Does Addictive Pleasure at Work and Building a Personal IS on One's Smartphone Lead to Problematic Smartphone Dependency?

Frantz Rowe, François-Charles Wolff, Carole Daniel

Journal of Global Information Management
Volume 31 • Issue 5

Does Addictive Pleasure at Work and Building a Personal IS on One's Smartphone Lead to Problematic Smartphone Dependency?

Frantz Rowe, Nantes Université, France*
https://orcid.org/0000-0001-8520-1570

François-Charles Wolff, Nantes Université, France

Carole Daniel, SKEMA Business School, Université Côte d'Azur, France

ABSTRACT

Using a sample of 848 workers in France, this article aims to explain problematic smartphone dependency, a behavior considered to have negative consequences for sufferers in the context of work. It examines whether and how addictive pleasure at work is related to problematic smartphone dependency (PSD). The authors propose a model with the originality of an exploratory measure of what is conceptualized as a mobile personal information system (PIS) development. The results obtained are paradoxical in that addictive pleasure at work is negatively correlated with PSD, although it positively contributes to the development of a PIS, the latter being itself positively correlated to gratifications. However, PIS development is not positively correlated to PSD. It is plausible that, although addictive pleasure at work drives the development of mobile PIS, it also provides an escape from compulsive smartphone usage, thus mitigating PSD. These findings also highlight the protecting role of mindfulness against PSD.

KEYWORDS

addictive pleasure at work, gratification, mindfulness, mobile personal information system, problematic smartphone dependency, workaholism

INTRODUCTION

In the context of the COVID-19 crisis, information technology (IT) was presented as a solution for staying in touch at a distance and continuing to work from remote locations (Carillo et al., 2021). In these ways, IT was expected to support collective resilience. In fact, the use of IT had been growing for some time. Maintaining and developing telework is, however, making us increasingly dependent on IT. Although work can be a pleasure, its support by these technologies may trivialize both addiction

DOI: 10.4018/JGIM.323201 *Corresponding Author

to work and addiction to IT devices like smartphones, especially when used as personal information systems (PIS) for work.

Smartphone addiction is already the subject of a vast amount of scientific literature. Smartphone use can lead to a behavioral addiction that proves problematic when it causes deleterious effects for its user (Gentina & Rowe, 2020). Although these negative consequences do not always result in severe physiological effects like other substance addictions (Panova & Carbonell, 2018), smartphone addiction can manifest itself in other symptoms or states (Yu & Sussmann, 2020). These may range from problematic compulsive use to severe addiction (Vaghefi et al., 2017; Vaghefi et al., 2022). Apart from the degree of dependency of the behavior, use becomes problematic insofar as it leads to increased risks of accidents (driving a vehicle), health risks (not wearing wired headphones, but a wireless earpiece or worse holding the smartphone up to one's ear), or uncontrolled spending (Bianchi & Phillipps, 2005).

In the current study, problematic smartphone dependency (PSD) is characterized by compulsive-obsessive behavior accompanied by a loss of control in its use, conflicts with others or an inability to fulfill one's obligations (Gentina & Rowe, 2020) . It is not a pathology. Thus, it is not an addiction in the psychiatric sense because it does not affect the body of the sufferer, is not stable over time, and can disappear quickly.

The literature on smartphone addiction and dependency has focused on young people because of the ease of constituting study samples from this population and their intense use of social networks (Gentina & Rowe, 2020). Unfortunately, there are few studies on adult populations, especially among workers. On the one hand, working adults may be protected from PSD by their activities at work. When focused on the tasks at hand, workers are distracted from compulsive use of their smartphones (whether compulsive use is linked to the phone as a "fetish" object or the multiple applications that offer an escape from the routine of daily life). On the other hand, the few studies on smartphone addiction among workers show that the perception of the benefits of smartphone use at work can turn into an addiction and, in turn, become counterproductive (Li & Lin, 2019).

The smartphone can be considered a Swiss army knife by ambitious and organized executives who aim to improve productivity. It allows them to handle e-mails and offers numerous applications for business (Barkhuus & Polichar, 2011). It can, thus, be tuned for work and serve as a personal information systems (PIS) (Baskerville, 2011). Adapted in this way, the smartphone makes it possible to follow one's workflow at any time, in any place, and without the encumbrance of a laptop.

For people who are passionate about their work, smartphones and the development of a PIS are not without risks. If an individual has difficulties regulating their behaviors, working life can encroach on time devoted to private life. This will result in work-family conflicts (Qi et al., 2017). Moreover, it may turn work enjoyment into work addiction, fostering dependency on the smartphone itself. Luckily, some personality traits contribute to a better capacity for self-regulation. Dispositional mindfulness – the "receptive attention to and awareness of present events and experience" (Brown et al., 2007, p. 212) – has been found to be a positive trait-based variable that alleviates automatic or compulsive behaviors (Daniel et al., 2022a).

The objective in this study is twofold. First, it aims to understand whether the pleasure component of work addiction (Spence & Robbins, 1992), which will be referred to as "addictive pleasure at work," is statistically correlated with PSD. If the correlation is negative, it could be potentially indicative of a paradox. Second, the study explores how specific uses of smartphones can help explain the occurrence of PSD. It aims to better understand if and how addictive pleasure at work and the development of a PIS on one's smartphone lead to PSD.

To achieve this, the study provides a conceptualization of the "mobile PIS." Next, it builds on gratifications, uses, and mindfulness to develop a conceptual model that is tested on a sample of 848 workers in France. The discussion section reflects on the results of this test.

LITERATURE REVIEW AND HYPOTHESES

This article explores original factors than can mitigate or reinforce PSD in a working population. On the mitigating side, it justifies and anchors these factors in two streams of literature. The first recognizes that we can look at problematic dependency as a syndrome with multiple expressions rather than focus on the object of addiction (Shaffer et al., 2004). This includes both PSD and addictive pleasure at work. It considers a strategy that develops preventative and coping behaviors like diverting potentially dangerous behavior by focusing on other activities (Xu et al., 2012) or regulating through mindful exercises (Rowe et al., 2021). The second (the reinforcement side) classically considers the uses and gratifications theory. More originally, the research will consider the role that mobile PIS development can play in nurturing these uses and gratifications and how it may be related to addictive pleasure at work.

Smartphones as Mobile PIS

PIS

The development of standardized components to customize information systems makes it easier to design PIS. PIS "provides information tailored to an individual and delivered directly to that individual via a portable, personal information device such as a personal digital assistant, handheld PC, or a laptop" (Silberschatz et al., 1996, p. 770). Importantly, devices equipped with PIS allow their users to access the Internet from anywhere at any time. Four years after the launch of the Apple iPhone, Baskerville (2011) proposed to develop research on individual information systems as owned and operated by individual persons (see Table 1).

Elaborating on Alter's (2008) concept of a work system – defined as "a system in which human participants and/or machines perform work (processes and activities) using information, technology, and other resources to produce specific products and/or services" (Alter et al., 2008, p. 451) – Baskerville (2011) distinguished between two overlapping work systems within the information systems architecture. The first, the *personal* work system, relies on an individual service cloud. The second, the *employee* work system, uses an employer-provided service cloud. Personal work systems include entertainment systems (e.g., video on demand, games), personal communications (e.g., e-mail, social networking), or retail purchasing online access. Employee work systems include office productivity systems (e.g., word processing, spreadsheets) and work-related communications systems (e.g., e-mail, virtual meeting spaces). Importantly, Baskerville highlighted the growing complexity of individual information systems as "complicated and unique systems that cross the boundaries between work and home" (Baskerville, 2011, p. 253).

Due to technological evolutions, individual information systems have become the most prevalent type of work system. They allow individuals to collect and process data into information for both personal and professional purposes. Smart mobile devices like laptops, smartphones, or tablets have enabled the development of individual information systems. Employees often bring their own computing devices to work, incorporating them into the organizational network rather than using company-owned devices (French et al., 2014). This shift in IT culture, termed "bring your own device" (BYOD), "refers to the provision and use of personal mobile devices and applications by employees for both private and business purposes" (Barlette et al., 2021, p. 102). Conversely, personal use of IT resources at work for non-work purposes can also take place. This has been studied under labels like cyberloafing (Chen et al., 2022), non-work-related computing, and workplace internet deviance (Jiang et al., 2021).

