



# The dark side of smartphone usage: Psychological traits, compulsive behavior and technostress



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## ABSTRACT

Smartphones have become necessities in people's lives. Along with its obvious benefits, however, the smartphone has other effects that are not all that glorious. This study investigates the dark side of the smartphone trend. We examine the link between psychological traits and the compulsive behaviors of smartphone users, and look further into the stress caused by those compulsive behaviors. We conducted an empirical study consisting of 325 participants and compared Structural Equation Modeling with competing models. The results suggest that compulsive usage of smartphone and technostress are positively related to psychological traits including locus of control, social interaction anxiety, materialism and the need for touch. Gender differences are also found in the aforementioned relationships. The results have practical implications to user-oriented smartphone design and operation companies as well as government agencies as they combat the social ills brought on by smartphones.

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## 1. Introduction

*"The smartphone revolution is under-hyped, more people have access to phones than access to running water. We've never had anything like this before since the beginning of the planet."* – Marc Andreessen, founder of Netscape

*"Technology is changing our world more than ever before. The catalyst now is the Smartphone."* – Larry Rosen, author of *iDisorder*

Recent market survey revealed an average smartphone penetration rate of 44.6% in 47 countries, and this number is expected to grow at a fast pace (International Data Corporation, 2013; Our Mobile Planet, 2013). Smartphones are no longer cutting-edge communication gadgets, but are now necessities in peoples' lives. For smartphone users, their phone is the first thing they look at in the morning, and the last thing they look at before going to sleep. Oulasvirta, Rattenbury, Ma, and Raita (2012) actually found that their subjects check their phones 34 times a day not necessarily because they really need to check that many times, but because it has simply become a habit. Excessive usage and habitual checking on missed calls or messages may result in compulsive usage and

even lead to mobile phone addiction for smartphone users (Bianchi & Phillips, 2005; Oulasvirta et al., 2012; Takao, Takahashi, & Kitamura, 2009).

People use smartphone for entertainment or to relieve stress. Such use can yield immediate gratification, but it can also be accompanied by a diminished sense of volitional control and induce persistent activity (Thomé, Hårenstam, & Hagberg, 2011). Compulsive usage leads to mental health symptoms such as sleep disturbance and depression (Thomé, Eklöf, Gustafsson, Nilsson, & Hagberg, 2007; Thomé et al., 2011). Ongoing use of technology also links to heightened psychological distress (Chesley, 2005). Medical literature also suggests that the electromagnetic radiation of smartphones may affect biological systems by changing the antioxidant defense systems of human tissues, leading to oxidative stress (Ozguner et al., 2005). Therefore, compulsive smartphone usage elevates user stress for psychological and biological reasons.

Technostress is "a modern disease of adaptation caused by an inability to cope with the new computer technologies in a healthy manner" (Brod, 1984), and is incorporated in this study to pinpoint the stress related to smartphone usage. Technostress is the phenomenon of end users experiencing stress due to information and communication overload (Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008). The explosive growth of end-user computing and networking technologies enhances the severity of technostress (Brillhart, 2004). We thus expect that the smartphone user's increased experience of technostress will cause greater feelings of stress for that user. Charles, Piazza, Mogle, Sliwinski, and Alemida (2013) discovered that daily exposures stressors have

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long-term negative effects on users' mental health. Since the smartphone is a major information technology device and people feel the urge to adapt to it in order to "keep up with the times", overdependence on smartphone may lead to compulsive usage and enhance user technostress.

Recent studies indicated the importance of personality and psychological variables in compulsive consumption in technology (e.g., Mueller et al., 2011; Roberts & Pirog, 2013; Takao et al., 2009). Previous research also found that certain psychological traits could influence ability to withstand stress or make a person vulnerable to stress (e.g., Ebstrup, Eplov, Pisinger, & Jørgensen, 2011). In addition, gender differences are found in psychological traits (Feingold, 1994), mobile phone usage (Leung & Wei, 2000), and compulsive behavior (O'Guinn and Faber, 1989). This article contributes to these evolving streams of research by investigating whether and how psychological traits result in compulsive smartphone use and whether this compulsive usage results in a user's technostress level while gender differences are considered in the relationships between psychological traits and compulsive usage of smartphones. In the following section, a series of hypotheses are proposed through an extensive review of appropriate literature in the fields of psychology, psychiatry, sociology, consumer behavior and mobile commerce.

