FACTORS AFFECTING TIKTOK ADDICTION BEHAVIOR AMONG ADOLESCENTS IN CHINA: THE ROLE OF ACTIVE PARENTAL MEDIATION AS MODERATOR

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2023

FACTORS AFFECTING TIKTOK ADDICTION BEHAVIOR AMONG ADOLESCENTS IN CHINA: THE ROLE OF ACTIVE PARENTAL MEDIATION AS MODERATOR

by

QIN YAO

Thesis submitted in fulfilment of the requirements
for the degree of
Doctor of Philosophy

January 2023

ACKNOWLEDGEMENT

How many roads must a man walk down before people call him a man?

The long and arduous PhD journey take me nearly three and a half years to finish. During the time, I met a lot of difficulties, but I also received dedicated support from many people along the way.

The deepest and sincerest gratitude goes to my supervisor Associate Professor Dr. Bahiyah Omar, Deputy Dean School of Communication. It was my great honor to work with her. She gave me constant encouragement and valuable guidance from the beginning of my topic selection to the end. Her patience, commitment, inspiration, consistent and illuminating instruction encourage me to finish my doctoral research. There is no doubt that I can achieve today's progress was largely due to her continuous support. Her tireless professionalism and meticulous work attitude are second to none. She is like a beacon to illuminate my unknown road. Thank you for letting me believe that no matter how tortuous and difficult the road ahead, I still can find the right course.

I want to thankful to the academic and non-academic staffs of the School of Communication. They offered me with necessary and continued help during my study. I would also like to thank for my university mates and my friends who contributed to this research directly or indirectly. No matter in which stage of this research, they provided me a lot of help.

I heartfelt thanks to my parents and fiancé, Wang Junjie, for their unconditional love and sacrifices they made to me. Their love and encouragement got me through the hard times. The doctoral study could not have been accomplished without their boundless love. When I broke down emotionally and could not hold on, my parents

would encourage me. They cooked three appetizing meals and take good care of me, and Mr. Wang accompany with me day and night. Kindly accept my hearty gratitude.

There may have been someone missing in this brief acknowledgment, but that does not mean there is no appreciation. Although life in School of Communication, Universiti Sains Malaysia is going to the epilogue, I will keep going and devote myself to research all my life.

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LIST OF ABBREVIATIONS

APM	Active Parental Mediation
FC	Concentration
FE	Enjoyment
FTD	Time Distortion
IQ	Information Quality
IQC	Conciseness
IQS	Subscription
IQU	Usefulness
SQ	System Quality
SQEF	Ease of Use
SQF	Flexibility
SQI	Integration
SQRT	Response Time
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FAKTOR-FAKTOR YANG MEMPENGARUHI TINGKAH LAKU KETAGIHAN TIKTOK DALAM KALANGAN REMAJA DI CHINA: PERANAN PENGANTARAAN AKTIF IBU BAPA SEBAGAI PENYEDERHANA

ABSTRAK

Penggunaan TikTok adalah sesuatu topik besar dalam masyarakat moden ini, dan remaja sebagai salah satu pengguna terbesar di TikTok, juga mendapat perhatian daripada semua lapisan masyarakat. Semakin ramai remaja kini terperangkap dalam kitaran menatal ke atas dan ke bawah untuk memuat semula video di TikTok. Walaupun penyelidikan telah mendapati hubungan antara persekitaran luaran media sosial (sistem maklumat), mental dan tingkah laku pengguna, tetapi hanya terdapat sedikit maklumat tentang bagaimana aspek luaran digabungkan dengan keadaan dalaman pengguna untuk mempengaruhi tingkah laku ketagihan pengguna. Untuk mengisi jurang ini, kajian ini meneroka hubungan antara persekitaran sistem maklumat, organisma dalaman pengguna dan tingkah laku ketagihan TikTok di China. Kajian ini memfokuskan kepada faktor luaran dan dalaman, dan menggunakan model rangsangan-organisma-tindak balas (S-O-R) dan teori aliran untuk mentafsir kualiti maklumat dan sistem, dan pengalaman aliran. Kajian ini juga menggambarkan kepentingan aspek ibu bapa, dan menguji peranan penyederhanaan pengantaraan ibu bapa yang aktif dalam meramalkan tingkah laku ketagihan TikTok. Kepetingan kajian ini adalah pengalaman aliran peranan (keseronokan, tumpuan, dan herotan masa secara khusus) sebagai pengantara yang mempengaruhi hubungan antara persekitaran luaran dan tingkah laku ketagihan TikTok. Kajian ini menjalankan tinjauan pada tahun 2022 di China, untuk mengkaji hubungan antara kualiti maklumat, kualiti sistem,

keseronokan, tumpuan, herotan masa, pengantaraan ibu bapa yang aktif dan tingkah laku ketagihan TikTok. Kajian ini menggunakan kaedah persampelan dan menemu duga dengan 659 orang responden, dan menganalisis data oleh PLS-SEM. Penemuan ini mendapatkan kedua-dua kualiti maklumat dan kualiti sistem boleh membawa kepada tingkah laku ketagihan TikTok, manakala kualiti sistem mempunyai pengaruh yang lebih besar daripada kualiti maklumat, dan tumpuan adalah faktor paling penting yang membawa kepada tingkah laku ketagihan TikTok. Kajian itu juga mendapati bahawa pengantaraan ibu bapa yang aktif tidak dapat memainkan peranan penting dalam mengurangkan kemungkinan tingkah laku ketagihan TikTok yang dijangkiti. Teori daripada paradigma S-O-R dan teori aliran mencadangkan bahawa persekitaran luaran dan keadaan dalaman pengguna boleh menangani tingkah laku ketagihan pengguna pada masa yang sama. Kajian ini mempunyai implikasi praktikal untuk pembangun TikTok, remaja dan ibu bapa, kajian ini menyedari remaja tentang kesan negatif ketagihan video pendek dan mengingatkan semua orang harus mengelakkan tingkah laku ketagihan TikTok.