Mixed purposes (personal and professional usage) are, therefore, commonplace and independent of device ownership. For instance, employees take their smartphone home even when paid for by the company. Conversely, when the smartphone is owned by the individual, users often leave it on

Table 1. Individual and Personal IS and related definitions

Concept and Related Notions	Definition	Source and Comment
Individual Information System	1. Independently owned and operated 2. Complex because it encompasses personal work systems (e.g., entertainment systems, personal communications, retail purchasing web-access), employee work systems (e.g., office productivity systems, work-related communication systems), and overlapping systems (e.g., personal finance systems, office productivity systems)	Baskerville, 2011, p. 253 Emphasizes individual ownership and types of work systems
PIS	1. Information system equipped with mobility, accessibility, personalization, and localizability 2. Supports the communication, information, transaction, and entertainment tasks of an adopter	Kim and Ammeter, 2014, p. 453
PIS	1. Information system that is personally developed and used 2. Includes personal data (e.g., notes, comments, observations, calculations, or correspondence) and organizational data related to professional life that meets individual needs	This paper. Emphasizes personal activities and types of data. Not necessarily based on mobile phones or smartphone.
Personal Data	1. "Any [meaningful] information relating to an identified or identifiable natural person."	Edwards, 2018, p. 81
Organizational Data	1. Any meaningful information relating to an identified or identifiable organizational unit (e.g., department, service in an association, firm, or public body)	This paper

to maintain a constant link with the professional sphere. Further, smartphones offer a diversity of applications (e.g., budget management, booking, payment) for mixed (personal and professional) purposes (David et al., 2017). While such applications may not be recommended or requested by the employer, they may be preferred by employees who find them user-friendly or a complement to their professional equipment. A smartphone can, thus, be assimilated to a mobile PIS because it allows one to collect, process, store, and disseminate both professional and private information via apps that match the preferences and needs of each user (Kim & Ammeter, 2014).

Thanks to its portability, employees use smartphones to access information in any location. Thus, it becomes an "omnipotent" object. Through its use, apps, and stored data, smartphones become a representation and interpretation of individuals. Therefore, smartphones are PIS that qualify as *mobile* PIS because they can be accessed on a mobile device (Barkhuus & Polichar, 2011; Baskerville, 2011).

In the remainder of this article, the smartphone is conceptualized as a mobile PIS because it is developed by a person for uses and applications that meet individual needs related to one's private and professional life. The concept of mobile PIS *development* goes beyond simple customization or configuration based on a given menu at the start of a newly acquired smartphone. It is an intentional and ongoing practice of enriching the smartphone's capabilities and content to meet the evolving needs of the user.

Antecedents to Mobile PIS Development

This research investigates two factors that may foster the development of one's employee smartphone as a mobile PIS. First, employees may think that the development of their smartphones as mobile PIS

will contribute to cost and time savings. Mobile PIS is considered a tool that can perform professional tasks; a smartphone is perceived as a tool that improves productivity and saves time (Kim, 2008). If employees believe the smartphone can increase their productivity through saved time, they will use it and configure it to compensate for a lack of office equipment or resources (French et al., 2014). This is a performative belief. Thus, the more strongly it is affirmed, the more employees will develop their smartphone as a PIS. Consequently:

H1: Perceived cost and time savings with the use of a smartphone positively affect the development of a smartphone as a mobile PIS.

A second factor that may prompt employees to use smartphones as a mobile PIS is their inability to stop working because they are enjoying their work. When work enjoyment can no longer be resisted, employees feel the need to continue their work during leisure time or outside of their working hours. It is addictive when workers find pleasure in work and lack pleasure when work is over. This phenomenon, as noted by Spence and Robbins (1991), is labeled "work enjoyment" or, as we prefer to call it, addictive pleasure at work.

Addictive pleasure at work is distinct from workaholism or work addiction. Workaholism has been defined as "being overly concerned about work, to be driven by an uncontrollable work motivation, and to spend so much energy and effort into work that it impairs private relationships, spare-time activities and/or health" (Andreassen et al., 2014, p. 8). This concept was introduced and measured by Spence and Robbins (1992) through three dimensions: (1) time spent (as work addicts spend a considerable part of their activity time at work); (2) work enjoyment; and (3) drive (because they are motivated by a compulsive, internal pressure rather than external factors).

Indeed, work enjoyment differs from pure work enjoyment (for example, Leischnig & Kasper-Brauer, 2015) because it includes characteristics of addictive behaviors (Spence & Robbins, 1992). Addictive pleasure at work can lead to mobile PIS development to remain connected to work. Addictive pleasure at work can motivate and feed into the constitution of a PIS for work if it contributes to work execution. Thus:

H2: Addictive pleasure at work positively affects the development of a smartphone as a mobile PIS.

Uses and Gratifications Theory and PSD

Uses and Gratifications Theory

The uses and gratifications theory can explain dependency and addiction behaviors (Katz et al., 1974). When the needs of an individual are satisfied by use, the resulting satisfaction reinforces needs through the gratification received. In contrast to a regulatory mechanism, this reinforcement mechanism leads to the repetition of the behavior and, thus, to a potential addiction (Wang & Lee, 2020). As such, addiction feeds on the benefits (or gratification) that one perceives with use.

Research on smartphone dependency framed within the uses and gratifications theory identifies three types of gratification: (1) learning gratification from content; (2) process gratification through experience (e.g., escapism offered by social networks); and (3) social presence (Li et al., 2017; Sutanto et al., 2013). The remainder of this article will consider the first two types of gratification because social presence is not conducive to addiction (Rowe et al., 2021). The perceived advantage of media like websites or e-mail is considered a component of content gratification because it supports efficiency and effectiveness when performing information and communication tasks (Kim & Ammeter, 2014). The perceived enjoyment of online social networks is a typical process gratification (Li et al., 2017).

The development of the smartphone as a PIS leads to the greater use of functionalities that generate gratifications. Therefore:

H3: Smartphone development as a mobile PIS positively affects content gratification linked to e-mail (H3a) and websites (H3b), as well as process gratifications linked to social networks (H3c).

PSD

According to Gentina and Rowe (2020), PSD is a compulsive-obsessive behavior accompanied by a loss of control. This behavior leads to conflicts with others or an inability to fulfill one's obligations. This definition is consistent with work that proposes an evolution toward a high degree of dependence that can result in a real behavioral addiction (Vaghefi et al., 2022). Continuing the logic grounded in the uses and gratifications theory, PSD can be explained by the greater use of functionalities enabled by smartphones and crafted as mobile PIS (e-mails, web content, or social networks).

H4: Content gratification linked to e-mails (H4a) and websites (H4b) or process gratification linked to social networks (H4c) will positively affect PSD.

Finally, this research focuses on an active population. It draws on research showing that addiction to mobile technologies is not only correlated with high usage during the working week, but more significantly with high usage on the weekend (Li et al., 2017). While high usage during the working week may be related to work, high smartphone use on weekends is a marker of smartphone dependency (Li et al., 2017; Rowe et al., 2021).

H5: Smartphone use on weekends positively affects PSD.

Exploring Mitigating Factors to PSD

Paradoxical Role of Addictive Pleasure at Work

Addictive pleasure at work is likely to foster the development of a mobile PIS. It may also alleviate PSD. Due to its addictive denotation, it could be an escape route that limits tendencies toward PSD. This reasoning can only hold if a smartphone is not required by the employer for work performance. Addictions can be limited by activities that take addicts' focus away from the object of their dependency (for example, the smartphone) to concentrate on other activities (Tarafdar et al., 2020; Xu et al., 2012). Such a hypothesis is more realistic when the activity (in this case, working) is perceived as pleasant.

This research hypothesizes that addictive pleasure at work is negatively related to PSD. Enjoying work is an activity that can distract from the use of a smartphone as an object of addiction.

H6: Addictive pleasure at work negatively affects PSD.

Addictive pleasure at work may alleviate PSD; however, it may be seen as paradoxical if the syndrome of addiction counters itself. Rather than seeing addiction as a behavior focused on an action or substance, the addictive behavior results from a dependence or "a syndrome with multiple opportunistic expressions (e.g., substance use disorders and pathological gambling)" (Shaffer et al., 2004, p. 367).

Assessing conditions under which they can counter each other or appear simultaneously is a complex question beyond the current research. Suffering from multiple addictions, also expressed as cross-addiction or polyaddiction, is not rare among those who have been identified as suffering from an addiction or problematic dependency (Burleigh et al., 2019; Carnes et al., 2005). Addictions or PSD develop when more vulnerable people cannot cope with a stressful situation or avoid the situation. Addiction is then seen as a maladaptive behavior that can take a plurality of forms. While it is not so clear how these forms interact or how this multiplicity manifests, any form of addiction or problematic dependency as defined in this article can be interpreted as a deficiency of self-regulation mechanisms.

