Is Smartphone usage truly smart?
A qualitative investigation of IT addictive behaviors

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Abstract
Defined as the dependency to a technology that results in its excessive and compulsive use, IT addiction is seen as increasingly prevalent in today’s societies. Recent research has revealed that IT addictive behaviors are creating serious problems for individuals and organizations alike. In this paper, we report the results of a qualitative study that aimed at investigating smartphone addictive usage. Building on 11 in-depth interviews and answers to 183 exploratory written questionnaires, we used a grounded theory approach to investigate this phenomenon. Our results reveal four smartphone user profiles. In two of these profiles, users are exhibiting addictive behaviors. In the first group, the users’ profile corresponds to that of other types of additions. In the second group, known definitions of addiction do not apply and the characteristics of these users are very different. Our results thus suggest that adopting traditional conceptualizations of addiction will not be sufficient to define, understand and manage IT addictive behaviors.

1. Introduction
Over the last few years, millions of users have switched from regular phones to smartphones. Statistics show that by 2012, 46% of US mobile users have smartphones [1]. Smartphone usage varies considerably between different users, ranging from a couple of hours to 14 hours per day [2]. From an information system (IS) research perspective, such broad and intense usage could be considered a positive outcome, given that use is one of the most common indicators of IS implementation success [3, 4]. Indeed, information technology (IT) use is generally recognized as a desired behavior that can facilitate tasks and help improving performance of individuals and organizations alike.

Recent research tends to indicate however that IT usage is likely to lead to undesired outcomes when it becomes addictive [5, 6]. There has been a growing concern in psychology, health and IT research that addiction to technology causes serious challenges for individuals, organizations and even society [7, 8]. More precisely, recent research has shown that IT addiction can lower school performance, bring about family conflicts and work related problems, and in extreme cases, result in severe depression and loneliness [9, 10, 11]. Addictive IT use has also been shown to undermine performance because it reduces or interrupts employees’ availability and concentration for other work tasks [12]. Similar to other types of technology addiction, there is evidence that excessive or addictive use of smartphones results in several negative impacts on users [13].

To meet these disturbing challenges, a better understanding of the nature, antecedents and impacts of IT addictive behaviors becomes critical. In this paper, we report the results of a qualitative study on smartphone addiction that reveals four profiles of smartphone users: the addicts, the copycats, the regulars and the moderates. In the first two profiles (addicts and copycats), users exhibited IT addictive behaviors. Our study also identifies antecedents and outcomes associated with smartphone usage. These results suggest that adopting traditional conceptualizations of addiction will not be sufficient to define, understand and manage IT addictive behaviors.

2. Literature Review

2.1. Conceptualization of IT addiction

The concept of addiction originally roots in psychology and mental health research, where it has been often referred to as a type of behavior that either serves to produce pleasure or to escape from internal discomforts [14]. Such behavior usually follows a recurring pattern, where an individual experiences failure to abandon a behavior despite significant negative outcomes [14, 15, 16, 17]. Marlatt, Baer, Donovan, & Kivlahan [18], p. 224, defined addiction as “a repetitive habit pattern that increases the risk of disease and/or is associated with personal and social problems…often experienced subjectively as loss of control [that] continues despite volitional attempts to abstain or moderate use”.

While initially solely used to describe behaviors related to substance abuse, the concept of addiction...
has been extended to other contexts and now encompasses behaviors such as gambling and gaming [19, 20, 21]. With the sophistication of new technologies and constant improvement of the technological abilities of users, IT usage has also recently been identified as an addiction [20]. While, as indicated above, the use of technology is generally considered a positive behavior, excessive IT usage may cause numerous social, affective or behavioral disorders in users [22]. Recently, studies were conducted to explore this phenomenon in different contexts such as online gaming [23], online surfing [16], media use [7] internet usage [24] and online auctions [25].