FACTORS AFFECTING TIKTOK ADDICTION BEHAVIOR AMONG ADOLESCENTS IN CHINA: THE ROLE OF ACTIVE PARENTAL MEDIATION AS MODERATOR

ABSTRACT

The use of TikTok is a big topic in modern society, and adolescents, as one of the biggest consumers of TikTok, have also drawn attention from all walks of life for their use of short videos. More and more adolescents are now trapped in a cycle of scrolling up and down to refresh videos on TikTok. While research has established the link between external environment of social media (information system), user internal states, and following behavior, little is known about how external aspects combined with users' internal states to influence users' addiction behavior. To fill this gap, this study explored the relationship between information system environment, users' internal organism and TikTok addiction behavior in China. Focusing on external and internal factors, this study applied stimulus-organism-response (S-O-R) model and flow theory to interpret the role of information quality and system quality, and flow experience. This study also illustrated the importance of parents' aspect, and therefore tests the moderating role of active parental mediation in predicting TikTok addiction behavior. Central to the study was the role flow experience (enjoyment, concentration, and time distortion specifically) as mediators that affects the relationship between external environment and TikTok addiction behavior. This study conducted a survey during 2022 in China, to examine the relationships between information quality, system quality, enjoyment, concentration, time distortion, active parental mediation, and TikTok addiction behavior. This study used purposive sampling method to recruit 659 respondents, and analyzed the data by PLS-SEM. The findings represented both

information quality and system quality could lead to TikTok addiction behavior, while system quality had greater influence than information quality, and concentration was the most important factor lead to TikTok addiction behavior. The study also found that active parental mediation could not play a significant role in reducing the possibility to infected TikTok addiction behavior. Theoretical insights from S-O-R paradigm and flow theory suggested that external environment and users' internal states could together work on users' addiction behavior. This study had practical implications for TikTok developers, adolescents' users, and their parents, make adolescents aware of the negative effects of short video addiction and that everyone should avoid TikTok addiction behavior.

CHAPTER 1

INTRODUCTION

1.1 Overview

This chapter presents the basis of the research. It highlights the use behavior of the emerging social media TikTok, its role in people's lives, especially during the COVID-19 pandemic, and how it helps alleviate people's anxiety and stress. This section also explains the current use of TikTok, discusses its specific use in China, and emphasizes the importance of this research. The next part focuses on the problems to be solved in this study. In addition, the critical concepts used in the research are appropriately defined in this section. In the end, the content of the next chapter is briefly summarized.

1.2 Background of the Study

"Non-chemical addiction," which involves addictive behavior in the online environment, has become a significant concern in today's digital world (Sha & Dong, 2021). Internet use disorder (Brand et al., 2016; Montag et al., 2021), smartphone use disorder (Peng et al., 2020; Peterka-Bonetta et al., 2021), compulsive social media use (Aladwani & Almarzouq, 2016), and problematic use of mobile phones (Hong et al., 2019) are among popular expressions used by researchers to describe addiction to the Internet. It is a psychological state of poor adaptive dependence on the use of technology (Ghosh, 2021)., which can take many forms, such as computer and smartphone addiction, online gaming addiction, etc. (Moqbel & Kock, 2018).

In the past, non-chemical addiction involved gambling, food, chocolate, and sex. With the development of technology, the addiction behavior gradually became

related to the internet, which was called internet addiction, and addiction to social media was one of them.

Social media is a kind of application that depends on the development of the network. From 1996 to 2021, the number of social media users accounts for 56.8% of the world's total population (more than 4.48 billion). The number of social media platforms users has increased from 970 million to 4.48 billion in the past decade, and users spend nearly 2 hours and 25 minutes daily on social media (Dean, 2021). Social media has been deeply embedded in people's daily life (Kizgin et al., 2018). People can create, spread, exchange information, and connect with friends through social media platforms and send their photos and images (Chen et al., 2020, Zhang et al., 2019). Social online has become the daily life of ordinary users.

However, with the rapid development of social media, the platforms constantly introduce new content types and forms of gameplay, enhancing the possibilities of interaction between users and users with the platform. There are many kinds of social media which provide users with various functions. For example, WeChat or WhatsApp enables users to build close relationship with family and friends, contact is the main purpose of these applications, besides, the applications like Instagram or Facebook, allow celebrities to present their talents, or to show off, and initially, the way for posting a moment was represented as a picture, as the technology developed, the static presentations with picture gradually developed into posting videos, such as Instagram reels or short video application (i.e. TikTok). Although Instagram and short video application both enables users to posting videos, short video application is unique as the length of the video (TikTok with 10 minutes, while Reels with 90 seconds), and the high quality of background music. Therefore, it provides users with more fluency using experience and offers customized content based on a user's preferences. These

hedonic characteristics and personalized content generate different degrees of an immersion experience and attachment psychology for users because making and watching short videos are enjoyable, thereby inducing addictive behaviors (Wang et al., 2021; Zhang et al., 2019).

Social media addiction is the psychological dependence on social media usage (Serenko et al., 2009). It refers to a branch of Internet addiction (Moqbel & Kock, 2018). As a new form of social media, short-form video application addiction can also be another subcategory of internet addiction (Zhang et al., 2019). More precisely, it's called over-focusing on social media. Mainly manifested as people being driven by uncontrollable motivations to use social media. They often log in to their social media accounts to check messages and spend much time and energy. Therefore, it's the detriment of other essential areas of life (Qahri-Saremi et al., 2021).