Self-Regulating Role of Mindfulness

Management sciences research on mindfulness, a personality trait characterized by the quality of paying attention to what is happening within and around us in the present moment (Brown & Ryan, 2003), has exploded in the past 10 years (Daniel et al., 2022b). In information systems, a growing body of research investigates the beneficial effects of mindfulness (Dernbecher & Beck, 2017) in relation to the adoption of new technologies (Sun et al., 2016; Thatcher et al., 2018) or as a trait that enables the identification of phishing attacks (Jensen et al., 2017). Recent studies reveal the protective role that mindfulness can play in technology addiction, particularly smartphone addiction. For example,

low levels of mindfulness appear to be associated with greater smartphone addiction in young adults (Kim et al., 2018). This mechanism could be explained by less self-monitoring and more rumination (Cheng et al., 2020). Furthermore, mindfulness could reduce risk factors that lead to PSD, such as boredom tendency and nomophobia (Regan et al., 2020). Therefore:

H7: Mindfulness negatively affects PSD.

These hypotheses aim to explain the contributing and mitigating factors of PSD (see Figure 1).

EMPIRICAL ANALYSIS

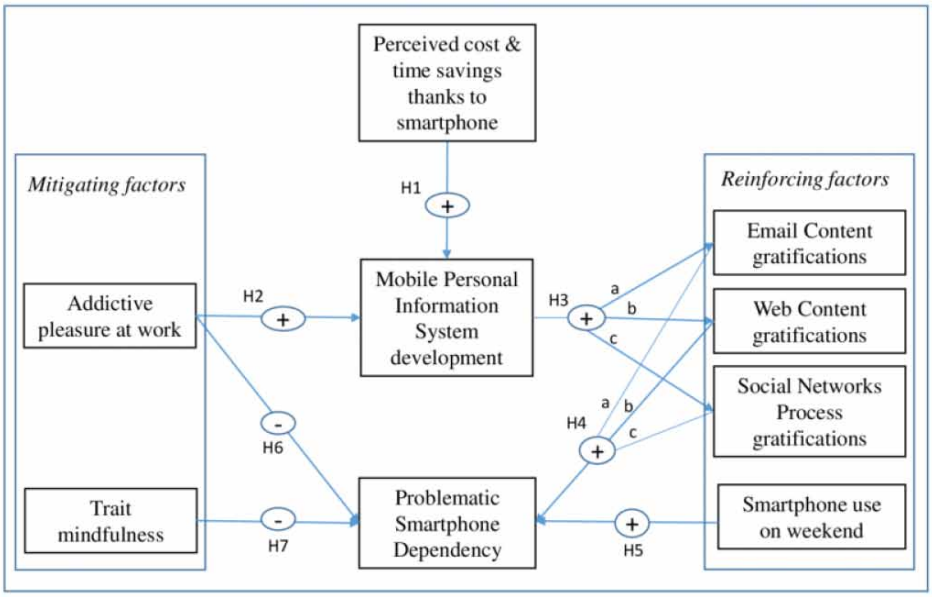
Data Collection and Construct Measurement

An online survey was sent to professional contacts and those in the databases of our institutions. The researchers collected 1,936 completed surveys from June through October 2019. The research focused on 848 responses from professionally active adults (executives and higher professions = 441; business owners, artisans, self-employed = 55; intermediate professions = 189; employees and workers = 163). The sample was made up of 77.9% women. The average age of respondents was 40.3 years. Respondents gave their consent and completed the survey anonymously and voluntarily without any financial reward. This process limited social desirability bias and contributed to "honest" answers (Joinson, 1999).

Initially constructed and tested by Walsh et al. (2010) in Australia, the PSD scale is based on the components of addictive behavior described in Brown (1997):

- Domination of one's life by the addictive activity
- Loss of control
- Euphoria and craving
- Relapse despite periods of abstinence
- Conflicts with one's own responsibilities and with others

Figure 1. Explanatory model of PSD among working adults



Euphoria is not specific to addictive behavior, however.

The study selected the five items of the PSD scale as adapted by Gentina and Rowe (2020) in France. The PSD scale measured aspects of behavior related to: (1) salience without reason; (2) conflict; (3) tolerance to loss of control; and (4) relapse. The study used the mindful attention awareness scale (MAAS, see Brown and Ryan, 2003). The study adapted the scales of Li et al. (2017) to the smartphone to explore the uses and gratifications associated with e-mail and the internet for professional purposes and social networking. Finally, the study used a variable on perceived time savings related to smartphone use by choosing the perceived cost and time savings (PCTS) scales of Kim (2008).

To operationalize the concept of mobile PIS development, the study constructed a latent variable using the following questions:

1. Do you file your professional mail in folders on your smartphone? (never / rarely / sometimes / often / systematically)
2. Do you take notes on your smartphone (with a note-taking application) in the professional context? (yes/no)
3. Have you downloaded any applications that you use for work and that you do not have on your workstation? (yes/no)
4. Select the five applications that you have used the most in the last three days. (A drop-down menu proposes a typology of applications that draw on the classification provided by Apple [David et al., 2017]. Items available to check include "Business" and "Productivity," which are types of applications people download to equip their smartphone for professional purposes [see Table A in the Appendix]. Another category was added to adapt the list to the French context: "Administration: family allowances, health insurance, social security...," because women in the pre-test mentioned that these applications are important in their daily lives. This indicator of a mobile PIS development, therefore, measures both active practices [taking notes and filing e-mail] and organized activity by selecting and downloading work-related applications the person does not have on their usual workstation.)

The work enjoyment measurement proposed by Spence and Robbins (1992) was initially tested in a North American context. It has also been tested and validated in a European context (Buelens & Poelmans, 2004). This study used the work enjoyment measure by Spence and Robbins (1992) for addictive pleasure at work. It measured working hours per week on a declarative basis because workaholics work long hours, typically more than 50 hours per week (Mosier, 1983).

Descriptive Statistics

Table 2 provides a description of the variables introduced in the current analysis (see Supplementary materials for more details). Regarding the PIS, 35.5% of the respondents reported taking notes on their smartphone and 23.2% had applications related to their professional activity on their smartphone. Among them, 24.6% (5.7%/23.2%) used business-type applications and 18.1% (4.2%/23.2%) used productivity-type applications. The perceived usefulness of the smartphone in the professional context was high. In fact, 33.4% of respondents agreed or strongly agreed that the smartphone saves time and money; 37.0% agreed or strongly agreed that it saves time and effort. The smartphone allows one to process professional mail. Therefore, almost half of the respondents perceived it as beneficial for work (49.4% somewhat or completely agree) and 41.3% thought the smartphone makes work more efficient. However, only 24.2% claimed that it improves the quality of work.

Addictive pleasure at work concerned a significant proportion of the respondents: 33.6% did not feel they were working due to their interest in their work (rather or completely agree); 52.0% found that their work is pleasant most of the time; 28.2% worked more than they were supposed to

Table 2. Description of variables (N = 848)

Variables	Average	St. Deviation
PIS (1) Do you file your professional mail in folders on your smartphone?	1.588	1.223
PIS (2) Do you use a note-taking app to take notes on your smartphone in the professional context?	0.355	0.479
PIS (3) Have you downloaded any mobile apps for your work that you do not have on your workstation?	0.232	0.423
PIS (4) Business applications	0.057	0.231
PIS (5) Productivity applications	0.042	0.202
PCTS (1) In my work, I can avoid wasting time and money by using a smartphone.	2.708	1.360
PCTS (2) In my work, using my smartphone saves time and effort.	2.787	1.370
PCTS (3) A smartphone saves more money than other technologies in my work.	2.375	1.191
MAILCONTENT (1) Processing business e-mail on a smartphone is advantageous to my work.	3.079	1.475
MAILCONTENT (2) Processing business e-mail on a smartphone makes my work more efficient.	2.910	1.433
MAILCONTENT (3) Processing business e-mail on a smartphone improves the quality of my work.	2.575	1.296
WEBCONTENT (1) Getting information from websites or forums on a smartphone is advantageous to my work.	3.308	1.330
WEBCONTENT (2) By allowing me to get information from websites or forums, my smartphone makes my work more efficient.	2.986	1.289
WEBCONTENT (3) Getting information from websites or forums via my smartphone improves the quality of my work.	2.818	1.256
SOCNETPROCENJ (1) The use of social networks on my smartphone is pleasant.	3.541	1.125
SOCNETPROCENJ (2) The use of social networks on my smartphone is interesting.	3.216	1.116
SOCNETPROCENJ (3) The use of social networks on my smartphone is captivating.	2.994	1.292
WORKENJOY (1) My work is so interesting that I feel like I am not working.	2.888	1.130
WORKENJOY (2) Most of the time, my work is very enjoyable.	3.449	0.993
WORKENJOY (3) I work more than I am supposed to (just for fun).	2.712	1.163
WORKENJOY (4) I lose track of time when I am working on a project.	3.362	1.131
WORKENJOY (5) When I get involved in an interesting project, it is hard to describe my level of euphoria.	3.078	1.090
PSD (1) I often use my smartphone for no reason.	3.649	1.222
PSD (2) My smartphone use is a source of conflict with people around me.	2.206	1.211
PSD (3) I abandon my current activities as soon as my smartphone rings or vibrates.	2.751	1.234
PSD (4) I can spend hours on my smartphone without realizing it.	2.887	1.373
PSD (5) I feel unable to reduce the time spent on my smartphone.	2.208	1.075
MIND (1) I could be experiencing emotion and not be conscious of it until later.	4.711	1.209
MIND (2) I break or spill things because of carelessness, not paying attention, or thinking of something else.	3.959	1.305
MIND (3) I find it difficult to stay focused on what is happening in the present.	3.526	1.416
MIND (4) I tend to walk quickly and without paying attention to what I experience along the way.	3.943	1.378