During the last two decades, researchers (mostly in psychology) have looked at the different characteristics of behaviors associated with technology addiction. These characteristics were used as a guide to identify addiction in different contexts, and have helped researchers to better understand addicts’ behaviors. For example, Goldberg [26] discussed four attributes of internet addiction namely tolerance, withdrawal, craving, and negative life consequences. Griffiths [27] discussed salience and moods change as additional characteristics of addiction. Some authors use these characteristics to provide an operational definition of addiction [7] while others consider these as the key determinants and consequences of IT addiction [24].

Addiction to technology -in its various forms and contexts- has been studied primarily in psychology and health. These studies have focused on the pathological use of different technological innovations, which can be passive (like with TV addiction) or active (like with Internet addiction) [28]. Young [16] has made a significant contribution to the literature on the drivers and antecedents of dependency to technological innovations with his pioneer work on irregular and extreme use of internet (such as cyber-sex, cyber-relationships, and information overload) that showed how such use resulted in a loss of control over daily life activities.

Other studies have examined the role of demographic factors that could have been correlated with Internet addiction (such as gender, age, and education); results were mixed for these effects. For instance, Shotton [29] showed that computer addicts are mainly male introverts who are also highly educated. Other findings suggest that Internet addiction is prevalent in both male and female computer-savvy individuals [16]. Other studies seem to indicate that anyone with internet access can be an addict without any specific pattern being revealed [19].

Overall, our review of the literature reveals the saliency of seven core attributes, associated with technology addiction (see table 1). While preoccupation, saliency, tolerance, sense of withdrawal, and relapse can be considered as attributes of technology addictive behaviors, mood change and conflict can also be seen as its consequences. Based on our literature review and building on previous conceptualizations of addiction, we define IT addiction as the dependency to a technology that results in its excessive and compulsive use. We define IT addictive behaviors as IT-related behaviors that become a major focus of a person's life and that have potential negative consequences.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Definition</th>
<th>Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoccupation</td>
<td>“Excessive levels of use, craving or feeling tension or arousal while using it”</td>
<td>[7, 15, 21, 30]</td>
</tr>
<tr>
<td>Saliency</td>
<td>“The technology dominates a user’s thoughts and behaviors”</td>
<td>[13, 27, 31, 32, 33]</td>
</tr>
<tr>
<td>Tolerance</td>
<td>“Increasingly large “doses” of the activity are needed to achieve the same effect”</td>
<td>[13, 24, 34, 35, 36]</td>
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<tr>
<td>Sense of Withdrawal</td>
<td>“Negative emotions arise if a person cannot use the technology”</td>
<td>[13, 19, 37, 38, 39]</td>
</tr>
<tr>
<td>Relapse</td>
<td>“A user is unable to voluntarily reduce the use of the technology”</td>
<td>[15, 30, 32, 35, 36]</td>
</tr>
<tr>
<td>Mood Change</td>
<td>“Using the technology offers thrill and relief”</td>
<td>[19, 21, 28, 33, 39, 40, 41, 42]</td>
</tr>
<tr>
<td>Conflict</td>
<td>“The use of technology conflicts with other tasks, which impairs normal functioning”</td>
<td>[20, 36, 6, 42]</td>
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2.2. Smartphone usage and addiction

Nowadays, smartphone is fast becoming one of the preferred mobile tools. Smartphone use is fairly intensive with an average number of interactions ranging from 10-200 times per day and a mean length between 10-250 seconds [43]. Most smartphone owners use this device at home (93%) and on-the-go (87%). Interestingly, 72% of smartphone users use
their smartphone at work and 66% during social gathering. The most common Internet use with smartphones is for texting, checking and sending emails, followed by looking for directions, social networking and reading news. Data indicates that heavy users interact with their smartphones consistently throughout the day [43] and use it a lot on-the-go [2]. Light users, however, spend time on their phone in concentrated periods [43]. It seems voice calls are done in the daytime, messaging in the evening and the use of applications and data in the late evening and at night [44].

In extant literature (in the psychology, health, and IS domains), there is not much research that has focused on smartphone or mobile devices addiction [25]. In the broader technology addiction literature, extant studies mainly investigated one or a limited number of factors associated with technology addictive behaviors. Given the theoretical and practical importance of the topic and in light of existence of inconsistencies in extant literature, it becomes increasingly important to identify the actual drivers of IT addiction and their consequences.