Short-form videos are mobile applications that allow users to create, edit, share, and view short videos. Short videos range in length from a few seconds to a few minutes. The relative convenience of content generation, the rapid dissemination of content, and the emphasis on sociality are the distinctive attributes of short-form video platforms (Wang et al., 2021). Short-form video app TikTok has become increasingly popular recently, but overuse can lead to addiction.

TikTok, known as Douyin in China, was developed by ByteDance in 2016, a Chinese company. It is a social media application that allows users to create 15-second videos and share them with friends, family, or the world (Yang et al., 2019). Up to now, the downloads were more than a billion times through 150 markets and 75 languages all over the world and gained 1.5 billion active users, which surged ahead

of competitors like Netflix, YouTube, Snapchat, and Facebook (Weimann & Masri, 2020; Omar & Dequan, 2020).

A short video on TikTok may usually only take 15 seconds and is accompanied by an incomplete piece of music (including only the musical background of the climax). The content of the video generally does not show the complete story and plot, and the user can watch and hear the core content of the video and music in a short time. As a result, many of TikTok's videos seem to be ended abruptly, and many people can't help but watch them several times and even memorize them deeply. In addition, one of the most critical interactions in TikTok video playback is automatic loop playback. Users focus on the same short video repeatedly and quickly. The user's finger just needs to be swipe up, and the video is displayed full-screen with personalized background music.

In addition, TikTok uses a streaming computing approach to handle most user profiles dynamically. It has targeted the younger demographic as its primary audience. The characteristics of younger group users are short attention span and easy to get immersed in the content they like. According to the features and preferences of this age group, the designers create a unique algorithm (Feed for You) that builds a video feed system using artificial intelligence (AI) techniques and a "recommendation engine" of data mining practices, customizing exclusive video content for each user (Figliola, 2020). This intelligent algorithm has a unique advantage, that is, the more time users spend on TikTok, the better the algorithm can understand users (Zhao, 2021; Weimann & Masri, 2020), in turn, users are also more likely to experience enjoyment, and continue to focus on TikTok.

Based on this, TikTok has become the most popular social media application among adolescents and young adults. One factor contributing to the popularity is its highly personalized distribution and easy-to-use editing methods. This has led to unforeseen problems that raised concerns among the public about being immersed in it (Zhang et al., 2019). Recommendation algorithms make users increasingly addicted to TikTok (Scalvini, 2021). Users can perceive enjoyment and fully concentrate on TikTok, while these two feelings can trigger a surge of dopamine in the brain, leading to "behavioral addiction". Behavioral addictions are biologically similar to substance addictions, such as drugs and alcohol, and both result from stimulating the same brain areas. Since they do not need to spend much effort searching for information and what they see can meet their needs and interests.

Therefore, the funny and entertaining video content, a full-screen immersive viewing experience, and simple interaction allow users to focus on TikTok to pass the time, and they tend to lose track of time and consume far more than 15 seconds without even realizing it (Zhao, 2021). In other words, users spend hours watching short videos, which is the manifestation of behavioral addiction (Zhao, 2021). As this phenomenon continues, the addiction behavior is getting worse, and users find it harder to control themselves.

People's excessive indulgence in watching short videos has resulted in various negative consequences. As leads to adolescent users spending too much time, it results in psychological problems, easy distraction, poor time regulation ability, reduced learning time, people's mental anxiety, depression, physical fatigue, poor eyesight, low work or academic performance (Neyaz et al., 2020). At the same time, it affects people's emotional response, cognitive, and interpersonal problems (Błachnio et al., 2017), and distress symptoms (Frost & Rickwood, 2017; Marino et al., 2018a).

Several studies indicate that the purpose of the use of social media users, including information sharing (Liu et al., 2019), hedonic (Jung et al., 2018), entertainment, and keeping relationships (Hur et al., 2017), when adolescent user exposed with more and more matched content, they prefer to extend the using time, and immersed in TikTok, but excessive immersion leads to users' attachment and addiction behavior to social media (Cao et al., 2020), it then caused anxiety, insomnia, poor eyesight, etc. (Fu et al., 2020).

The TikTok addiction phenomenon is getting more serious, requiring in-depth research (Zhang et al., 2019). But most previous studies have focused on the symptoms and behavioral changes of social media addiction in adolescents (Liang, 2021), such as the changing in attitude and personality. Besides, some of the studies have identified many factors that directly influence social media addiction (Hasan et al., 2018; Ho et al., 2017). However, these studies only consider one factor and lack comprehensive research investigation, so they fail to clarify the formation process of social media addiction in detail. Moreover, no studies have focused on alleviating and curbing adolescents' immersive experience and addiction behavior, which cannot solve this problem.

This study overcomes the shortcomings of the above studies and reevaluates some recent research. In general, addiction behavior is an automatic or habitual control generated by environment-related stimuli (Musetti & Corsano, 2018). From this perspective, the Stimuli-Organism-Response framework, proposed by Mehrabian and Russell (1974), explained human behavior would be influenced by the combination of external environmental stimuli and people's internal states. This framework is considered as one of the most widely used models to explain the causal relationship between addictive behaviors (Hull, 1943). And compared with other theoretical

frameworks, such as the Technology Acceptance Model (TAM) and the Task Technology Fit Model (TTF), the SOR framework is more suitable for investigating the impact of a unique technology environment and user experience. For example, the task technology fitting model (TTF) has been used to study the antecedents of students' intention to revisit Massive open online courses (MOOCs). Still, it ignored the factors from users' aspects (Huang et al., 2017).

Moreover, due to the target people are adolescents, the parental mediation theory was most appropriate to combine with the SOR framework to examine the effects of active parental mediation on the avoidance and control of adolescents' addiction behaviors. Unlike traditional media, short-form video media needs to continue acknowledging parental influence on adolescents' behaviors in future studies. Therefore, the research field of this theory needs to be expanded.