continued on following page

Table 2. Continued

Variables	Average	St. Deviation
MIND (5) I tend not to notice feelings of physical tension or discomfort until they really grab my attention.	3.546	1.518
MIND (6) I forget a person's name almost as soon as I have been told it for the first time.	3.935	1.289
MIND (7) It seems I am "running on automatic" without awareness of what I am doing.	3.916	1.194
MIND (8) I rush through activities without being attentive to them.	4.162	1.246
MIND (9) I get so focused on my goal that I lose touch with what I am doing to get there.	3.933	1.238
MIND (10) I do jobs or tasks automatically and am unaware of what I am doing.	3.409	1.253
MIND (11) I find myself listening to someone with one ear and doing something else at the same time.	4.210	1.383
MIND (12) I drive places on "automatic pilot" and wonder why I went there.	2.934	1.338
MIND (13) I find myself preoccupied with the future or the past.	3.921	1.216
MIND (14) I find myself doing things without paying attention.	4.712	1.373
MIND (15) I snack without being aware that I am eating.	4.311	1.333
TIMEDAYWKD time spent per day on a smartphone during the weekend	3.492	1.159

by pleasure; 58.0% reported losing the notion of time when working on a project; and 39.4% felt euphoric when they got involved in an interesting project.

Smartphone dependency was also frequently observed: 66.6% declared using their smartphone often without any reason (rather or completely agree); 35.8% abandoned their current activities as soon as their smartphone rang or vibrated; and 41.6% could spend hours on their smartphone without realizing it. Overall, 15.2% felt unable to reduce the time spent on their smartphone.

The questionnaire also included questions about the time spent per day on a smartphone during the weekend. This was measured from an ordered variable using six intervals: 0–30 mins; 30 mins–1 h; 1–2 h; 2–4 h; 4–6 h; 6 h or more. The modal category was between two and four hours per day (34.2%). Almost 7 out of 10 respondents spent at least two hours per day on their smartphone. By taking the point in the middle of each class as the average time and a threshold of eight hours for the interval over six hours, this gives an average time of about two and one-half hours per day during the weekend.

Estimation and Results

A structural equation model is used to explain PSD. The model has five equations. The main equation that explains smartphone dependency includes six explanatory factors: (1) gratification related to the use of social networks (SOCNETPROCENJ); (2) gratification related to the use of e-mail (MAILCONTENT); (3) gratification related to the use of the web (WEBCONTENT); (4) addictive pleasure at work (WORKENJOY); (5) mindfulness (MIND); and (6) time spent on the smartphone during the weekend (TIMEDAYWKD). Gratification is explained through three equations (social networks, e-mail, and use of the web). These depend on the PIS. Finally, the last equation explains the PIS as a function of the perception of time savings related to smartphone use and work addiction.

The model is estimated using the Sem command of Stata. The variables of interest (PIS, PCTS, MAILCONTENT, WEBCONTENT, SOCNETPROCENJ, WORKENJOY, PSD) are expressed as latent variables; however, the time spent on the smartphone on weekends is continuous. Each latent variable is expressed as a function of its corresponding indicators. For example, the latent variable that measures smartphone dependency is a function of the five items PSD (1) – PSD (5).

The structural equation model is estimated by likelihood maximization. The usual measures of fit are used to assess the quality of the estimated model. The Chi^2 statistic was 2421.3, with 844 degrees of freedom (prob = 0.000). The root mean square error of approximation (RMSEA) statistic was 0.047 and standardized root mean residual (SRMR) was 0.052. In both cases, the values of the indicators are low (less than 0.08), suggesting a good fit. The comparative fit index (CFI) and Tucker-Lewis index (TLI) were equal to 0.911 and 0.905, respectively. These values are slightly below the threshold of 0.95. Finally, the coefficient of determination was equal to 0.999. This is higher than a previous study (Rowe et al., 2021), which developed an alternative model explaining PSD. Overall, the present model has a very high explanatory power for PSD among working people.

This study reports the measurement model that examines relationships between the latent variables and their measures (see Table 3). The structural model indicating the relationships between the latent variables is reported in Table 4. First, the constitution of the PIS was positively correlated with both the perceived time savings related to smartphone use and addictive pleasure at work. Second, the gratifications related to use of social networks, e-mail, and web were all positively correlated with the PIS. Third, PSD was positively influenced by social networking rewards and time spent on the smartphone during weekends. However, it was not positively influenced by professional rewards related to website and forum content or e-mail use. Fourth, it was negatively influenced by addictive pleasure at work and mindfulness.

Overall, this research concludes that H4a and H4b must be rejected.

DISCUSSION

This study provides a better understanding of the relationships between addictive pleasure at work, development of a mobile PIS, and PSD. The study acknowledges that the greater one's addictive pleasure at work, the less one is dependent on one's smartphone. This supports H6. This result is interesting because the study also posited that addictive pleasure at work leads to the development of a mobile PIS (H2). Through the ensuing smartphone gratifications, this might lead to the opposite effect. The study also tested an alternative model that incorporated the hypothesis that mobile PIS positively influences PSD (see Table B in the Appendix). The relationship was not statistically significant. In fact, it was negative. Therefore, the hypothesis that addictive pleasure at work promotes one to focus on something other than smartphone use is negatively related to PSD should be retained.

The belief that the time savings obtained thanks to smartphone use motivates the constitution of a PIS effectively contributes to PIS development. This supports H1. Working people strongly distinguish the smartphone from usual productivity tools at work because of its availability. Therefore, it is seen as complementary. In this way, people justify using their own devices (Barlette et al., 2021; French et al., 2014). The strength of this motivation translates into an active behavior of constitution and maintenance of their PIS, conditioning the realization of concrete benefits and gratification. In other words, there are no advantages of smartphone use that are significantly perceived as gratifying without voluntary actions of configuration of the PIS made by its user.

In the pre-COVID context, there was clear evidence that the development of a PIS was associated with both content and process gratification (H3a, b, and c were strongly supported). This does not mean that all customization actions would be perceived as gratifying in a post-COVID context in which telework gained legitimacy (Carillo et al., 2021). In fact, an obligation to work from home has its consequences. First, the notion of personal information systems becomes ambiguous because it may convey pressure from the company and will, in turn, impede on autonomy. Second, the use of tailored systems may not be very gratifying.

The rejection of H4a and H4b suggests that gratification related to professional content does not reinforce PSD. This finding is important because it contradicts previous findings (Mazmanian et al., 2013). Only gratification related to the use of social networks is significantly and strongly associated with this dependency (H4c). E-mail use on smartphones does not contribute to PSD or smartphone

Table 3. Estimates of the measurement model

Variables	Coefficient	t-stat
PIS PIS (1)	1.000	-
PIS (2)	0.406***	(7.93)
PIS (3)	0.311***	(7.20)
PIS (4)	0.097***	(4.74)
PIS (5)	0.078***	(4.42)
PCTS (latent) PCTS (1)	1.000	-
PCTS (2)	1.032***	(40.27)
PCTS (3)	0.799***	(32.58)
MAILCONTENT MAILCONTENT (1)	1.000	-
MAILCONTENT (2)	1.030***	(54.55)
MAILCONTENT (3)	0.838***	(40.63)
WEBCONTENT WEBCONTENT (1)	1.000	-
WEBCONTENT (2)	1.099***	(36.78)
WEBCONTENT (3)	1.003***	(33.62)
SOCNETPROCENJ SOCNETPROCENJ (1)	1.000	-
SOCNETPROCENJ (2)	0.975***	(20.66)
SOCNETPROCENJ (3)	0.785***	(16.12)
WORKENJOY WORKENJOY (1)	1.000	-
WORKENJOY (2)	0.833***	(24.83)
WORKENJOY (3)	0.949***	(20.93)
WORKENJOY (4)	0.626***	(13.51)
WORKENJOY (5)	0.494***	(11.10)
PSD (latent) PSD (1)	1.000	-
PSD (2)	0.771***	(12.65)
PSD (3)	0.857***	(13.61)
PSD (4)	1.383***	(18.11)
PSD (5)	0.880***	(15.44)
MIND MIND (1)	1.000	-
MIND (2)	2.187***	(8.18)
MIND (3)	2.152***	(7.95)
MIND (4)	2.222***	(8.05)
MIND (5)	1.950***	(7.53)
MIND (6)	2.918***	(8.56)
MIND (7)	2.788***	(8.59)
MIND (8)	2.697***	(8.51)
MIND (9)	2.868***	(8.59)
MIND (10)	1.944***	(7.98)
MIND (11)	1.778***	(7.54)
MIND (12)	1.818***	(7.70)
MIND (13)	2.610***	(8.51)
MIND (14)	1.904***	(7.74)
MIND (15)	1.854***	(7.75)

