# Understanding Problematic Smartphone Use and Its Characteristics: A Perspective on Behavioral Addiction

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## Abstract

The problematic use of smartphones has extensively drawn social attention because of the harmful and disturbing outcomes. However, there has been little comprehensive research concerning the mechanism of problematic behavior in the use of smartphone, particularly for behavioral addiction. Given the specific characteristics of smartphones (e.g., high mobility, instant connection, and ubiquitous access), it is highlighted that smartphone addiction is a behavior that differentiates from traditional addiction behavior. However, in the previous research, there is a lack of comprehensive understanding of the characteristics and the underlying mechanism of smartphone addiction. Motivated to systematically theorize this issue, we primarily define addiction in the smartphone context and comprehend the characteristics of smartphone addiction, followed by developing the measures for smartphone addiction. On this conceptual foundation, future empirical research should be able to explain, predict, and test addiction behavior in the use of smartphone.
**Keywords:** Problematic smartphone use, addiction behavior, characteristics, measurement

## 1. Introduction

Smartphones, handheld personal computers, have exploded to become a daily part of our lives. With the great improvement of electronic technology and the rapid influx of new applications introduced to the public, smartphones can serve various functions such as providing instant news, web browsing, text messaging, online gaming, online shopping, social networking, and so forth. Nowadays people use smartphones very frequently — smartphones have become the first things many of us reach for when we wake up in the morning and frequently the last thing we check before going to sleep at night [32]. For the majority of individuals, smartphones represent an incredible tool for information update, instant communication, social connection, self-education, and entertainment. The use of mobile devices is a normal and routine part of everyday life. However, for some users, they look at their phones' menu screens, news, emails and apps

throughout the day. The failure to control an overwhelming impulse to check their phones pervades their lives and results in negative consequences.

As our dependency on mobile technology grows, an increasing attention has been paid to the use of smartphones. Particularly, we found a significant number of studies on negative consequences of mobile phone use. Most of these studies dealt with ill-effects or ill-coordination of mobile phones use. For example, researchers examined the possible adverse health issues of mobile phones [14, 21, 22] and phone-related driving hazards [12, 13, 43]. In recent years, there are an increasing number of studies on negative psychological effects on the smartphone usage, particularly from psychiatrists, psychologists, and social psychologists. However, existing studies tend to adopt a traditional and general way as an exploration of problematic smartphone use in nature. For instance, most studies focused on demographics and personality traits of mobile phone users [5, 18, 40], as well as dimensions and measurement instruments of problematic smartphone use [7, 19]. Some researchers addressed diagnoses, symptom management and treatment strategies for addictive mobile phone use [3, 47].

Theory-guided studies on the development of addictive smartphone use are relatively rare. There is little understanding of the process of addiction IS/IT behavior, as well as the variables affecting its enactment. The scant theoretical research might be attributed to a lack of a common nomenclature and conceptualization, which is crucial in providing the conceptual foundation and developing a useful theory [26, 33]. Therefore, this study aims at enriching existing IS literature on addictive use of technologies by primarily developing the conceptual foundation for addiction behavior in the context of smartphone and identifying its specific characteristics.

Important theoretical and practical contributions are expected from this study. On the theoretical side, this research project addressing addictive use of technologies will enrich existing IS literature by augmenting our knowledge of typical system usage. Particularly, our result will illustrate how the key characteristics of addictive use operate to drive addictive smartphone use. On the practical side, this investigation is timely to enhance our understanding of the problematic usage of smartphones, a seemingly universal phenomenon. The results will help clinicians, educators, and parents to develop possible counter-measures against addictive use of smartphones.

## 2. Theoretical Background

### 2.1. Prior Literature

Though research on problematic use of IS/IT is still evolving in the IS field, a significant number of studies on smartphone-related addiction have been conducted in the psychology and clinical psychology literature [4, 37]. For instance, Kwon et al. [20] proposed a series of scales to identify the addiction symptoms of smartphone use, measuring as daily-life disturbance, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance. Similarly, Casey [7] defined smartphone addiction as a set of symptoms such as disregard of harmful consequences, preoccupation, inability to control craving, productivity loss, and feeling anxious and lost. However, scholars have been limited by a lack of deep understanding in this area. Our review of prior studies found that previous studies mainly focused on demographics and psychosocial characteristics of mobile phone users [4, 31], dimensions and measurement instruments [7, 25], as well as diagnoses, symptom management, and treatment strategies for problematic mobile phone use [3, 47].