3. Research Methods

Given the lack of knowledge about smartphone addiction, the use of a qualitative method was deemed appropriate [45]. We adopted an inductive strategy to investigate the antecedents, behaviors and outcomes associated with smartphone addictive use. We followed a grounded theory approach for our data analysis [46].

3.1 Data collection

We first relied on a theoretical sampling strategy [45, 46] and selected 11 smartphone “heavy” smartphone users for face-to-face semi-structured interviews. We used an interview guide that was developed based on the extant literature on addiction, more specifically IT addiction. The interview guide, which included 18 open questions (with some probes and prompts to be used as needed), was refined in the field with three pilot interviews with habitual smartphone users and a qualitative research expert. The interview guide began with a very general question on smartphone usage and then moved on to more specific questions to explore: (1) the different types of behaviors associated with smartphone addictive use; (2) the factors contributing to the emergence of smartphone addictive use and (3) the outcomes associated with such usage. The interviews ended with a general question to allow interviewees to provide additional insight on smartphone usage and addiction. We finished the interviews with a short questionnaire (8 yes/no questions) adapted from Young’s [16] Diagnostic Questionnaire to assess more objectively the level of smartphone dependence of our interviewees. Respondents are considered addicted if they answered “yes” to 5 or more questions. Basic demographics data was also collected. Each interview lasted between 20 and 40 minutes, was recorded in its entirety and transcribed verbatim.

Second, to enhance our understanding of smartphone addiction, we proceeded to the development of an exploratory written questionnaire. While they are not typically used in qualitative research, open-ended written questionnaire are particularly useful as a means of collecting information from a wider sample. Open-ended questionnaires have been successfully used in various domains of research such as education [47], political science [48] and healthcare [49]. Though the information available with written questionnaire is by default more limited than with interviews, it allowed us to focus on the salient issues identified in the interviews. We were therefore able to get additional details and gain further insight in the antecedents, behaviors and outcomes associated with smartphone addictive usage. The exploratory written questionnaire comprised five open-ended questions about smartphone usage behaviors and their associated outcomes. Nine additional questions allowed probing respondents to identify relevant individual characteristics and their perception of smartphones technical aspects. The questionnaire ended with the IT addiction instrument adapted from Young [16]. The questionnaire was validated for content and face validity first with two senior researchers and then with six smartphone users who had a similar profile as the one of our respondents. They provided comments on the readability and intelligibility of the questions.

The questionnaire was distributed to smartphone users who were studying in an undergraduate program in a large North-American University. We chose this population because most students are cellphones users [50]. Undergraduate students are typical of the fastest growing smartphone user segment [51] and represent a large proportion of smartphone users [52, 53]. Based on Google statistics for the US, Germany, France, UK and Japan, these users represent between a quarter to one third of smartphone users in developed countries [52]. A recent survey indicates that 53 % of college students own a smartphone [53]. Moreover, students have been extensively used as respondents in previous research on the topic [50, 54, 55], and they were found to be a good representative for
professionals in recent studies on smartphone addiction [56].

The targeted student body size target was 275 students; 182 questionnaires were returned for a response rate of 66.18%. Respondents were between 17 and 29 years old; 42.86% were male and 54.95% female (3 respondents did not specify their gender). They took on average 30 minutes to fill out the questionnaire.

3.2 Data coding and analysis

The interview data and the answers to the exploratory questionnaires were recorded in a data repository for coding and analysis.

First, the interviews were coded using standardized methods of qualitative thematic analysis [45], N'Vivo 9 was used to support the coding and analysis of the transcripts. This coding and analysis was performed using the Strauss and Corbin grounded theory approach [46]. In order to identify relevant categories and relationships, we first proceeded with a round of open coding of the interviews. Then, following an axial coding strategy [46] codes with the same content and meaning were grouped into categories: antecedents, addictive behaviors and outcomes. We then coded all the answers to the questionnaires using these three initial categories. Through selective coding, patterns were analyzed, linking the core category (e.g. addictive behaviors) to other categories (e.g. user characteristics, technical characteristics or impacts). Some patterns emerged and we were able to distinguish different user profiles.