## 2. Conceptualization and hypotheses

This research adopts the view of personality theories to explain compulsive behavior since personality theories emphasize on the relationships between personality trait and compulsive behavior (Hirschman, 1992). Previous studies have considered problematic mobile phone use as addiction-like behavior, and examined from perspectives of personality traits (Bianchi & Phillips, 2005; Takao et al., 2009). In this research, we attempt to explore more traits. Four traits including locus of control, social interaction anxiety, materialism and the need for touch were selected as four antecedents for compulsive usage of smartphone. Locus of control and materialism are recognized as two important personality traits to explain compulsive behavior (e.g., Chak & Leung, 2004; Haynes & Ayliffe, 1991; Rindfleisch, Burroughs, & Denton, 1997; Iskender & Akin, 2010). Social interaction anxiety and the need for touch are both related to the motivations of smartphone usage and pleasure from such use, which increase reliance on smartphone. Social interaction anxiety has been discussed as a driving force behind phone use and it has recently received a lot of media coverage, particularly for young adults (Atchley & Warden, 2012). Compulsive behavior serves as an anxiety reliever and a source of gratification for people (Hirschman, 1992; O'Guinn & Faber, 1989; Roberts & Pirog, 2013; Takao et al., 2009). Need for touch relates to compulsive smartphone usage because the majority of smartphone comes with a touch screen (Allied Business Intelligence, 2011), which also makes touching inevitable in smartphone usage. Therefore, it is conceivable that social interaction anxiety and need for touch can serve as new predictors of compulsive smartphone use and technostress. In the following, hypotheses regarding influences of each psychological trait are developed.

### 2.1. Influence of locus of control

*Locus of control* refers to an individual's perceptions about the cause of events in his/her life, and is defined as the extent to which an individual believes that he/she has the ability to affect the outcome through his/her own actions (Rotter, 1966). Internal locus of control suggests that the cause of an event or behavior depends on one's internal force, and personal decisions and efforts can decide or influence what will happen in one's life (Lefcourt, 1991).

Compared with their "external" counterparts, "internals" (people with an internal locus of control) are more likely to engage in problem-focused coping behaviors, and reduce or eliminate possible stressors (Ng, Sorensen, & Eby, 2006; Qiang, Bowling, & Eschleman, 2010). On the other hand, individuals with an external locus of control believe that events are not within their control but in the hands of some external force. They tend to believe that their lives are influenced or controlled by fate, luck and other people. This belief leads to a sense that nothing can be done to change or improve the current situation. Locus of control influences how one copes with stress (Qiang et al., 2010). Internals engage in problem-focused coping behaviors to reduce stressors by making and following plans (Ng et al., 2006). Researchers suggest that externals' passive tendencies increase the likelihood that externals will exhibit compulsive behaviors such as drug and alcohol addiction (Haynes & Ayliffe, 1991), Internet addiction (Chak & Leung, 2004; Iskender & Akin, 2010), and credit card misuse (Watson, 2009). Given the externals' diminished sense of self-control, we expect that individuals with an external locus of control are more likely to experience compulsive usage of smartphones than their counterparts with an internal locus of control.

**H1.** Smartphone users with a stronger tendency toward an external locus of control demonstrate more compulsive usage of smartphones.

### 2.2. Influence of social interaction anxiety

*Social interaction anxiety* is an excessive fear of social situations or interactions with others, and of being evaluated or scrutinized by other people, particularly when encountering strangers in public settings (Schlenker & Leary, 1982). The need to reduce anxiety motivates socially anxious people to minimize their chances of making undesired impressions on others (Caplan, 2007). Acute social anxiety leads to social withdrawal and isolation (Leary, 1983). Researchers have shown that lonely and anxious individuals positively benefit from on-line interaction (Morahan-Martin & Schumacher, 2003; Yen et al., 2012). Because social anxiety is lower when interacting online than when interacting in real life, interacting online rather than face-to-face has proven to be a useful alternative, fulfilling the need to interact in a less direct way (Reid & Reid, 2007; Yen et al., 2012). However, this group of people is likely to develop problematic or excessive Internet use behavior (Caplan, 2002). Problematic Internet use and smartphone use may share the same properties because they are both related to communication tools and interpersonal interaction (Takao et al., 2009). Since 83% of smartphone users use their phone for communication (Our Mobile Planet, 2013), it is plausible that people with high social interaction anxiety will be more disposed to depend on their smartphones than those with low social interaction anxiety.

**H2.** Smartphone users with a higher level of social interaction anxiety demonstrate more compulsive usage of smartphones.

### 2.3. Influence of need for touch

*Need for touch* is defined as a preference for the extraction and utilization of sensory information obtained through touch or the haptic system (Peck & Childers, 2003a; Peck & Childers, 2003b). Individuals who have a stronger need for touch enjoy touching the groceries in supermarkets and cannot help touching the other person's arm or shoulder during conversations (Peck & Childers, 2003a). Need for touch has been identified as a multidimensional construct with two primary dimensions: instrumental and autotelic

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