Table 4. Estimates of the structural equation model

Variables	Coefficient	t-stat
PIS equation		
PCTS (H1)	0.265***	(9.88)
WORKENJOY (H2)	0.113***	(5.82)
MAILCONTENT equation		
PIS (H3a)	2.374***	(10.14)
WEBCONTENT equation		
PIS (H3b)	1.819***	(9.66)
SOCNETPROCENJ equation		
PIS (H3c)	0.461***	(4.86)
PSD equation		
MAILCONTENT (H4a)	0.023	(0.95)
WEBCONTENT (H4b)	0.036	(1.20)
SOCNETPROCENJ (H4c)	0.136***	(4.52)
TIMEDAY_WKD (H5)	0.311***	(12.16)
WORKENJOY (H6)	-0.073**	(-2.32)
MIND (H7)	-0.862***	(-6.85)

addiction. This result complements the findings of Mazmanian et al. (2013), who underlined the paradoxical side of autonomy at work given a priori by the smartphone. Its use gradually shifted toward an addiction to e-mail. For these authors, the use of e-mail on the smartphone may be addictive; however, one it can be perceived by the subject as motivation at work. For instance:

Indeed, for many of the professionals, the long working hours, job stress, and sense of "being addicted" [to their mobile e-mail] were evidence of their motivation, competitiveness, hard work, and achievements as professionals. (Mazmanian et al., 2013, p. 1350)

The admittedly strong smartphone dependency of the consultants in the previous case corresponds closely to the current study's definition of PSD. It was favored by the fact that the tool in this case was a BlackBerry. This mobile tool sends notifications through sensitive alerts. Also, the use of the device at any time and any place became the professional norm in the context of the study and became a personal habit. However, it cannot be said that smartphone e-mail creates dependency or smartphone addiction in the sense that this pathology is defined in psychiatry (Panova & Carbonell, 2018). Rather, it is an excellent illustration of work addiction as defined by Andreassen et al. (2014).

The fact remains, however, that the question of PIS development and the link of its construction to work addiction are not addressed by Mazmanian et al. (2013). The following propositions can be conjectured from this discussion:

- **P1:** When smartphone use is neither required nor convenient for the execution of work tasks, pleasure at work or addictive pleasure at work is negatively correlated with PSD.
- **P2:** When smartphone use is required or convenient for work-task execution, addictive pleasure at work is positively correlated with PSD.

The results confirm the protective role that a personality characterized by high levels of mindfulness can play against smartphone addiction. This mechanism has been revealed in young adults (e.g., Kim et al., 2018; Regan et al., 2020). However, it has not been proven in a working population. Still, the mindfulness personality trait is known to protect against other addictions like substance use (Karyadi et al., 2014) or gambling (Mettler et al., 2020).

Knowing that mindfulness can help address addictive behaviors is important because this personality trait can be strengthened through meditative practice. This age-old practice involves developing a capacity for attention and self-regulation. As noted by Kabat-Zinn (1990), it can be learned through training methods like the mindfulness based stress reduction (MBSR). Thoughts, ruminations, and compulsive behaviors that beset us are limited through the practice of mindfulness meditation. A recent study found that the practice of mindfulness and completing an MBSR program were negatively correlated with problematic smartphone addiction (Rowe et al., 2021). Programs on mindfulness practices are also being tested among students and young adults to help them combat smartphone addiction (e.g., Kim, 2013; Lan et al., 2018). These results support the interest of meditation practices, providing an explanation for their benefit through the self-regulation of stimuli that could lead to compulsive behavior. More generally, this study hypothesizes that having a high level of mindfulness protects individuals from PSD.

Limitations

This exploratory study contributes to literature on the PIS and explains PSD in the working population. However, it has several limitations. First, the PIS (as was conceived) is a set of ongoing practices that logically and effectively influence the professional use and gratification of e-mail, forums, and websites. It also affects the use and gratification of social networks. Regarding the latter it would have been interesting to distinguish professional social networks from other social networks. Considering the descriptive results, it would have also been relevant to extend process gratification types, including items like listening to music or playing videos. Second, the study should explore when people work or whether they are on the job during the weekend. Third, the sample may suffer from self-selection bias. The respondents in this study were reached by e-mail, which may have impacted the study characteristics by providing a high representation of people gratified by e-mail. This sample may also be biased because of an over-representation of respondents who tend to be dependent on their smartphone. A quantification of this bias would require information based on a national survey representative of the population in France. The authors are unaware of any representative public survey with detailed questions on smartphone dependency. However, because of this difficulty, the study asked whether respondents felt dependent on their smartphone. Among those who responded to this question (1,075 respondents), 56.7% of the sample felt dependent. A fourth limitation of this study relates to causal analyses, which are always difficult in the field of addiction.

Practical Implications

Despite the limitations, the research model can be interpreted in the direction of causal factors to find suggestions that help reduce PSD (Markus & Rowe, 2018). Two factors are posited in the model as reducing this addiction. The empirical investigation did not invalidate these hypotheses; therefore, strengthening these factors may reduce PSD. First, mindfulness works in the direction of this reduction. Interestingly, long-term programs can strengthen mindfulness. Numerous studies have shown that repetitive practice of mindfulness meditation can increase individuals' natural disposition for mindfulness (Carmody & Baer, 2008; Shapiro et al., 2008). This is one reason why mindfulness interventions are increasingly advocated for in the workplace (Van Gordon et al., 2014) to support employee well-being and combat some addictions (Shonin et al., 2014). Such interventions could also be useful in combating PSD.

Second, addictive pleasure at work and pure work enjoyment (Leischnig & Kasper-Brauer, 2015) tend to reduce smartphone addiction. It would be interesting to better understand how and for which

occupations pleasure at work (addictive or not) diverts people from smartphone addiction. Studies should explore if this also applies to occupations like journalism or taxi driving, which are highly dependent on mobile devices. To further investigate a model with the first dimension of workaholism (Spence & Robbins, 1992), this study also tested the effect of working time (column 1, Table C in the Appendix). Working time was found to have no effect on smartphone addiction. However, taking addictive pleasure in one's work and spending more time on it than others is positively related to building a mobile PIS for work. This point needs to be explored in more detail.

More classically, rewarding uses like those found on social networks increase problematic dependency on the smartphone. To deepen this model on a practical level, the study estimated the time spent on social networks. It found that time contributed strongly to PSD (column 2, Table C in the Appendix). Interestingly, this finding for adolescents is also valid for working adults. Minimizing social network use is, according to the data in this survey, one of the best avenues to explore regarding limits on smartphone addiction.

CONCLUSION

Addictive pleasure at work is not positively associated with PSD. In the sample of workers studied, these behaviors are unrelated. Instead, they are in opposition. However, the constitution of a personal mobile information system could be explained by the influence of a behavioral addiction to work as an individual views the smartphone as a productivity tool.

This exploratory study suggests several reasons for the paradox between addictive pleasure at work and PSD. This paradox cannot be explained by a dissociation between the user's way to constitute a PIS and their beliefs about it (seeing the smartphone as a productivity tool at work leads to the creation of a mobile PIS). However, the levels of use and professional gratification linked to work content, such as e-mail or the use of certain sites, and sought in the constitution of a PIS are not necessarily the cause of problematic dependency. The PIS is associated with pleasure at work; however, it is not associated with a problematic smartphone addiction. Among working people, problematic smartphone addiction is often linked to the use of social networks and excessive use of the phone on weekends. Finally, the paradox in this study – addictive pleasure counters problematic dependency – is not explained by the constitution of a mobile PIS. Instead, escaping into work impacts one's focus on smartphone dependency, causing it to become less visible (Xu et al., 2012). The pleasure provided by the exercise of work beyond what is necessary would constitute a sufficient distraction or divert a user from being dependent on the use of their smartphone.