Based on the critical review mentioned above, research in the field of "problematic use of smartphone" is still explorative and evolving. There has been no consensus on the causes and consequences, and even no consensus has been reached on the nomenclature used to describe the phenomenon. In the previous literature concerning about the smartphone use, this type of irrational behavior has been referred as addiction [7, 19, 20, 25, 34, 36, 46], compulsive usage [15,

31], and problematic use [4]. In this article, we prefer the term addiction because it represents a behavioral pattern that causes compulsive use despite harmful consequences [2]. The term also refers to repetitive behaviors driven by an irresistible urge and ultimately harmful to the person [4]. A review of prior literature found that addiction behaviors occur in various domains, such as gambling, alcoholism, gaming, and drinking, and they share a number of common features. These include physical and/or psychological dependence on the substance or activity, loss of control regarding the behavior, and negative consequences related to everyday life [10]. Other commonalities include denial of the harmful consequences, and repeated failure in controlling the behavior [35].

## 2.2. Characteristics of Smartphone Addiction

Although addiction behavior has been pervasively investigated in prior literature, it has been highlighted that "studies are still needed to explore the similarities and differences between smartphone addiction and other behavioral addictions" [4, p. 303]. Similarly, it is proposed that understanding the characteristics of mobile addiction is useful and effective in capturing the usage behavior and motivation of smartphone use [16]. Following this line of reasoning, we primarily identify the characteristics of smartphone addiction (as shown in Table 1).

**Table 1.** Characteristics of smartphone addiction.

| Underlying mechanisms | Characteristics of smartphone addiction | Description |
|---|---|---|
| **Rewarding base** | Ubiquitous | "37 percent of adults and 60 percent of teenagers described themselves as 'addicted' to their device" [9] |
| | Socially accepted, normal | "The guise of a 'normal' socially acceptable activity" [45] |
| | Natural, undetectable, habit-forming | A checking habit [30]; A natural part of today's life, check smartphone over and over without even thinking about it [1] |
| | Voluntary | A reasoned behavior for social and personal benefits on the basis of positive attitudes and social norms [16]; "A desired behavior that can facilitate tasks and help improving performance" [23]; Positive experiences of repetitive uses [30] |
| **Compensation base** | Mandatory | Using smartphones is necessary to daily lives [16, 31] The feelings of missing out [15] Anxiety and withdrawal [39] |
| | Session usage | More shorter non-even-initiated interaction sessions (i.e., the interval between the screen turning on and the screen turning off) evenly spread over the day [38]; Short, brief usage sessions repeating over time [30] |
| | Contextual, stimulus-oriented | Tightly associated with a particular triggering context (e.g., bus trip, lecture, and home) [27, 30]; Driven or prompted by environmental consequences [16, 31] |
| | Annoyance, rather than conflict | Not yet perceived as problematic [30] |

## 2.3. Conceptualization of Smartphone Addiction

Typically, IT addiction has been defined as "the dependency to a technology that results in its excessive and compulsive use" [23, p. 1064]. Consistent with this definition, Thadani and Cheung

[41] proposed that addiction acts as the compulsive repetition elicited by psychological dependence. From this perspective, addiction is perceived as a type of irrational behaviour that results in negative consequences on individuals.

By identifying the characteristics of smartphone addiction, we attempt to explain the rationale of smartphone addiction through differentiating it from traditional addiction behavior. First, smartphone addiction is conducted as a reinforcement process associated with desired rewarding experience [17]. Given that smartphones allow users to pursue their instant connection anytime and anywhere [27, 31], the high responsiveness of smartphone is of great value for individuals [49]. In this case, repetitive usage pattern for the gratification of interactivity and connectivity (i.e., the rewarding experience) is readily developed. From this perspective, smartphone addiction is perceived as a normal, socially accepted, and seemingly harmless habit, performing voluntarily in the pursuit of rewarding experience.

