor for gambling addiction and being older and an Arts student were risk factors for

shopping addiction. Students showed moderate incidence of mobile phone use behavior, while a very small group came close to having an addiction problem.

Hassanzadeh and Rezaei (2011) explored the effect of students' course on SMS addiction among students of the Islamic Azad University. Results showed that there was a significant difference between SMS addiction among students in different courses or majors.

4.3. Smartphone addiction and Family Income level

According to Castell *et al.* (2004) users' income is an important predictor of mobile phone use. Income is often a reason for mobile users to either continue or stop using emerging technology. Wireless technology, such as mobile devices, were generally expected to have a higher correlation with income, since these are becoming more advanced and applications are more expensive. Hence, making the assumption that there is a higher adoption of mobile devices in high socio-economic groups.

Similarly, Zulkefly (2009) examined the personal and family factors related to the mobile phone use. The results indicated that family income highly correlated with the duration of phone use and monthly expenditure. In conclusion, the findings revealed that students from higher income families spent more time and money on their mobile phone.

In contrast, research by Brown *et al.* (2011) found that lower income students' use of their mobile devices for the Internet was significantly higher than with students who had higher family earnings. Precisely, the results showed that in families which earned less than ($30,000) per year, (41%) of students used their mobile phones to access the Internet compared to (23%) of students in families that earned more than ($30,000) per year. This disparity may exist because lower income students lack access to other information communication technologies, such as PCs and tablets. Consequently, low income students accept mobile phone as an alternative to access the Internet. The results also revealed that students who paid their own phone bills used more features and services that the phone offered than students who did not pay their own monthly bills. In fact, (23%) of students with low incomes pay their own phone bills and only (4%) of students from families with higher incomes

Likewise, Rice & Katz (2003) found that lower income groups in the United States and in developing countries usually used mobile technology before any other users due to the lack of access to other wireless communication technology.

However, James and Drennan (2005) found that university students, regardless of income, had a long established relationship with their phones with an average of 6.5 years. All subjects were using their third to fifth mobile phone upgrade. Moreover, their use time was high, ranging from 1.5 to 5 hours per day and the average bill per month was $140, which was expensive given restricted student incomes. In Prezza *et al.* (2004) the results showed that students with a lower socio-economic status tended to use the mobile phone less to make phone calls. However, there was no significant status difference for the other uses.

Chakraborty (2006) compared usage patterns in a mature market (United States) with a rapidly growing new market (India) by surveying students in each country. The findings showed similarities in the use of phones to communicate with others and in the perception of mobile phone use in public settings, but showed differences in text messaging. However, in a developing market like India, mobile phones may be the primary and only phones to which students have access.

Naz *et al.* (2011) highlighted the economic consequences of excessive mobile phone use among university students. They found that it is one of the disastrous threats to economic independence of students and their families. They deduced that excessive mobile phone use paves the way for plenty of crimes and deviant acts that were regarded as severe threats to the stability of the community. Such crimes include robberies, excess of burglaries and thefts, and more prominently, the curse of gambling.

4.4. Smartphone addiction and Parent education level

A new report published by Grunwald Associates and the Learning First Alliance (2013) found that in terms of support, a majority of parents believed that mobile phones could be positive educational tools for their

children because their applications offer engaging ways of learning, in addition to connecting and communicating. This report states that "when it comes to mobile devices and education, most parents believe (completely or somewhat) that these devices open up learning opportunities (71 percent), benefit students' learning (62 percent) and engage them in the classroom (59 percent). Thirty-nine percent of parents say that using mobile devices supports their child's learning regardless of the app used." (Grunwald Associates LLC., 2013. P. 15).

However, Zulkefly (2009) found that parents' education level was positively related to the monthly phone expenditure of university students in Malaysia. This study also found a significant correlation between parents' age and problematic phone use. These findings tend to suggest that students with younger parents were inclined to get hooked on their phones.