This hypothesis should be explored in greater detail by examining different work contexts and occupations. As demonstrated in this article, exogeneous factors like occupation play a positive role on the impact. However, this research reminds us that endogenous factors like self-regulation and mindfulness play an eminent role in preventing or moderating PSD.

Having a job that one considers fulfilling enhances well-being. This study's results do not question the multiple or polyaddiction phenomenon (Shaffer et al., 2004), which focuses on making and keeping people happy at work to maintain the sanity of the population.

REFERENCES

Alter, S. (2008). Defining information systems as work systems: Implications for the IS field. *European Journal of Information Systems*, *17*(5), 448–469. doi:10.1057/ejis.2008.37

Andreassen, C. S., Griffiths, M. D., Hetland, J., Kravina, L., Jensen, F., & Pallesen, S. (2014). The prevalence of workaholism: A survey study in a nationally representative sample of Norwegian employees. *PLoS One*, *9*(8), e102446. doi:10.1371/journal.pone.0102446 PMID:25118877

Barkhuus, L., & Polichar, V. (2011). Empowerment through seamfulness: Smart phones in everyday life. *Personal and Ubiquitous Computing*, *15*(6), 629–639. doi:10.1007/s00779-010-0342-4

Barlette, Y., Jaouen, A., & Baillette, P. (2021). Bring Your Own Device (BYOD) as reversed IT adoption: Insights into managers' coping strategies. *International Journal of Information Management*, *56*, 102212. doi:10.1016/j.ijinfomgt.2020.102212 PMID:32934432

Baskerville, R. (2011). Individual information systems as a research arena. *European Journal of Information Systems*, *20*(3), 251–254. doi:10.1057/ejis.2011.8

Bianchi, A., & Phillips, J. G. (2005). Psychological predictors of problem mobile phone use. *Cyberpsychology & Behavior*, *8*(1), 39–51. doi:10.1089/cpb.2005.8.39 PMID:15738692

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*(4), 822–848. doi:10.1037/0022-3514.84.4.822 PMID:12703651

Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological Inquiry*, *18*(4), 211–237. doi:10.1080/10478400701598298

Brown, R. I. F. (1997). A theoretical model of the behavioural addictions - Applied to offending. In J. E. Hodge, M. McMurran, & C. R. Hollin (Eds.), *Addicted to crime* (pp. 13–65). Wiley.

Buelens, M., & Poelmans, S. A. (2004). Enriching the Spence and Robbins' typology of workaholism: Demographic, motivational and organizational correlates. *Journal of Organizational Change Management*, *17*(5), 440–458. doi:10.1108/09534810410554470

Burleigh, , Griffiths, M. D., Sumich, A., Stavropoulos, V., & Kuss, D. J. (2019). A systematic review of the co-occurrence of gaming disorder and other potentially addictive behaviors. *Current Addiction Reports*, *6*(4), 383–401. doi:10.1007/s40429-019-00279-7

Carillo, K., Cachat-Rosset, G., Marsan, J., Saba, T., & Klarsfeld, A. (2021). Adjusting to epidemic-induced telework: Empirical insights from teleworkers in France. *European Journal of Information Systems*, *30*(1), 69–88. doi:10.1080/0960085X.2020.1829512

Carmody, J., & Baer, R. A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine*, *31*(1), 23–33. doi:10.1007/s10865-007-9130-7 PMID:17899351

Carnes, P. J., Murray, R. E., & Charpentier, L. (2005). Bargains with chaos: Sex addicts and addiction interaction disorder. *Sexual Addiction & Compulsivity*, *12*(2-3), 79–120. doi:10.1080/10720160500201371

Chen, Q., Gong, Y., Lu, Y., & Chau, P. Y. K. (2022). How mindfulness decreases cyberloafing at work: A dual-system theory perspective. *European Journal of Information Systems*, 1–17. doi:10.1080/0960085X.2022.2067490

Cheng, S. S., Zhang, C. Q., & Wu, J. Q. (2020). Mindfulness and smartphone addiction before going to sleep among college students: The mediating roles of self-control and rumination. *Clocks & Sleep*, *2*(3), 354–363. doi:10.3390/clockssleep2030026 PMID:33089209

Daniel, C., Gentina, E., & Mesmer-Magnus, J. (2022a). Mindfulness buffers the deleterious effects of workaholism for work-family conflict. *Social Science & Medicine*, *306*, 115118. doi:10.1016/j.socscimed.2022.115118 PMID:35696778

Daniel, C., Walsh, I., & Mesmer-Magnus, J. (2022b). Mindfulness: Unpacking its three shades and illuminating integrative ways to understand the construct. *International Journal of Management Reviews*, *24*(4), 654–683. doi:10.1111/ijmr.12296

David, M. E., Roberts, J. E., & Christenson, B. (2017). Too much of a good thing: Investigating the association between actual smartphone use and individual well-being. *International Journal of Human-Computer Interaction*, *34*(3), 265–275. doi:10.1080/10447318.2017.1349250

Dernbecher, S., & Beck, R. (2017). The concept of mindfulness in information systems research: A multi-dimensional analysis. *European Journal of Information Systems*, *26*(2), 121–142. doi:10.1057/s41303-016-0032-z

Edwards, L. (2018). Data protection: Enter the general data protection regulation. In L. Edwards (Ed.), Law, Policy and the Internet (pp. 77–117). Hart.

French, A. M., Guo, C., & Shim, J. P. (2014). Current status, issues, and future of bring your own device (BYOD). *Communications of the Association for Information Systems*, *35*(10). doi:10.17705/1CAIS.03510

Gentina, E., & Rowe, F. (2020). Effects of materialism on problematic smartphone dependency among adolescents: The role of gender and gratifications. *International Journal of Information Management*, *54*, 102134. doi:10.1016/j.ijinfomgt.2020.102134

Jensen, M. L., Dinger, M., Wright, R. T., & Thatcher, J. (2017). Training to mitigate phishing attacks using mindfulness techniques. *Journal of Management Information Systems*, *34*(2), 597–626. doi:10.1080/07421222.2017.1334499

Jiang, H., Siponen, M., & Tsohou, A. (2021). Personal use of technology at work: A literature review and a theoretical model for understanding how it affects employee job performance. *European Journal of Information Systems*. doi:10.1080/0960085X.2021.1963193

Joinson, A. (1999). Social desirability, anonymity, and internet-based questionnaires. *Behavior Research Methods, Instruments, & Computers*, *31*(3), 433–438. doi:10.3758/BF03200723 PMID:10502866

Kabat-Zinn, J. (1990). *Full catastrophe living: The program of the Stress Reduction Clinic at the University of Massachusetts Medical Center*. Dell Publishing.

Karyadi, K. A., VanderVeen, J. D., & Cyders, M. A. (2014). A meta-analysis of the relationship between trait mindfulness and substance use behaviors. *Drug and Alcohol Dependence*, *143*, 1–10. doi:10.1016/j.drugalcdep.2014.07.014 PMID:25113434

Katz, E., Blumler, J. G., & Gurevitch, M. (1974). Utilization of mass communication by the individual. In J. G. Blumler & E. Katz (Eds.), *The uses of mass communications: Current perspectives on gratifications research* (pp. 19–32). SAGE.

Kim, D., & Ammeter, A. (2014). Predicting personal information system adoption using an integrated diffusion model. *Information & Management*, *51*(4), 451–464. doi:10.1016/j.im.2014.02.011

Kim, H. (2013). Exercise rehabilitation for smartphone addiction. *Journal of Exercise Rehabilitation*, *9*(6), 500–505. doi:10.12965/jer.130080 PMID:24409425

Kim, K., Milne, G. R., & Bahl, S. (2018). Smart phone addiction and mindfulness: An intergenerational comparison. *International Journal of Pharmaceutical and Healthcare Marketing*, *12*(1), 25–43. doi:10.1108/IJPHM-08-2016-0044

Kim, S. H. (2008). Moderating effects of job relevance and experience on mobile wireless technology acceptance: Adoption of a smartphone by individuals. *Information & Management*, *45*(6), 387–393. doi:10.1016/j.im.2008.05.002

Lan, Y., Ding, J. E., Li, W., Li, J., Zhang, Y., Liu, M., & Fu, H. (2018). A pilot study of a group mindfulness-based cognitive-behavioral intervention for smartphone addiction among university students. *Journal of Behavioral Addictions*, *7*(4), 1171–1176. doi:10.1556/2006.7.2018.103 PMID:30418075

Leischnig, A., & Kasper-Brauer, K. (2015). Employee adaptive behavior in service enactments. *Journal of Business Research*, *68*(2), 273–280. doi:10.1016/j.jbusres.2014.07.008

Li, L., & Lin, T. (2019). Smartphones at work: A qualitative exploration of psychological antecedents and impacts of work-related smartphone dependency. *International Journal of Qualitative Methods*, *18*, 1–12. doi:10.1177/1609406918822240

Li, Q., Guo, X., & Bai, X. (2017). Weekdays or weekends: Exploring the impacts of microblog posting patterns on gratification and addiction. *Information & Management*, *54*(5), 613–624. doi:10.1016/j.im.2016.12.004

Markus, M. L., & Rowe, F. (2018). Is IT changing the world? Conceptions of causality for information systems theorizing. *Management Information Systems Quarterly*, *42*(4), 1255–1280.