Second, smartphone addiction is also performed to compensate the none-use experience of smartphone usage. Compulsion occurs with "a chronic, repetitive, and excessive behavioral response to inner deficiencies, negative feelings and events" [29, p. 510]. Given the feelings of missing out [15], anxiety and withdrawal [39], individuals defensively approach the smartphone usage to overcome the potential threatens of none-use, thus leading to smartphone addiction as a necessary and mandatory part in daily life. In summary, we propose that smartphone addiction as users' repetitive and persistent checking behavior with the goal to maximize potential rewarding experience and compensate potential threatens.

## 3.    Research Methodology

As research on addictive use of IS/IT is evolving, the conceptualization and operationalization of addiction are still in the development stage [42]. Particularly, the crucial construct (i.e., smartphone addiction) has not been investigated in the context of mobile technologies. Therefore, we focus on the conceptualization of smartphone addiction, and develop measures specific to the context of the current study by following Moore and Benbasat's [28] instrument development approach.

### 3.1.  The Inconsistence of Addiction Measurement

Although existing studies have developed a plethora of measures for addiction, no consensus has been reached to date. Despite the considerable merits of previous measurements, we believe that there still exist several limitations on the basis of our conceptualization of smartphone addiction.

First, addiction should be distinguished from similar constructs, such as compulsion, dependence, and problematic use. Studies that investigate the inappropriate use of smartphone typically adopt a set of nomenclature, while departing the definition of the construct from its measurement. A confusion of the research unit may lead to the failure to understand its underlying mechanisms. Therefore, a fine-grained threshold for smartphone addiction should be proposed, albeit the difference of these constructs is significantly subtle.

Second, addiction should be defined with a difference from its antecedents and consequences. The overlaps of addiction with its antecedents (e.g., mood modification, positive anticipation) and consequences (e.g., conflict, disturbance) have been pervasively found in previous addiction research [20, 42]. Despite the high relatedness of these factors to addiction, it is believed that they cannot be conceived as the addiction behavior in nature.

Finally, addiction should be measured with a focus on the behavior itself, rather than the interplay of emotional and cognitional process. It has been highlighted that the essence of addiction is an uncontrolled behavior to repetitively engage in the specific behaviour [4]. Well in line with this perspective, Griffiths [11, p. 211] proposed that technological addiction acts as a behavioral addiction that involves human-technology interaction, rather than a chemical addiction.

From this perspective, addiction should be distinguished from the emotion or belief systems. Given the inconsistencies of addiction measurement, we believe that it is imperative to develop a proper measurement for addiction in the context of smartphone use.

### 3.2. Measurement for Smartphone Addiction

To refine the conceptualization and operationalization of smartphone addiction, we start the measurement based on the assumptions in the following.

We first assume that smartphone addiction is different from online auction, gambling, and gaming addiction. Rather, it acts as a behavioral pattern of individuals' uncontrollable urges to repetitively check their smartphones. Given that smartphones provide a seminal platform for information obtainment and social connection, individuals are spurred to consecutively use their smartphones to pursue those neutral and even positive aspects of smartphones. Technological attributes of smartphones such as interactivity and mobility lead to the proportion of smartphone addiction far greater than any other known so far. In this regard, the criteria such that "addiction occurs depending on its negative impacts on society, family, and individuals themselves" might be not suitable in the mobile context. Instead, smartphone addiction tends to be more pervasive and social facilitating in comparison with other problematic technology use. Following this line of reasoning, we believe that it is not necessary to clarify the significant difference between addicts and non-addicts. Oppositely, each user is conceived as a potential of addict, albeit with a varying extent.

We then define smartphone addiction as a reflective construct, with the focus on behavioral addiction. Contrasted with previous studies that define addiction as a multiple-dimension construct [7, 19, 25], we believe a concise definition that focuses on the addiction behavior itself, rather than the containing of its antecedents and consequences, is more appropriate to provide the fundamental theoretical base of smartphone addiction.