The coding was validated by two researchers. A consensus approach was used to resolve discrepancies [57]. In addition, the first author critically discussed the results and played the role of a devil’s advocate to ensure that the relationships identified were not the result of spurious associations [58]. The analytical process was repeated until theoretical saturation [46], i.e. the point at which additional analysis repeatedly confirms previously made interpretations. The most revealing quotes were selected to illustrate the results of the analysis.

4. Findings

From our data analysis, we identified some patterns and could distinguish four profiles of smartphone users (see Appendix one for an overview of the four profiles).

In the first profile, the “Addicts” the user characteristics are those of typical addicts and would likely be clinically diagnosed as addict. They used their smartphone 2-20 hours per day 5.24 hours on average. Many of them had tried to reduce their usage but had failed. They represent 28/182 users that is 15.38% of the respondents.

The second user profile is that of the “Copycats” with 45 users that is 25.73%. Though they exhibit several addictive behaviors, their overall characteristics do not correspond to those of typical addicts, as described below. They spend 1 to 10 hours per day using their smartphone with an average of 3.73 hours.

The third user profile is that of the “Regulars” with 70 users (38.46%). These users exhibit much fewer addictive behaviors. They spend 5 minutes to 10 hours per day using their smartphones with an average of 1.99 hour.

Finally, the “Moderates” (39 users; 21.43%) represent the fourth category of smartphone users. They exhibit very few addictive behaviors and have a lower intensity of usage with 5 minutes to 6 hours per day for an average of 1.76 hour per day.

The respondents were divided in these four groups primarily based on the similarity of their profiles. A key issue was that of problematic behaviors, which appear to be good indicators of smartphone use intensity. The Addicts are users who answered “Yes” to 5 or more questions of Young’s adapted Diagnostic Questionnaire and those who had at least four out of seven problematic behaviors in addition to failed attempts of reducing their usage. The Copycats consist of users with at least six problematic behaviors out of seven, but without failed attempts of reducing usage. The Regulars display four to five problematic behaviors and the Moderates have reported three or less problematic behaviors. All in all, it seems that users with a similar number of problematic behaviors showed many similarities in other aspects of their use. We did not observe differences associated with age and gender, except in the addicts category where there were more women (75%).

4.1 Smartphone addictive behaviors

A number of smartphone addictive behaviors were reported by users from all four profiles. Overall, close to 90% of the respondents said that they use their smartphone during class or meetings. A large proportion of respondents (80%) use their phone when socializing and eating. One respondent wrote: “The only time I don’t use my smartphone is in the shower.” For the same proportion of users (90%) using their smartphone is the first thing they do after waking up. One copycat user said “I never leave home without it. I even sleep with it in my hand”.

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Close to 50% of our respondents text and drive and/or play games when not appropriate.

We observed some differences depending on the different user profiles. For example, the copycats text and drive more than the others, with 78% of them having this behavior (compared to 50% of the addicts, 36% of the regulars and 8% of the moderates). The same is true for playing phone games with 75% of the copycats doing so (compared to 36% for the addicts, 24% for the regulars and 3% for the moderates). Though using a smartphone while eating or socializing is a common behavior for all users, it is also more problematic in the copycats category with 100% of the users exhibiting this behavior. As one copycat interviewee said:

“It’s a friend of mine – it’s funny you say that, because it’s a friend of mine. It’s a companion – it’s like a dog. I want it with me and I feel naked without it.” Interviewee B

The addicts and the copycats have said to feel particularly uncomfortable when they don’t have their smartphone. One addict user said: “It’s my life line. I can’t live without a phone. Every time I see a text, I have to respond, it makes me needy for the phone.” Regulars, and especially moderates did not report such a need for their phones. Addicts reported to be deeply involved when using their phones and they were more preoccupied with excessive level of use.