As most of the factors considered in previous studies are one-sided, this study draws on and modifies the SOR model in environmental psychology to comprehensively assess the formation factors of addiction behavior. SOR model proposed that various aspects of the external environment collectively influence people's internal states (like psychological, cognitive, and emotional) and later have an effect on the performance of individual actions (accept or reject) (Mehrabian & Russell, 1974). Flow experience worked as internal motivation (Zhao & Zhou, 2021) and was an essential structure for understanding and developing compelling online experiences (Lin et al., 2020, Kim & Ko, 2019). And parental mediation was selected to moderate and alleviate the negative impact of media on their children's lives because parents can influence adolescents' media use behavior to some extent (Fu et al., 2020b).

1.2.1 Proliferation and impact of short-form video app TikTok (Douyin) in China: The study context

TikTok (Douyin) is a representative of short video applications and has become one of the fastest-growing social media platforms in China and the world (Weimann & Masri, 2020). In addition, it is the most popular music video community (Zhou, 2019; Asia et al., 2017), and has become a popular form of social media application for millennials to share entertainment content (Jung & Zhou, 2019).

Unlike other social media sites (like YouTube), TikTok aims at adolescents and young adults with short attention spans. Based on data statistics, the most significant number of users are 6-17 years old, accounting for 31.59%, followed by 18-24 years old (30.14), 25-30 years old (20.85%), 31-35 years old (8.66%), and over 35 years old (8.76%) (Mou, 2020). The active TikTok users averagely open the app a whopping 21 times a day (Chen et al., 2019). From April 2017 to April 2019, the average daily usage of short video apps in China increased from less than 100 million hours to 600 million hours. In 2020, the average time people spent on TikTok per day rose to 122.3 minutes due to the COVID-19 outbreak worldwide, which is almost double the 68.8 minutes recorded in 2019 (Iqbal, 2020). Among them, nearly 26.3% of them are active between 9 p.m. and 12 a.m. (Mou, 2020). Therefore, researchers acknowledge a closed-loop relationship between TikTok addiction and algorithm optimization (Zhao, 2021). Users seem to be caught in an entertainment spiral.

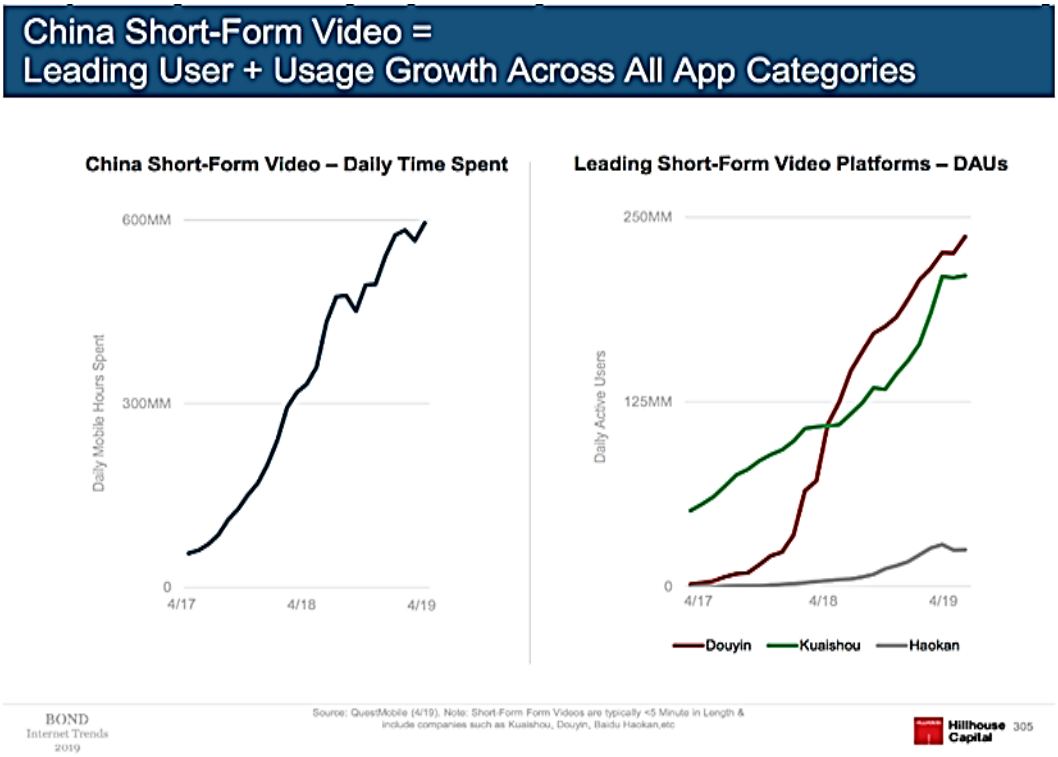

Figure 1.1 2019 China short-form video Usage time per day and leading platforms

While social media addiction is not a new phenomenon, short video applications introduce new types of content and forms of play, enhancing new possibilities for interaction between users and the platform, and this make addiction phenomenon getting worse. In China, with the increasing popularity of the Internet and smartphones that support short videos in families, new concerns have emerged about the impact of short-form video apps on users, especially children. Adolescents have shown addictive behavior to video apps, which has aroused public concern about the risk of being immersed in them (Zhang et al., 2019).

After realizing how social apps cut into children's schoolwork and social time, TikTok corporation is trying to take steps to ease the way children become addicted to its platform. For example, TikTok developers launched a version of TikTok for Chinese adolescents, and TikTok's engineers also developed new features for the app

to ease addiction among Chinese adolescents by adjusting the system's functions, such as setting Five-second pauses between videos, inserting educational content in the feed, and banning video game (Kantrowitz, 2021). Specifically, TikTok displays messages like "put down the phone," "Go to bed," or "work tomorrow" when users spend a long time watching short video. These features might wake some people up from their mindless and never-ending scroll, thus, increasing an atmosphere of control. Furthermore, more educational content, including science experiments, museum exhibitions, landscapes, and history, are displayed to inspire children to use TikTok to cultivate their passion for science and art (Montag et al., 2021).

