Persistent Smartphone Overuse in the Digital Era: A Multi-Theoretical Perspective

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Abstract. Overuse of the smartphone is a common issue in modern society, and it is increasingly concerning due to its negative impact on mental health, behavior, and social interaction. This study investigates the reasons why people are aware of the harmful effects of smartphones, yet still use these devices excessively. Based on various theoretical perspectives, the study combines behavioural psychology and motivational theory with perspectives on cognitive adaptation, and a critical approach to digital design. First, operant conditioning theory is introduced to elaborate on the effects of positive and negative reinforcement on the development of habitual smartphone use. Second, Maslow's hierarchy of needs demonstrates that a smartphone can satisfy a user's need for belonging, esteem, and cognitive development. Third, from the perspective of successful intelligence, it explains why high levels of smartphone engagement in learning contexts is a rational choice in a digital and post-pandemic era. Finally, the paper discusses how algorithmic design and surveillance capitalism contribute to the entrenchment of user dependency through digital manipulation. Together, these theoretical frameworks represent a holistic explanation of ongoing smartphone overuse and have potential implications for digital well-being.

Keywords: Smartphone overuse, reinforced habit, rational adaptation, multi-theoretical perspective

1 Introduction

There was a visible breakthrough in smartphones' evolution since the International Business Machines (IBM) patented the first smartphone in 1992[1]. In 2001, smartphones made wireless connections to a 3G network. In 2007, Apple debuted the first iPhone, followed by Android entering the market in 2008. This process reflects that smartphones have been upgraded over generations and significantly changed our lives and societies and even became a necessity for most human beings. In 2024, there were 4.88 billion smartphone users in the world, counting for over 60% of the world's population, and there was a 115% increase since 2019 [2]. According to a global statistic, people spend 4 hours and 37 minutes daily on smartphones[3]. Such heavy usage of smartphones potentially brings concerns of addiction, which negatively affects both

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physical and mental health, causing anxiety, sleep disturbance, musculoskeletal disorder, and attention deficit[4]. To mitigate the problem, we need to recognize the potential negative impacts of excessive usage and critically analyze the reasons that lead to them. Therefore, this paper will analyze the contributing factors from perspectives of behavioral psychology, personal needs, rational adaptation, and digital manipulation.

1.1 Excessive Smartphone Usage is a Reinforced Habit

Excessive smartphone usage can be attributed to a reinforced habit, and this can be supported by Skinner's (1953) operant conditioning theory[5]. His theory introduces a concept of how a person's behavior is affected by operant conditioning, which is a learning process that consists of reinforcement and punishment[5]. According to this theory, behaviors that are reinforced by positive outcomes are more likely to recur, while those associated with negative consequences (e.g., punishment) are less likely to be repeated[5]. This theory can be used to explain the reasons for excessive phone usage among most people[6] Specifically, the use of phones can bring two forms of reinforcement: positive and negative reinforcement. Positive reinforcement strengthens behavior by providing a consequence an individual finds rewarding[5]. For instance, if a teacher gives students five dollars when they complete their homework, students will be motivated to finish the homework efficiently, and it may even drive students to continuously complete the homework in the long term. The rewarding (i.e., positive reinforcement) that students received can strengthen the behavior of completing the homework efficiently, possibly leading to habit development. Similarly, in the case of excessive phone usage, small rewards such as likes, notifications, messages, comments, even just an emoji of a thumbs-up or a smiley face, can trigger the brain to produce dopamine because of positive reinforcement from social interactions[7]. Motivated by dopamine, one would be encouraged and inspired to repeat their behavior (e.g., posting and staying active on phones).

In addition, negative reinforcement strengthens behavior as it stops or removes an unpleasant experience[5]. For example, if a student cannot complete their homework on time, they will be required to give five dollars to teachers, and this is an unpleasant consequence. Within this context, students would strengthen the behavior of doing homework. In terms of smartphones, if one stops using their smartphone, they will worry about losing connections to the social network and the outer world by missing essential information or social updates. To avoid this unpleasant consequence (aversion), they may rely more on smartphone usage[8]. Besides the fear of missing out (FOMO), there are other aversive emotional aspects one would like to avoid or remove, such as anxiety, loneliness, and boredom[9]. People would notice those emotions especially when they are out of their comfort zone, where their needs of belonging are missing. Under these circumstances, smartphones work like pacifiers to sustain comfort by distracting one from the missing needs. For example, people attempt to use the smartphone in the elevator, typically to entertain themselves in such a boring atmosphere and to lessen the anxiety of staying with strangers in a small space.

In general, according to Skinner's theory[5], the over usage of smartphones is attributed to the positive (e.g., small rewards) and negative reinforcements (e.g., the

FOMO and aversive emotions). In addition to the habits developed through reinforcement as mentioned above, excessive smartphone usage can also be triggered by human needs.

1.2 Excessive Smartphones are Used to Fulfill Various Levels of Needs

People use smartphones excessively due to the fulfillment of different levels of needs. This can be explained by Maslow's Hierarchy of Needs[10], especially the needs of love and belonging, esteem, and self-actualization, which are based on social interactions between human beings [11]. With all the upgraded functions, such as having access to the internet and making video calls, smartphones make it feasible for individuals to keep connection and intimacy among friends and family members. In addition, because of the accessibility and portability of smartphones, the needs of love and belonging are met almost anytime by using the smartphone even when families or friends are far away.