Finally, all users – but especially copycats – expect a rapid answer when they connect to people using their smartphone. One respondent said: “I expect people to answer me within 10 minutes, if not I expect an explanation.”

4.2 Emergence of smartphone addictive behaviors

It was interesting to observe that the factors associated with smartphone addictive behaviors are different depending on the profile of the users. Two main categories of factors emerged: user-related characteristics and technology-related characteristics.

4.2.1 User-related factors.

Boredom was mentioned as a key factor associated with smartphone use for all types of users, but this was the only common salient factors. Some other characteristics appear to become increasingly more important from one profile to the next and augment along the ‘addictive’ scale. This is the case of fear of rejection (with 36% for moderates, 43% for regulars, 53% for copycats, and 64% for addicts), need for approval (with respectively 36%, 43%, 42% and 75%). The same is true for feeling of loneliness (38%, 46%, 67%, 71%), anxiousness and stress (21%, 28%, 53%, 71%).

Overall, some other key differences were observed across the profiles. In the addicts profile, the users describe themselves as introvert, conformist, dependent and shy. They like to take risks, some had suffered from depression in the past or reported being depressed. They appear to be very emotional. Compared to the user from the moderates profile, they are much more obsessed by their smartphone usage. Copycats on the other hand seem to be more extrovert. They like to be with people and have an active social life. Interestingly, in both addicts and copycats profiles, users perceived themselves as being more motivated than in the other two groups.

4.2.2. Technology-related factors.

All respondents – and all at a high percentage – commented on the fact that they like the technology. They associate their smartphone usage to the fact that the technology is useful, easy to use, portable, convenient, and to a lesser extent fun and efficient.

“It replaces a watch. It replaces an alarm clock. It replaces a camera. It replaces TV for consuming, you know, what the weather is going to be like or the forecast. It replaces a computer for scheduling. So, it’s a replacement of all that stuff right handy and I think that’s probably the best context for that thing. It’s just so convenient and then you get all of these other things that you can do with it and you can customize it however you want it.” Interviewee D

“The way Apple has designed their stuff, it’s fun to use, right. [...] So even the text messages are fun, right – it’s cute, like the way they – they come up. I don’t know – it’s different – it’s more fun” One copycat respondent

They also all said that the possibility to access to the internet and to multiple applications (with texting being the most important one) contributed to their smartphone usage. Access to email (though to a lesser extent for the moderates) and Facebook access (for all but especially for the copycats) were also deemed to be important applications that prompt smartphone usage.

The impact of the technology design and speed was important for all, but especially for the addicts and the copycats. Gaming is twice as much important for the copycats and addicts, with network gaming being particularly important for copycats (two times more than for addicts). The visual interface was also particularly important for the copycats (64%
compared to less than 50% for the others three profiles. The same was true for connectivity (80% for copycats and less for the other groups)

4.3 Outcomes of smartphone addictive behaviors

All in all, we identified three main categories of impacts associated with smartphone usage: impacts on productivity, impacts on social life and impacts on well-being. Though they used their smartphone the least and had much fewer addictive behaviors, users in the moderates profile seemed the more aware of potential negative consequences associated with smartphone usage. Paradoxically, and though they were exhibiting the highest number of addictive behaviors, the copycats seemed less conscious of the negative impacts of their behaviors.

4.3.1 Impacts on productivity.

Close to 50% of all respondents find that their smartphone usage conflicts with their tasks. They all reported negative impacts on productivity. As explained by some interviewees:

“I think it can increase and decrease productivity, right? So if I – if I were addicted to a game on my phone and all I wanted to do was play that game – I think that’s bad, right? But I think at the same time, it lets me be like – okay, I’m going – I’m working now – I’m doing my work stuff and I don’t have to worry about my plans for tonight. I don’t have to worry about figuring out how to get here or telling people to meet here because when I leave, we’ll just do it on the spot.”