In addition to the system setting measures of the platform, the Chinese government also pays great attention to the problem of adolescents' addiction behavior. To enhance creativity and digital literacy, and protect adolescents from smoking, drinking, rude language, and other inappropriate content, the relevant administrative departments have taken a series of measures to regulate the order of the network and online behavior of adolescents, trying to establish a mature network protection system for minors and achieve the purpose of creating a healthy network environment (Jiang, 2020). For examole, the "Regulations on Internet Protection of Minors" and "The Law on the Protection of Minors of the People's Republic of China" offered relevant protection regulations.

Although Chinese government has taken measures to deal with youth addiction to TikTok, these measures do not seem to have had a significant effect, and adolescents' users were highly affected by the TikTok addiction problem (Weimann & Masri, 2020), it might because the policy and regulation are general, it is faced to the whole online environment which can not precisely applied to TikTok. According to the latest Statistical Report on China's Internet Development (49th), the number of

short video users has reached 934 million, accounting for 90.5% of the total Internet users in China. Nearly half (49.8%) are under 30 years old, 20.5% are 24 years old, and 29.3% are 24 to 30 years old (China Internet Network Information Center (CINIC), 2022). They watch the short video for more than two hours a day (Thomala, 2022).

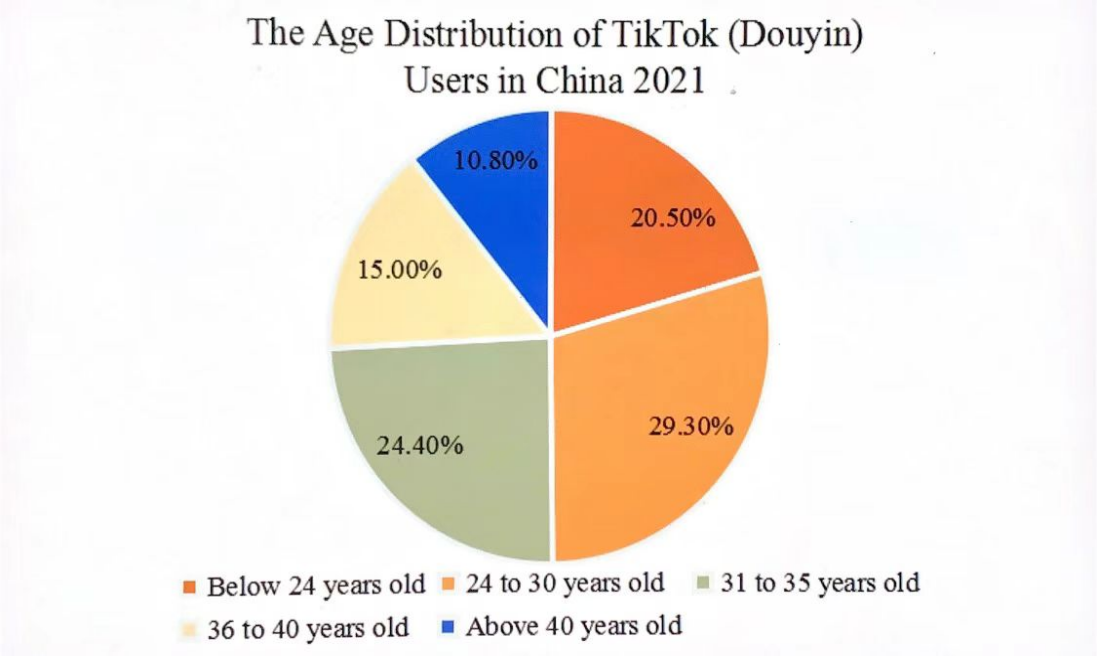

Figure 1.2 The Age Distribution of TikTok (Douyin) Users in China 2021

A functional magnetic resonance imaging study from Zhejiang University in China has revealed a link between short videos and addiction. According to a survey of 153 Chinese TikTok users, about 45.8% of the participants have mild to moderate TikTok addiction, and 5.9% are seriously addicted to TikTok. It reveals that the worse self-control ability, the higher the addiction level (Su et al., 2021). And changes in hormone levels caused by growing brains in adolescents can affect their self-control and put them at higher mental health risks, such as addiction to short videos. Since most TikTok users are adolescents, they are more vulnerable than adults because their cognitive level is still in a developing state.

At the same time, according to a survey of more than 3,000 Chinese adolescents released by Southwest University of China in 2021, adolescents who excessively rely on TikTok are more likely to suffer from psychological problems such as depression and anxiety, which may lead to the decline of short-term memory (Sha & Dong, 2021). In addition, the content of short videos can affect adolescents' self-judgment, causing users to have body image disturbances (Vall-Roqué et al., 2021). Besides, short videos may also lead to more upward social comparison and lower adolescents' self-confidence and self-esteem (Demircioglu & Kose, 2020).

Social media addiction might be a prospective source of severe problems and deserve urgent attention (Brailovskaia & Teichert 2020). The short video addiction among Chinese adolescents is stubborn and serious. Therefore, this social problem has also attracted a lot of academic attention. Most of these studies focus on how social media addiction affects adolescents' growth and development, predicting how adolescents gain problematic use of social media, the addiction symptoms, and the changes in behavioral, attitudinal, and personality after withdrawal. When adolescents become addicted to TikTok, they spend less time interacting with society and nature, thus losing some social capital and creating a growing desire for social acceptance (Morales et al., 2022). In addition, qualitative studies explored the specific video content (e.g., live streaming, pornography), platform-driven continuous viewing, and short videos can trigger young adults' addiction behavior (Yang et al., 2021). Such studies mainly focus on the adverse effects of TikTok on psychology, body, and social aspects but still were too subjective and lacked an objective perspective (Liang, 2021).