Mazmanian, M., Orlikowski, W., & Yates, J. A. (2013). The autonomy paradox: The implications of mobile email devices for knowledge professionals. *Organization Science*, *24*(5), 1337–1357. doi:10.1287/orsc.1120.0806

Mettler, J., Mills, D. J., & Heath, N. L. (2020). Problematic gaming and subjective well-being: How does mindfulness play a role? *International Journal of Mental Health and Addiction*, *18*(3), 720–736. doi:10.1007/s11469-018-9978-5

Mosier, S. K. (1983). *Workaholics: An analysis of their stress, success, and priorities*. [Unpublished master's thesis, University of Texas at Austin].

Panova, T., & Carbonell, X. (2018). Is smartphone addiction really an addiction? *Journal of Behavioral Addictions*, *7*(2), 252–259. doi:10.1556/2006.7.2018.49 PMID:29895183

Qi, C., Huang, J., & Liu, O. (2017). *Exploring the antecedents of work-to-life conflict under the context of bring your own device.* Pacific Asia Conference on Information Systems, Langkawi Island, Malaysia.

Regan, T., Harris, B., Van Loon, M., Nanavaty, N., Schueler, J., Engler, S., & Fields, S. A. (2020). Does mindfulness reduce the effects of risk factors for problematic smartphone use? Comparing frequency of use versus self-reported addiction. *Addictive Behaviors*, *108*, 106435. doi:10.1016/j.addbeh.2020.106435 PMID:32335396

Rowe, F., Wolff, F. C., & Daniel, C. (2021). *Entre matérialisme et méditation: Une exploration des déterminants de la dépendance problématique au smartphone chez les actifs en France.* Colloque de l'Association Information et Management, Nice, France.

Shaffer, H. J., LaPlante, D. A., LaBrie, R. A., Kidman, R. C., Donato, A. N., & Stanton, M. V. (2004). Toward a syndrome model of addiction: Multiple expressions, common etiology. *Harvard Review of Psychiatry*, *12*(6), 367–374. doi:10.1080/10673220490905705 PMID:15764471

Shapiro, S. L., Oman, D., Thoresen, C. E., Plante, T. G., & Flinders, T. (2008). Cultivating mindfulness: Effects on well-being. *Journal of Clinical Psychology*, *64*(7), 840–862. doi:10.1002/jclp.20491 PMID:18484600

Shonin, E., Van Gordon, W., & Griffiths, M. D. (2014). The treatment of workaholism with meditation awareness training: A case study. *Explore (New York, N.Y.)*, *10*(3), 10. doi:10.1016/j.explore.2014.02.004 PMID:24767267

Silberschatz, A., & Zdonik, S. (1996). Strategic directions in database systems—Breaking out of the box. *ACM Computing Surveys*, *28*(4), 764–778. doi:10.1145/242223.242295

Spence, J. T., & Robbins, A. S. (1992). Workaholism: Definition, measurement, and preliminary results. *Journal of Personality Assessment*, *58*(1), 160–178. doi:10.1207/s15327752jpa5801_15 PMID:16370875

Sun, H., Fang, Y., & Zou, H. (2016). Choosing a fit technology: Understanding mindfulness in technology adoption and continuance. *Journal of the Association for Information Systems*, *7*(6), 377–412. doi:10.17705/1jais.00431

Sutanto, J., Palme, E., Chuan-Hoo, T., & Chee, W. P. (2013). Addressing the personalization privacy paradox: An empirical assessment from a field experiment on smartphone users. *Management Information Systems Quarterly*, *37*(4), 1141–1164. doi:10.25300/MISQ/2013/37.4.07

Tarafdar, M., Maier, C., Laumer, S., & Weitzel, T. (2020). Explaining the link between technostress and technology addiction for social networking sites: A study of distraction as a coping behavior. *Information Systems Journal*, *30*(1), 96–124. doi:10.1111/isj.12253

Thatcher, J. B., Wright, R. T., Sun, H., Zagenczyk, T. J., & Klein, R. (2018). Mindfulness in information technology use: Definitions, distinctions, and a new measure. *Management Information Systems Quarterly*, *42*(3), 831–847. doi:10.25300/MISQ/2018/11881

Vaghefi, I., Lapointe, L., & Boudreau-Pinsonneault, C. (2017). A typology of user liability to IT addiction: Liability to IT addiction. *Information Systems Journal*, *27*(2), 125–169. doi:10.1111/isj.12098

Vaghefi, I., Negotia, B., & Lapointe, L. (2022). (forthcoming). The path to hedonic information system use addiction: A process model in the context of social networking sites. *Information Systems Research*.

Van Gordon, W., Shonin, E., Zangeneh, M., & Griffiths, M. D. (2014). Work-related mental health and job performance: Can mindfulness help? *International Journal of Mental Health and Addiction*, *12*(2), 129–137. doi:10.1007/s11469-014-9484-3

Walsh, S. P., White, K. M., & Young, R. M. (2010). Needing to connect: The effect of self and others on young people's involvement with their mobile phones. *Australian Journal of Psychology*, *62*(4), 194–203. doi:10.1080/00049530903567229

Wang, C., & Lee, M. K. O. (2020). Why we cannot resist our smartphones: Investigating compulsive use of mobile SNS from a stimulus-response reinforcement perspective. *Journal of the Association for Information Systems*, *21*(1), 175–200. doi:10.17705/1jais.00596

Xu, Z., Turel, O., & Yuan, Y. (2012). Online game addiction among adolescents: Motivation and prevention factors. *European Journal of Information Systems*, *21*(3), 321–340. doi:10.1057/ejis.2011.56

Yu, S., & Sussman, S. (2020). Does smartphone addiction fall on a continuum of addictive behaviors? *International Journal of Environmental Research and Public Health*, *17*(2), 422. doi:10.3390/ijerph17020422 PMID:31936316

APPENDIX

A. Most Used Applications by Type

Table A. Most Used Applications by Type

Type of application	Most used application		At least two hours spent over the last three days
	Observation	Proportion	Proportion
Social networks	447	52.7%	52.6%
Music	61	7.2%	63.9%
Photos and videos	59	7.0%	16.9%
Games	56	6.6%	57.1%
Information	51	6.0%	39.2%
Navigation	50	5.9%	24.0%
Utilitaires (weather, maps)	41	4.8%	7.3%
Business (files, …)	21	2.5%	57.1%
Banking and finance	18	2.1%	5.6%
Leisure	12	1.4%	16.7%
Sports	11	1.3%	27.3%
Transportation	11	1.3%	9.1%
Productivity	7	0.8%	42.9%
Training	2	0.2%	0.0%
Administration (family allowances, health insurance, social security)	1	0.1%	100.00%
All	848	100.0%	44.1%

B. Model with Effect of Mobile PIS on PSD

Table B. Estimates of the Structural Equation Model

Variables	Coefficient	t-stat
Dependent variable: PIS		
PCTS (H1)	0.266***	(9.90)
WORKENJOY (H2)	0.114***	(5.82)
Dependent variable: MAILCONTENT		
PIS (H3a)	2.368***	(10.16)
Dependent variable: WEBCONTENT		
PIS (H3b)	1.814***	(9.68)
Dependent variable: SOCNETPROCENJ		
PIS (H3c)	0.460***	(4.87)
Dependent variable: PSD		
MAILCONTENT (H4a)	0.056	(1.26)
WEBCONTENT (H4b)	0.066	(1.46)
SOCNETPROCENJ (H4c)	0.138***	(4.57)
TIMEDAY_WKD (H5)	0.313***	(12.18)
WORKENJOY (H6)	-0.061*	(-1.82)
MIND (H7)	-0.869***	(-6.85)
PIS	-0.182	(-0.88)