Interviewee A

“I get distracted by it for sure. Like, if something is on my mind and I get a phone call or I get something related to that – you know – that’s what – I guess that’s what it is – you’re accessible wherever you – you know, you’re accessible and so in some way or another you can be distracted from the task that you are doing because somebody’s trying to contact you, yes”

Interviewee B

These negative impacts of smartphone usage were higher for addicts (57%). As one respondent wrote: “It distracts me from studying and sometimes a simple assignment can take twice as long because of that”. This was also true for copycats (47%). One mentioned: “It definitely has an impact on studying as it is a constant source of distraction”.

Though the overall impacts of smartphone use on productivity seem to be negative, some users reported that its usage has a positive impact for collaboration, as it makes co-workers available at all times:

“One night we were working on a paper when something was due when I was out and one of my co-authors always just Skype’s me – and he Skyped me and he had no idea that I was at a bar, which is not a great thing. I wasn’t trying to lie to him, but it was also nice that I could be like, okay, I can still – I can still take care of this when, you know, I’m not tied to one place, right.”

Interviewee K

This was especially true for copycats who saw it as a way to always be connected and to get a response in real time. One respondent commented: “It helps in group work as it allows us to keep in touch and search information faster”.

Users from the regulars and moderates profiles however reported negative impacts on collaboration. In the words of one of the respondents: “People rely too much on smartphones for communicating rather than physically meeting up to do work. Things get lost in translation sometimes”.

4.3.2 Social impacts.

The impacts of smartphone usage on the users’ social life were generally seen as positive as its use allow them to stay connected with others.

“I think overall it’s been good in terms of maintaining friendships and relationships with people who aren’t close by as well as creating a community here. But it’s hard – it’s hard to balance it, right – sometimes it’s too much information – it’s too much contact with people – because you can contact everybody all the time, you don’t know how to set the boundaries, right.”

Interviewee G

Across the four profiles, some negative impacts were however reported. The first one is that the use of smartphones creates barriers with the people who are physically present when one is using his/her smartphone. The two following answers to the questionnaire illustrates this issue: “Some people make comments to me that they felt neglected” and “I sometimes pay more attention to my phone than to those I’m with right now”. Likewise, an interviewee commented:

“A Smartphone with all of those apps is supposed to help your social life being more connected, but at the same time, being all of the time on it with so much on it, you’re disconnected from your immediate environment”

Interviewee E

Another negative impact on social life that seems to be brought by smartphone usage is the fact that it sometimes creates conflicts. Addicts reported a higher incidence of conflicts (25%). One said: “People get mad sometimes when you do not give them your full attention because you’re on your phone” and
referring to heavy users, one user from the moderates profile commented: “I hate when people are texting or using their phone while we're talking or hanging out, I find it impolite.”

4.3.3 Impacts on well-being.

Finally, the analysis revealed some negative consequences of smartphone usage, both psychological and physical. A large proportion of users reported to be frustrated, stressed or guilty when they cannot use their phone. For example, a respondent wrote: “When I constantly receive bbms, and I am trying to study, as soon as I read it, my friends know I did, which makes me feel guilty to not answer.”

As evidence by the following interview excerpts, overall smartphone usage can also be associated with an increased level of stress:

“I was working on this thing with three other people and they would keep e-mailing versions back and forth, but I wasn’t – like, I wasn’t able to – like I felt like I had to be aware of what was going on, but then it stressed me out because I wasn’t in a place where I could work on anything or comment on anything or anything, right. So it was sort of this weird thing where I felt like, “okay, this is enabling me to still be part of the process, but I can’t really be part of the process so”, you know, that stressed me out a little more” Interviewee A

“When it wasn’t there, I kept – like, you have this feeling that there is less to do and right now like because you need to capture all of these new things that are in your phone and they take more time so you just spend more time playing with your phone, you know, like working with it, that you could have gone to the gym or like walk or like something, you know – so, maybe it increases the stress I would say, in general.” Interviewee L

Finally, the use of smartphones was sometimes associated with physical impacts, such as fatigue or lack of sleep. One respondent from the addicts profile wrote: “Sometimes I’m on it so much my brain starts to hurt.” Similarly one copycat commented: “It keeps me from sleeping because of the games”

5. Discussion and Conclusion

Our results suggest that at times, smartphone users in all four profiles exhibit IT-addictive behaviors. These behaviors represent a problem in two of the four profiles: the addicts and the copycats (see Table 2). Both groups exhibit the same behaviors but on average, addicts spend a bit more time using their smartphones. Though both addicts and copycats feel uncomfortable without their phone, copycats feel even more uncomfortable. In addition, copycats seem to be less conscious of the negative impacts of their behaviors.