1.3 Statement of Research Problems

Social media addiction is gradually getting severe in the past few years (Lin et al., 2017), and it is becoming increasingly popular among young people. For example, it is widely spread among Asia adolescents (Arunrat Tangmunkongvorakul1 et al., 2020). With the increasing number of adolescents choosing TikTok as their favourite app, their frequency of use is increasing exponentially (Nesi et al., 2018). However, as they become more dependent on technology, addiction to the Internet and social media is also growing, which makes the issue of using social media more important. Given its impact on users, it is vital to reduce these addictions, and Internet addiction should be taken seriously (Longstreet & Brooks, 2017).

First, the addictive behavior of the short video app TikTok as another subcategory of Internet addiction (Zhang et al., 2019), has not been widely noticed by the academic field except for Gupta et al. (2021), Liang (2021), Sha and Dong (2021), Zhao (2021), Ghosh (2021), Iram and Aggarwal (2020), Zhang et al., (2019) and Xu et al., (2019).

As an emerging social media, the use and development of TikTok is a new topic in China and even the world. It has gradually attracted the attention of researchers (Omar & Dequan, 2020; Mou, 2020; Chen et al., 2019). However, most of the relevant literature on TikTok at the present stage focuses on its adoption factors, such as entertainment, social presence (Wang, 2020), perceived usefulness, perceived ease of use (Liao et al., 2009), performance expectancy (Rahi et al., 2018), continuous use behavior, and created commercial and social value (Scherr & Wang, 2021; Lu et al., 2020; Hu, 2020; Omar & Dequan, 2020; Yang et al., 2020). The variables involved

personality characteristics, technical factors, etc., but whether these factors can lead to short video applications addiction is not clear at present.

Second, due to the scarcity of research on the addiction to short-form video apps, it is necessary to draw lessons from other media platforms for addiction research. However, some factors such as negative reaction by online peers (Fabris et al., 2020), self-esteem (Hou et al., 2019), which is related to the addiction behavior of social media cannot be fully applied to short-form video apps.

Previous studies have looked at addiction behavior on social media such as Facebook, Instagram, WeChat, and Weibo (Cao et al., 2020; D'souza, 2019; Leong et al., 2019; Montag et al., 2019; Wang et al., 2018). Some evidence suggests that gender plays a crucial role in influencing users' risk of addictive behavior (Chen et al., 2017). And users' personality characteristics, which include neuroticism, extroversion, openness, agreeableness, and conscientiousness can also affect individuals' excessive Internet use (Qahri-Saremi et al., 2021). In addition, the psychological factors and vulnerability of users have also been proved by scholars to be essential predictors of problematic behavior, such as low self-esteem (Sim et al., 2021, Kim & Jahng, 2019), loneliness (Tian et al., 2021, Shen & Wang, 2019), depression (Zhao & Zhou 2021, Xie et al., 2019), shyness (Tian et al., 2021, Fu et al., 2020), low self-control or inadequate self-regulation (Turel et al., 2018), these are all considered as antecedents to lead to excessive Internet use.

But it is not clear how this particular psychological state of people arises from specific social media, for example, Facebook, Instagram, etc. Due to the progress of computer technology, such as the upgrade of the algorithm, TikTok provides users with higher quality content and a smoother system. The more users use TikTok, the

more accurate the algorithm will be, and the addiction could worsen significantly. Portability, sustainability (multitasking), and the ubiquity of video also add to the pressure to control addictive behavior (Zaman et al., 2016). These features make TikTok's addictive behavior different and more severe than other social media (Montag et al., 2019).

Third, there hasn't been a comprehensive effort to integrate the addiction behavior factors of the short-form video app TikTok into one model. Through reading the literature, this study found that although the interest in social media addiction has increased in recent years, they over-rely on the use and gratification theory (U&G), theory planned behavior (TPB), technology acceptance model (TAM), expectation confirmation theory (ECM), technology continuance theory (TCT) and other models when explaining its user behavior. These works of literature are commendable, but most studies only consider one single factor, such as family, individual, psychosocial, and social protection, which are external and internal factors, respectively (Sim et al., 2021, Tian et al., 2021, Turel et al., 2018). Therefore, the combination of the two aspects is ignored.

Some studies suggest that internal factors have a potential impact on user behavior, like satisfaction and attitude (Chen 2019), the user personality (Omar & Dequan, 2020), cognitive factors (Liao et al., 2009), etc., while others explore the external stimuli, such as the technology characteristic (Rahi et al., 2020), website design quality (Ma et al., 2019), information system quality (Idemudia et al., 2018), perceived usefulness and ease of use (Ifinedo, 2018). One-sided discussion of factors can easily lead to a deviation in results. Therefore, it is necessary to study the formation of users' addiction to TikTok from two aspects: external stimulus factors (technical aspects) and internal organism factors (users' personal experience) (Ghosh, 2021).

Fourth, although the problem of adolescent social media addiction has also attracted a great deal of academic interest in China context (Li et al., 2018), most of these studies focused on the prediction, symptoms, and behavioral changes (such as attitudinal and personality changes), and how it affects adolescent growth and development (Liang, 2021). However, these studies ignored how to curb and alleviate addiction behavior effectively.

With the development of information technology, adolescents' social ways also began to change. They often played with friends offline previously. But now, engaging in online social media activities seems to be popular, and to some extent, it helps their personal development, especially during COVID-19. Social media allows them to get back into relationships with remote friends, but as adolescents enter adolescence, they cannot control how much time they spend on social media. Therefore, sometimes they might excessively use social media, which leads to addiction behavior.