Maslow classified the needs of esteem into two categories: desire for respect, recognition, and eventually reputation; self-esteem (e.g., achievement, strength, and freedom)[12]. Through social media on smartphones, interactions between sharing and being shared bring a sense of belonging, recognition, and acceptance. Individuals post on social media and attempt to gain recognition through their post. Positive feedback on the post, such as likes, gives people a sense of being accepted, respected, and valued. This small positive feedback accumulated can make people have a sense of being appreciated for their work and feel like they have a good reputation in the social network. Meanwhile, self-esteem will be enriched, and one's emotional need will be fulfilled with a sense of achievement.

In the 1970s, Maslow updated the highest level, the needs of self-actualization into subcategories, including cognitive needs. Cognitive needs are "a desire to understand, to systemize, to organize, to analyze, to look for relations and meanings, to construct a system of values" [12]. Many people rely on their phones also to fulfill their cognitive needs through learning. Smartphones have gradually become a powerful learning tool due to their advances in physical portability, accessibility to resources, and communication within a learning group. In Maslow's theory[12], cognitive needs may inspire internal motivation, which means that people will become impelled to know and learn more knowledge. Smartphones serve as a key role to feed users with knowledge and information as needed by their cognition. Especially in the digital era, the development of AI empowered almost all learning platforms, thus, learners get even faster and easier access to more educational resources and guidance. This makes smartphones a particularly important tool for the learning process, and adapting to smartphones is a rational decision to better fulfill cognitive needs.

1.3 Excessive Smartphones Usage is a Rational Adaptation

Using smartphones is a capability rationally evolving in the digital era, especially after the Covid-19 pandemic. This can be supported by Robert Sternberg's theory of suc-

cessful intelligence[13]. Sternberg defined human intelligence as "mental activity directed toward purposive adaptation to, selection and shaping of, real-world environments relevant to one's life" [13]. This means that intelligence can be understood as the capability of an individual dealing with environmental and contextual changes.

With the development of science and technology, humans have entered a digital era with a variety of online resources. In recent years, AI is rapidly transforming the digital world with even higher efficiency and enhanced personalized experience. Such a transformation enables people to adapt to the crisis and ensure the operations of households, schools, businesses, hospitals, and governments. During the Covid-19 pandemic, people got used to the online version of living, studying, working, and communicating, and naturally carried the new style to their post pandemic life[14]. Especially in the field of education, smartphones significantly support mobile learning, which could have long term impact on how education is delivered[15]. From the following aspects, smartphones influence how people adapt to, select, and shape the innovative learning environment.

First, smartphones allow learners to access knowledge almost at any place and any time. This makes it much easier for the learners to adjust and adapt where and when to learn, therefore increase the learning efficiency. Second, mobile learning usually delivers information in shorter formats such as video or gamification, which can help improve information retention compared to pure class-based learning methods[16]. The improved knowledge retention saves learning efforts, therefore directs the learners to select mobile learning over traditional methods. Third, mobile learning platforms customize to meet the specific needs of each individual learner, leading to personalized learning experience. Meanwhile, learners with similar academic needs have opportunities to connect as a leaning community on those platforms, eventually boost communications and benefit the learning environment. Therefore, it can be concluded that excessive smartphone usage is a rational decision of human intelligence shaped and transformed by the digital era.

2 The External Impacts from Digital Manipulation

Another important reason why people spend much time on smartphones is that many platforms are designed by engineering algorithms. This seems like dosing consumers little shots of dopamine every day, making this feedback loop unstoppable and irresistible. For instance, the infinite scrolling feature in social media platforms such as TikTok and Instagram, makes it harder to stop using the apps. According to data from Statista, TikTok remained the top downloaded app in 2024, with 825.5 million downloads, followed by Instagram[17]. Globally, there are over 600 million active TikTok users, who spend 73.6 min per day per person on TikTok[18], marking it as one of the most time spent social networks. Every time a user spends time on a short video, the behavior will be caught and analyzed, then the indicated preference or curiosity will be integrated into the algorithm[18]. The algorithm uses the recommendation system to decide what to deliver next, to ensure continuous dopamine supply and to keep users engaged[19]. The apps on smartphones have been manipulated in the way one's preference or curiosity will be satisfied seemingly automatically.

This application of algorithms in platform design is closely related to surveillance capitalism, a concept proposed by Shoshana Zuboff[20]. This concept refers to the usage of consumer experiences as a free input of behavioral data for profits[20]. The "machine intelligence" processes the behavioral data into "prediction products," which make a key role in the so called "behavioral futures market"[20]. The free data is processed as consumer's needs or preference, which guide advertisements to be designed with successful targeting effects and further behavioral manipulation. With an increasing number of consumers engaged in the platforms, companies intend to collect more comprehensive data characterizing consumers' needs and preferences[21]. In such a manipulated environment, companies could gain significant profit from keeping consumers engaged in smartphones as long as possible[22]. Without detecting the manipulations, a consumer's own data helped the platforms to manipulate one's behavior, and in the end, one will develop reliance on smartphones.

3 Conclusion

In conclusion, this paper argues that the factors leading to the over usage of smartphones can be attributed into four aspects: reinforced habit, fulfilling of needs, rational adaptation, and digital manipulations. The critical analysis is based on theoretical support, empirical evidence, and example facts. To fully understand the reasons for excessive smartphone usage, future studies can aim to conduct empirical studies with both qualitative and quantitative research methods. The present study provided practical implications in the interaction among psychological factors (internal needs), behavior science (habits) and external factors (social influences) in influencing an individuals' over usage of smartphones, which contributes to understanding and mitigating smartphone addiction, and helps to explore more efficient learning processes. At the same time, understanding the external manipulation on smartphone usage is a key to awakening more awareness and promoting digital wellness.

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