Finally, we clarify smartphone addiction as a behavioral salience. This is mainly because that "salience" (i.e., preoccupation) is the fundamental base of addiction. IT addictive behaviors have been defined as "IT-related behaviors that become a major focus of a person's life and that have potential negative consequences" [23, p. 1064]. Consistent with this definition, evidence from the previous studies has been demonstrated that the majority symptoms such as withdrawal, conflict, relapse, tolerance, and mood modification simultaneously occur with salience [42]. Moreover, "the excessive levels of use, craving, structuring other activities around the addiction behavior, or feeling arousal while using" can be well represented by "preoccupation" [24] — a symptom that can be interchangeably described as salience. Therefore, we conceptualize smartphone addiction as a set of behaviors that saliently dominate individuals' daily life.

Based on these assumptions, we initially reviewed a great deal of literature on smartphone addiction, compulsion, and dependence, and rule out those measures that distract addiction behavior from symptoms such as "withdrawal", "mood modification", and "relapse and reinstatement". We then provide a basic operationalization of smartphone addiction on the basis of previous literature [7, 19, 20, 25, 48]. The items such that "I frequently check my smartphone," "I use my smartphone any time I can," "I often check my smartphone before something else that I need to do," "I often find myself engaged on the smartphone for longer period of time than intended," and "I often find myself anticipating when I will use the smartphone again" pave a seminal venue to measure addiction behavior in the context of smartphone use.

To test the validity of the items for smartphone addiction, we invited 56 active smartphone users to participate in a pilot study to refine the clarity of the questionnaire. Invitations were carried out by posting in various popular smartphone communities in China. To encourage participation, we gave remuneration to each participant. As the pilot study proceeded without any problem, it is evidenced that our measurement development was appropriate, and the

questionnaire was understandable and operational. Table 2 describes the details of the results for reliability and validity.

**Table 2.** The preliminary results for reliability and validity.

| No. | Item | Mean | S.D. | Factor Loading | Cronbach's α | AVE |
|---|---|---|---|---|---|---|
| 1 | I frequently check my smartphone. | 4.93 | 0.083 | 0.801 | 0.852 | 0.630 |
| 2 | I use my smartphone any time I can. | 4.83 | 0.084 | 0.823 | | |
| 3 | I often check my smartphone before something else that I need to do. | 4.01 | 0.089 | 0.808 | | |
| 4 | I often find myself engaged on the smartphone for longer period of time than intended. | 4.86 | 0.080 | 0.793 | | |
| 5 | I often find myself anticipating when I will use the smartphone again. | 3.92 | 0.084 | 0.740 | | |

## 4.    Discussion and Conclusion

This research seeks to advance the understanding of addictive use of smartphone. Though addiction has been widely studied in psychology, pathology, and biology, there is few and systematic theoretical studies that explain and predict the smartphone addiction in IS research. One possible explanation is that the distinct nomenclature and conceptualization lead to a divergent theoretical base for understanding the causal mechanism of addiction behavior.

We then identify the characteristics of smartphone addiction to understand and capture the addiction behavior in the use of smartphone. Our conceptualization integrates the rewarding experience with compensative experience, both of which exert a joint effect on the development of smartphone addiction. Based on this finding, we propose a comprehensive understanding about smartphone addiction, which can be used by researchers and practitioners for further explaining its theoretical foundation.

We also expect this research project yield important practical contributions. Although the problematic use of smartphone seems as a harmless habit, it has led to a harmful and disturbing outcome to the individuals and the society [4]. Our theoretical investigation is timely and imperative to enhance our understanding about the characteristics and underlying process of smartphone addiction. The expected results will help people to capture, predict, and understand the processes toward the development of addictive use of smartphone.

Aside from the empirical test of our theoretical mechanism, there still exist several factors that draw our attention. First, the technological attributes of smartphone (e.g., mobility, interactivity, pervasive access, and ease of use) facilitate the development of addiction behavior and contribute to the act of urge associated with the repetitive checking. In this regard, the theoretical understanding could be expanded to consider the role of technological attributes in the form of smartphone addiction.

Second, individuals' personality (e.g., low self-esteem, depression) also introduces theoretical possibilities in explaining the addiction behavior. Previous studies have shown that people who have certain personality and social-psychological characteristics are more likely to develop problematic use of technologies [4, 6, 7, 8, 44]. Whether the internal personality of individuals plays a role in the development of smartphone addiction needs further empirical research.

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