Adolescence is a time of significant changes in physical, cognitive, and social development. The early adolescence aged between 10 to 14, middle adolescence is 15 to 16, and the late adolescence aged between 17-21 (Moreira et al., 2018). It is a crucial period of teens' personality development (Kroger, 2005, Erikson, 1950). During the growth process of adolescents, their self-control is relatively low, and it is hard to resist the temptation of transgression or criminal opportunity (Gibbs et al., 1998; Gibbs et al., 2003; Baek & Lee, 2018). Moreover, they often evaluate the aspects of their peer relationships (Xie et al., 2019). In other words, contact with peers strongly influences their development, especially their behavior. They often do what their friends do. For adolescents, peers or friends are preferred even over family members. They enjoy their relationships with friends and participating in group activities (Nesi et al., 2018).

Therefore, the improvement of adolescents' self-control ability as a solution to curb addiction behavior cannot be effective. And according to Bronfenbrenner's Ecological Model, the family environment and the social environment significantly influence adolescents. Comparing the two environments, the family is the most lasting and core environment for children's development (Bronfenbrenner, 1979). It plays a central role in the occurrence and aggravation of adolescents' Internet addiction (Sim et al., 2021). Parents are the people who accompany them for the longest time, and the family environment has a profound influence on them (Xie et al., 2019). Therefore, parents are the critical factor affecting the growth of adolescents.

Next, some studies have confirmed that parental factors can influence adolescent behavior (Xie & Xie, 2020; Fu et al., 2020a; Fu et al., 2020b; Xie et al., 2019). One of these is Internet or smartphone addiction among adolescents (Wisniewski et al., 2017). Previous research has provided insight into what characteristics are associated with parental mediators (Cetinkaya, 2019, Padilla-Walker et al., 2012), such as family demographics (Mei et al., 2016), family communication styles (Xie et al., 2019), parents' own traditional media experience and related skills, attitudes toward media (Badillo et al., 2020), media use in the family environment, and these were associated with adolescent Internet addiction or smartphone addiction (Wisniewski et al., 2017). However, the relationship between these characteristics and the way parents mediates the use of short-form video apps has not been extensively studied, which needs to be further explored.

As the previous discussion has shown, the existing parental mediation framework has its limitations when extended to short video applications. As mentioned earlier, the rapid growth of applications requires parents to adjust their mediation skills accordingly, such as from setting strict rules for the watching time to explaining the

significance of the content. Because it's rooted in a tradition of media effects (Badillo et al., 2020), when applied to interactive media such as websites, social media, mobile apps, and video games, they are fundamentally inadequate. In addition, previous research has shown that parents have adjusted their mediation practices to keep up with changes in the media environment. However, whether these strategies can be applied in the context of short video app addiction remains to be seen. Moreover, the theory is oriented toward cognitive development. It focuses on child vulnerability, and studies tend to be skewed towards younger children, with less attention paid to the changing needs of the parent and child relationship as the child enters preadolescence and adolescence.

In addition, whether parents' active mediation can coordinate adolescents' immersive flow experiences and addictive behaviors is unknown. The structural equation model (SEM) showed that parenting style was indirectly related to Internet addiction through conscientiousness (Zhang et al., 2019). In other words, parents can control or curb the addiction behavior of their child. But new research has found that parental mediation generally does not reduce problematic smartphone use as expected. The shyer a child is, the more likely it is to increase the child's motivation to escape and inappropriate phone use (Fu et al., 2020b), which means the improper parental control may even lead to mobile phone addiction among adolescents. Hence, there was a conflict in previous study. From this perspective, whether the parental aspect is a potentially feasible solution to solve adolescent social media addiction needs to be reevaluated.

Last, in terms of the methods of parental mediation, the active mediation adopted in this study also has limitations. The term "active mediation" does not explicitly express the purpose of the dialogue process, and phrases such as "guiding,"

“evaluative,” and “explanatory” have been used to reinforce further the concept of active mediation (Dedkova & Smahel 2020). In many previous studies, there is no clear distinction between co-viewing and active mediation. During the shared use, opinion sharing should be a sign of positive mediation, but parents have been observed to forget to discuss their opinions with the child (Nielsen et al., 2019).

Overall, the problem of addiction has caused severe consequences to users. Although the research focusing on the negative impacts of addiction is growing, the causes of addiction are still unclear and not well studied academically (Liu et al., 2021, Cao & Sun, 2018; Luqman et al., 2017; Luqman et al., 2020; Whelan et al., 2020; Moqbel, 2020). It is necessary to investigate the formation of users’ addiction to TikTok from two aspects: external stimuli factors (technical aspects) and internal organism factors (user personal use experience). Besides, previous confirmed the relationship between flow experience and addiction behavior (Cao et al., 2020; Demircioğlu & Göncü Köse, 2018; Chen et al., 2017), however, this relationship is not immutable, it may be strengthened or be eased by the interference of external factors. In addition, past research has shown that the behavior of the parents and the reasonable control of adolescents could be used to prevent and mitigate adolescent addiction behavior (Xie & Xie, 2020; Wang et al., 2020; Xie et al., 2019), but other scholar disagreed with it after doing research (Fu et al., 2020b).

Thus, the research conflicts were existed among previous studies. This research reevaluates these recent studies that have increasingly focused on the role of parental factors in addressing adolescent addiction issues, and assuming that parental mediation can significantly reduce adolescent users' addiction to social media. Therefore, this study provides valuable insights into the causes of social media addiction among adolescents.

1.4 Research Objectives

The main research objective of this study is to develop a comprehensive model on TikTok addiction behavior. It illustrates the external factors (information quality and system quality) combined with internal factors (flow experience) that lead to adolescents' social media addiction behavior. Besides, it can be moderated by the active parental mediation factor.