In these two groups, we were able to identify that the emergence of smartphone addictive behaviors were associated to two main categories of factors: personality-related factors, and technology-related factors. Such categorization is helpful, as it provides a general sense of the origins of smartphone addiction.

Several authors have noted the importance of personality-related factors and their influence on technology addiction. The factors associated with addictive behaviors in our “Addicts” profile are very similar to those reported in the extant literature. For example, it was found that higher levels of boredom proneness and self-consciousness raise the risks of developing a technology addiction [59]. Primary symptoms of depression, such as low self-esteem, poor motivation, fear of rejection, and the need for approval, are reasons why depressive traits were also identify as increasing the risk of technology addiction [60]. Shyness is another factor identified as influencing addictive behaviors; shy individuals, who feel discomfort in others’ presence [61], tend to experience more online activities (e.g. email, chat, newsgroups, online games).

The factors associated with smartphone addictive behaviors in the Copycat profile are very different and these users tend to be extrovert with a very active social life. While addict have a strong need for approval, copycats seem to have a strong need for belonging. These results are not explained by the extant literature on addiction and future research should explore alternative avenues. Other theories, such as social network influence theory, which suggests that the more people are socially connected, the more intensely they are likely to communicate using various media available to them, might help explain our results. Some authors that have used this theory have shown, for example, that the use of IT can enhance relationships and family ties [62].

Our results also indicate that technology-related factors might help explain the emergence of smartphone addiction. Indeed, the technological features of smartphones, as well as the ubiquity and convenience of their applications could well result in addictive smartphone usage. Such behavior can be seen as a form of the concept of internet addiction, as smartphone addiction embeds most of the characteristics and tasks involved. Yet, the influence of these factors largely depend on the condition
whether individuals recognize and take advantage of those characteristics or not. Technology affordances, which refer to the type of relationships between technology and user that clarify what user can do with the technology to pursue their goals [63], could help explain how technical features are associated to IT addictive behaviors. For example, future research could explore how smartphone technology affordances are associated with problems that occur because of the opportunities that technology provides for people stimulate the problematic use of technology.

We must acknowledge that this study has some limitations. First, the choice of undergraduate students as respondents might limit the generalizability of the findings. Yet, as explained previously, selecting students as respondents was considered appropriate in previous IT addiction studies, such as smartphone and social media addiction. Second, and despite the fact that it is based on sound theoretical and empirical foundations, our study on determinants, consequences and characteristics of smartphone addiction is solely exploratory. To better understand the underlying dynamics of such behaviors, it will be important to conduct confirmatory studies, both qualitatively and quantitatively, to validate the findings of our study.

Despite its limitations, our study reveals that while, in essence, smartphones are useful mobile devices, extreme use of smartphones to the point of addiction can disturb a user’s personal and professional life. Previous studies have shown that technology addiction can lead to social difficulties such as marital discord, and social isolation [19]. Other authors such as Lemmens et al. [42] have studied the impacts of technology addiction and found that addictive behaviors result in poor life satisfaction, less social competency, and higher aggressive feelings and emotions. Finally, technology addiction is shown to have physical consequences such as fatigue and sleep deprivation [38]. Furthermore, the lack of environmental control in smartphone usage in situations that require conscious attention (e.g. driving, walking in streets) may also cause accidents and several physical impairments.