By contrast, Ahn (2011) examined the relationship between parents' education and university students' participation in social network sites using phones. The results suggested that parents' education was not a significant predictor of social networking site (SNS) use. Those students appeared to find a way to get connected.

Therefore, Koutras (2006) revealed that due to changes in family structure, many university students are taking more and more responsibility for their families' mobile phone purchase decisions. In cases where both parents work full-time, university students often made mobile phones purchasing decisions in order to compensate for their parents' absence from home. In the case of a single-parent family, they usually had to act on behalf of an absent parent.

5. Summary and conclusion

Supplementary studies highlighted the negative effects of Smartphone addiction among university students. They identified the nature of this type of addiction by indicating its symptoms, classifying its levels and developing tools to measure it (e.g. Bianchi and Phillips, 2005; Park, 2005; James and Drennn, 2005; Hooper and Zhou, 2007; Perry and Lee, 2007; Billieux *et al*., 2008; Igarashi. *et al*, 2008; Abu-Jedy, 2008; Walsh *et al*., 2008;Takao *et al*., 2009; Satoko, *et al*., 2009; Walsh *et al*., 2010; Hassanzadeh and Rezaei, 2011; Ahmed *et al*., 2011; Szpakow et al., 2011; Pawłowska and Potembska, 2011; Hong *et al.* , 2012; Casey, 2012; Krajewska-Kułak *et al*., 2012; Shambare *et al*., 2012; Chóliz, 2012; Kwon *et al*., 2013).

Many studies correlated Smartphone addiction with a decrease in academic achievement (e.g., Aoki and Downes, 2003; Hong *et al*., 2012; Javid *et al*., 2011; Kubey *et al*., 2001; Pierce and Vaca, 2008; Rau *et al*., 2008; Rodrigues, 2011; Sheereen and Rozumah, 2009; Srivastava, 2005; Szpakow *et el*., 2011; Sung and Mayer, 2012).

Although many researchers have addressed gender differences in Smartphone addiction, there is no agreement on which group is at the higher risk. However, while some studies have shown gender differences in Smartphone addictive use (e.g., Billieux *et al*., 2008; Chóliz 2012; Devís-Devís *et al*., 2009; Hakoama and Hakoyama, 2011; Howell *et al*., 2008; Pawłowska and Potembska, 2011; Turner et al., 2008; Villella *et al*., 2011; Walsh *et al*., 2011), others have proved that gender and Smartphone use are not significantly related (e.g Balakrishnan and Raj, 2012; Chung, 2011; Prezza *et al*., 2004; Perry and Lee, 2007; Satoko *et al*., 2009).

A few studies have examined the relationship between addiction and students' field of study. Some of these have found that humanities students have a higher addiction level than physical science students (e.g., Abu-Jedy, 2008; Ruiz-Olivares *et al*., 2010; Oliver, 2005).

So far, little is known about the extent of the relationship between socio-economic factors (such as parental education and family income), mobile phone use behavior and addiction among university students. The results regarding Smartphone usage and family income had showed contrary indications. Castell et al. (2004) and Zulkefly (2009) found that students from higher income families spent more time and money on their mobile phone, while Brown *et al.* (2011) and Rice and Katz (2003) found that lower income students used their mobile phones more. However, other researchers, such as James and Drennan (2005) and Chakraborty (2006) revealed that both groups were similar in their usage regardless of their income.

Nor is there agreement about the results regarding Smartphone use and parental education. While, Zulkefly (2009) found a significant correlation here, Ahn (2011) suggested that parents' education was not a significant predictor of Social Network Sites use through mobile phones.

Most studies focused either on the amount of time allocated for use by counting calls sent, calls received, messages sent, and messages received, or on counting the frequency of appearance of addiction symptoms, whereas both are needed. However, a mixed-approach investigation consisting of both quantitative and qualitative method is recommended to provide a comprehensive understanding of addiction and its impact on students' academic achievement.

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