In order to provide structure and basis for the research model, the stimulus-organic reaction (S-O-R) framework and Flow theory were used (Mehrabian & Russell, 1974, Csikszentmihalyi, 1975). This framework suggests that virtual world environmental stimuli work as external factors (information quality and system quality) that can influence users' internal experiences (such as virtual flow experiences) and subsequent responses (short video addictive behaviors). And to explore the influence of active parental mediation on adolescents' social media addiction, this study adopts an integrated model to investigate the various mechanisms of parental mediation on adolescents' social media addiction. Therefore, the multimedia model is of great significance in enriching the theories and prevention of TikTok addiction among adolescents.

1. To examine the effects of external factors (information quality, system quality) on adolescent's flow experience.
2. To explore the relationship between internal factors (flow experience) and TikTok addiction behavior.
3. To examine the mediating effect of internal factors (flow experience) between information quality, system quality with TikTok addiction behavior.

4. To examine the moderating effect of active parental mediation between internal factors (flow experience) and TikTok addiction behavior.
5. To explore the most influential factor affecting on TikTok addiction behavior.

1.5 Research Questions

The purpose of this study is to discuss how the information system environment of TikTok, and adolescents online use experience (enjoyment, concentration, and time distortion) affect TikTok addiction behavior. To broaden our understanding of TikTok addiction behavior by exploring SOR framework and flow theory, this study tries to examine the implications of addictive use in TikTok, especially among Chinese adolescents' users, how they gradually become addicted to TikTok, and explore whether active parental mediation can moderate such bad behavior. This research is instructed by the following questions:

RQ1: Do external factors (information quality and system quality) have a significant effect on internal factors (flow experience)?

RQ2: Do internal factors (flow experience) have a significant effect on the TikTok addiction behavior?

RQ3: Do internal factors (flow experience) mediate the effect between external factors and TikTok addiction behavior?

RQ4: Does active parental mediation moderate the relationship between internal factors (flow experience), and TikTok addiction behavior?

RQ5: Which is the most influential factor that affects on TikTok addiction behavior?

1.6 Research Significance

This study provides a comprehensive framework for TikTok's user experience and addictive behavior. Besides, it conceptualizes the theoretical framework of TikTok's addictive behavior by incorporating some variables identified as essential factors in user behavior. It explains how TikTok's personalized video content and highly interactive system affect adolescents' flow experience. It also explores the reasons for the formation of addiction behaviors and predicts how adolescents watching short videos can affect their addiction behaviors to TikTok through flow experience. In other words, the flow experience on TikTok, as a powerful predictor, can eventually predict the addictive behaviors of TikTok.

Therefore, this study broadens the understanding of addiction behavior in social media by applying the SOR framework in environmental psychology and flow theory and adding new mediating variables to the integrated theoretical framework. This study's theoretical, methodological and practical significance is mainly reflected in three aspects.

1.6.1 Theoretical Significance

Theoretically, this study contributes to media literature by confirming the SOR model in the context of TikTok addiction behavior. And also promote the understanding of adolescents' addiction behavior on TikTok by adopting the revised SOR model (Belk, 1975) to cover all four aspects of information system quality, flow experience, and moderating effects of active parental mediation. These findings allow scholars to embed this theoretical framework in other contexts of users' addiction behavior, such as online game addiction, online gambling addiction, smartphone

addiction, etc. Also, this framework can be applied to new media continuous usage behavior and compulsive online shopping addiction studies.

The first contribution lies in the expanding research field of the SOR framework. SOR model in the previous studies was widely used to test consumer purchasing behavior (Kim et al., 2020), impulsive consumption behavior (Chen & Yao, 2018), and visitors' revisit intention (Chen et al., 2020). Except for Lin et al. (2020), Moqbel (2020), Cao and Sun (2018), Yang and Zeng (2018), the SOR model has not been greatly employed in social media, particularly in the field of social media addiction behavior, not even mention about specific platform TikTok.

Previous literature conducted on social media heavily relied on the Theory of Planned Behavior (TPB), Technology Continuance theory (TCT), and Expectation Confirmation Theory (ECM) models. However, the TPB model mainly contained fundamental factors, such as attitudinal belief, subjective norms, and perceived behavioral control that have an impact on the user's continuance intention through satisfaction. (Liu et al., 2019), the TCT model ignored the technical and task characteristics that affect user adoption behavior (Rahi et al., 2020). The ECM model only confirmed that perceived usefulness and confirmation have an impact on users' continued usage through satisfaction.

Therefore, these studies analyze the causes of addiction from the perspective of the individual, ignoring external environmental factors. In other words, it ignores the potential changes in user behavior during the experience accumulation process (Ruangkanjanases et al., 2020). Thus, this study overcomes the defects mentioned before. Based on previous literature, this study combines the internal factors (flow experience) with external factors (information quality and system quality) to

reevaluate the relationship between information system, flow experience and regard flow as a mediator.

Among these very limited literatures, the variables covered product value, excessive information overload, excessive usage, technostress, academic performance, etc. These variables were employed to test the user behavior on social media and significantly contribute to social media literature. This study expands the research field of SOR by drawing on these variables and applying them to test the addictive behavior of the short-video application TikTok.

Following is the second contribution, expanding the SOR model by employing new variables. This study introduces the moderating effects of parental factors (parental mediation) on the relationships between flow experience and adolescents' addiction behavior, which has not been tested in previous studies. The investigation of the moderating variables promotes a better understanding of addiction behavior.

The parental mediation factor needs to be considered when testing adolescents' addiction behavior, especially in the TikTok environment during COVID-19. This specific situational factor might influence adolescents' feelings and thus lead to TikTok addiction behavior. Through a review of the literature, this study found that previous studies have not reached a consensus on the relationship between parental factors and adolescent addictive behavior. In order to resolve the academic conflict and obtain the latest research results, this research uses active parental mediation as a moderator to test whether parental mediation could buffer adolescents' addictive behavior.