Some might argue that what we label here addictive behaviors simply reflect a new social reality. However, given the potential negative outcomes of such behaviors on individuals, organizations and societies, it will be important to investigate these behaviors further. Undoubtedly, there is a need for additional research on technology addiction to identify negative consequences of such addictions and investigate ways to remedy them. In light of the results of our study, such research would need to go beyond the traditional literature on IT addiction since a large proportion of smartphone users who are exhibiting addictive behaviors are not addicts in the traditional sense of the term and would not be clinically diagnosed as addicts. These users nevertheless exhibit similar IT-addictive behaviors, which outcomes are potentially critical for organizations and societies alike.

6. References

APPENDIX ONE

<table>
<thead>
<tr>
<th>Total = 182: Number (Percentage)</th>
<th>Addicts</th>
<th>Copycats</th>
<th>Regulars</th>
<th>Moderates</th>
</tr>
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<tbody>
<tr>
<td>Total = 182: Number (Percentage)</td>
<td>28 (15.38%)</td>
<td>45 (25.73%)</td>
<td>70 (38.46%)</td>
<td>39 (21.43%)</td>
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<td>Personality</td>
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<tr>
<td>Conformism</td>
<td>64%</td>
<td>49%</td>
<td>46%</td>
<td>56%</td>
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<td>Fear of rejection</td>
<td>64%</td>
<td>53%</td>
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<td>36%</td>
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<tr>
<td>Need for approval</td>
<td>75%</td>
<td>42%</td>
<td>43%</td>
<td>36%</td>
</tr>
<tr>
<td>Active social life</td>
<td>71%</td>
<td>82%</td>
<td>66%</td>
<td>59%</td>
</tr>
<tr>
<td>Text and drive</td>
<td>50%</td>
<td>78%</td>
<td>36%</td>
<td>8%</td>
</tr>
<tr>
<td>During class</td>
<td>96%</td>
<td>98%</td>
<td>100%</td>
<td>74%</td>
</tr>
<tr>
<td>During meetings</td>
<td>54%</td>
<td>82%</td>
<td>57%</td>
<td>13%</td>
</tr>
<tr>
<td>While eating or socializing</td>
<td>89%</td>
<td>100%</td>
<td>96%</td>
<td>56%</td>
</tr>
<tr>
<td>Play games when not appropriate</td>
<td>36%</td>
<td>73%</td>
<td>24%</td>
<td>3%</td>
</tr>
<tr>
<td>Just woke up</td>
<td>89%</td>
<td>98%</td>
<td>94%</td>
<td>64%</td>
</tr>
<tr>
<td>Use it because:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feel uncomfortable when do not have it</td>
<td>82%</td>
<td>93%</td>
<td>59%</td>
<td>26%</td>
</tr>
<tr>
<td>Feel lonely</td>
<td>71%</td>
<td>67%</td>
<td>46%</td>
<td>38%</td>
</tr>
<tr>
<td>Feel anxious/Stressed</td>
<td>71%</td>
<td>53%</td>
<td>40%</td>
<td>21%</td>
</tr>
<tr>
<td>Smartphone characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Powerful/fast</td>
<td>75%</td>
<td>76%</td>
<td>51%</td>
<td>59%</td>
</tr>
<tr>
<td>Access to Facebook</td>
<td>79%</td>
<td>80%</td>
<td>67%</td>
<td>31%</td>
</tr>
<tr>
<td>Reducing usage</td>
<td>Failed attempts</td>
<td>86%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Usage (hrs)</td>
<td>Average time spent</td>
<td>5.24</td>
<td>3.73</td>
<td>1.9958</td>
</tr>
<tr>
<td></td>
<td>Range of time</td>
<td>2-20</td>
<td>1-10</td>
<td>5min-10hrs</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>75% (21)</td>
<td>46.67% (21)</td>
<td>57.14% (40)</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>25% (7)</td>
<td>51.11% (23)</td>
<td>42.86 (30)</td>
</tr>
<tr>
<td></td>
<td>Not Specified</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Age</td>
<td>Average</td>
<td>19.67</td>
<td>19.68</td>
<td>19.65</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>18-23</td>
<td>18-22</td>
<td>17-29</td>
</tr>
</tbody>
</table>