C. Model with Working Hours and Time Spent on Social Networks

Table C. Model with Working Hours and Time Spent on Social Networks

Variables	(1)		(2)	
	coefficient	t-stat	coefficient	t-stat
Dependent variable: PIS				
PCTS (H1)	0.261***	(9.84)	0.261***	(9.84)
WORKENJOY (H2)	0.110***	(5.69)	0.110***	(5.69)
WORKING HOURS	0.073**	(2.33)	0.073**	(2.33)
Dependent variabl: MAILCONTENT				
PIS (H3a)	2.374***	(10.16)	2.374***	(10.16)
Dependent variable: WEBCONTENT				
PIS (H3b)	1.808***	(9.67)	1.808***	(9.67)
Dependent variable: SOCNETPROCENJ				
PIS (H3c)	0.451***	(4.79)	0.450***	(4.78)
Dependent variable: PSD				
MAILCONTENT (H4a)	0.026	(1.04)	0.020	(0.83)
WEBCONTENT (H4b)	0.037	(1.23)	0.043	(1.46)
SOCNETPROCENJ (H4c)	0.134***	(4.47)	0.113***	(3.79)
TIMEDAY_WKD (H5)	0.311***	(12.15)	0.274***	(10.53)
WORKENJOY (H6)	-0.071**	(-2.26)	-0.064**	(-2.05)
MIND (H7)	-0.859***	(-6.85)	-0.828***	(-6.78)
WORKING HOURS	-0.041	(-0.75)	-0.042	(-0.79)
TIME ON SOCIAL NETWORKS			0.047***	(4.10)

SUPPLEMENTARY MATERIAL NOT FOR PUBLICATION IN PRINT

D. Detailed measurement scales for ordered variables

Table D. Description of ordered variables (N=848)

Variables	Measurement scale					
	Never	**Rarely**	**Sometimes**	**Often**	**Syste-matically**	
PIS (1) mail filing on smartphone	77.2	6.1	4.3	5.3	7.1	
	No	Yes				
PIS (2) note taking on smartphone	64.5	35.5				
PIS (3) applications downloaded for work	76.8	23.2				
PIS (4) business applications used	94.3	5.7				
PIS (5) productivity applications used	95.8	4.3				
	Strongly disagree	**Rather disagree**	**Neither agree nor disagree**	**Rather agree**	**Strongly agree**	
PCTS (1) avoiding wasting time and money by using a smartphone	29.1	14.2	23.4	23.6	9.8	
PCTS (2) saving time and effort using a smartphone	27.7	13.2	22.2	26.5	10.4	
PCTS (3) saving more money than other technologies using a smartphone	33.5	16.2	34.7	10.7	5.0	
MAILCONTENT (1) processing business emails on a smartphone is advantageous	26.2	7.8	16.6	30.8	18.6	
MAILCONTENT (2) processing business emails on a smartphone is more efficient	27.7	9.6	21.5	26.5	14.7	
MAILCONTENT (3) processing business emails on a smartphone improves the quality of the work	30.3	14.6	30.9	15.6	8.6	
WEBCONTENT (1) getting information on websites on a smartphone is advantageous	17.0	8.4	19.9	36.3	18.4	
WEBCONTENT (2) getting information on websites on a smartphone is more efficient	20.3	11.4	29.1	27.7	11.4	
WEBCONTENT (3) getting information on websites on a smartphone improves the quality of the work	22.2	14.3	31.8	23.0	8.7	
SOCNETPROCENJ (1) social networks use on smartphone is pleasant	9.6	6.3	20.6	47.6	15.9	
SOCNETPROCENJ (2) social networks use on smartphone is interesting	10.1	13.9	29.6	36.9	9.4	
SOCNETPROCENJ(3) social networks use on smartphone is captivating	17.6	18.9	22.2	29.4	12.0	
WORKENJOY (1) feeling of not working	13.0	25.0	28.4	27.5	6.1	
WORKENJOY (2) work considered very enjoyable	5.2	12.5	23.4	50.1	8.8	
WORKENJOY (3) work for fun	17.8	27.0	27.0	22.5	5.7	
WORKENJOY (4) loss of time tracking while working	8.4	16.2	17.5	46.9	11.1	
WORKENJOY (5) euphoric feeling while working	9.6	19.8	31.3	32.1	7.3	
PSD (1) I often use my smartphone for no reason	5.8	18.0	9.6	38.8	27.8	
PSD (2) Arguments have arisen with others because of my smartphone use.	39.9	21.7	19.6	15.7	3.2	
PSD (3) I interrupt whatever else I am doing when I am contacted on my smartphone.	18.5	29.8	15.9	29.5	6.3	
PSD (4) I lose track of how much I am using my smartphone.	20.9	24.5	13.0	28.3	13.3	
PSD (5) I have been unable to reduce my smartphone use.	29.8	37.0	17.9	13.0	2.2	

continued on following page

Table D. Continued

Variables	Measurement scale					
	Almost always	**Very frequently**	**Rather frequently**	**Rather rarely**	**Rarely**	**Almost never**
MIND (1) I could be experiencing some emotion and not be conscious of it until later.	0.9	4.4	11.2	22.4	28.3	32.8
MIND (2) I break or spill things because of carelessness. not paying attention. or thinking of something else.	3.3	10.0	23.5	27.7	21.7	13.8
MIND (3) I find it difficult to stay focused on what's happening in the present.	8.0	15.9	28.3	21.9	14.9	11.0
MIND (4) I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.	4.3	11.8	21.5	25.8	21.2	15.5
MIND (5) I tend not to notice feelings of physical tension or discomfort until they really grab my attention.	9.9	16.3	25.0	21.8	12.2	14.9
MIND (6) I forget a person's name almost as soon as I've been told it for the first time.	2.8	10.5	24.5	28.1	20.6	13.4
MIND (7) It seems I am "running on automatic" without much awareness of what I'm doing.	2.2	8.7	25.4	33.3	19.7	10.7
MIND (8) I rush through activities without being really attentive to them.	3.1	5.8	18.0	35.1	21.0	17.0
MIND (9) I get so focused on the goal I want to achieve that I lose touch with what I am doing right now to get there.	2.4	9.7	24.8	30.9	20.2	12.2
MIND (10) I do jobs or tasks automatically. without being aware of what I'm doing.	4.8	18.5	33.8	23.5	12.4	7.0
MIND (11) I find myself listening to someone with one ear. doing something else at the same time.	1.5	10.3	20.5	27.8	13.1	26.8
MIND (12) I drive places on "automatic pilot" and then wonder why I went there.	14.6	24.8	32.3	14.4	8.7	5.2
MIND (13) I find myself preoccupied with the future or the past.	2.2	9.0	25.7	32.7	18.4	12.0
MIND (14) I find myself doing things without paying attention.	2.2	6.8	9.9	19.6	21.3	40.1
MIND (15) I snack without being aware that I'm eating.	1.9	8.7	16.5	26.2	22.6	24.1

Frantz Rowe is a Professor at Nantes Université, IEMN-IAE and LEMNA Laboratory, France. He graduated as an engineer from ENTPE, holds an MS from UC Berkeley and PhD from the University of Paris. He has been a Professor at Telecom Paris, Harvard University and SKEMA Business School and visiting Professor at Bentley University. He is a Fellow of the AIS and a Member of the Institut Universitaire de France where he is currently researching the risk of entrapment and infringement of liberties associated with the strategies of digital platforms. His research reappraises critical approaches in information systems management by exploring their causal language and examining the dynamics of envisaged causalities. The originality of this project lies in its in-depth philosophical examination and comparison of methods and theories from the perspective of their causal structures. His project also empirically investigates digital effects (addiction, undefined responsibilities, surveillance, discrimination) and agile method effects (DevOps and technical debt creation). His project finally contributes to the epistemology of the theoretical genre, notably concerning digital transformation theories. He is an expert on literature reviews and related methodologies.

François-Charles Wolff is professor in economics at the Institut d'Administration des Entreprises, Nantes Université, France. He received a PhD in Economics from Nantes Université in 1998 and is Agrégé des Universités since 2004. His main research interests deal with economics of the family, health economics, economics of education, law and economics, maritime transportation and maritime economics. He is author and co-author of more than 150 peer-reviewed papers published in journals like American Journal of Agricultural Economics, Applied Economics, Ecological Economics, Economica, European Journal of Operational Research, International Review of Law and Economics, Journal of Comparative Economics, Journal of Health Economics, Journal of Population Economics, Review of Income and Wealth, Social Science and Medicine, Transportation Research A and Transportation Research E.

Carole Daniel is associate professor at Skema Business School. Doctor in management sciences, Carole Daniel is a specialist in leadership development and team dynamics, and since 2016 has been leading a research program on the theme of mindfulness. Her fields of investigation are the effects of mindfulness in professional settings, both at individual and collective levels. She also conducts empirical studies on mindful leadership, and on the implementation and effects of interventions based on mindfulness practices (including MBSR) in companies. Her articles are published in top tier academic journals such as Journal of Business Ethics, Social Science & Medicine, International Journal of Management Reviews and International Journal of Project Management. She is also a regular author of chronicles in Harvard Business Review and The Conversation.