I TEXT THEREFORE I AM: MESSAGE INTERACTIVITY VS. MESSAGE EXCHANGE IN ADDICTIVE USE OF INSTANT MESSAGING

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by

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ABSTRACT

Instant Messaging (IM) has evolved into a real-time, cross-platform, presence-enabled service that allows users to send text-based messages anytime and anywhere. It is very common to see users constantly glued to their mobile devices and texting, but the nature of their messages and the motivations behind such habitual behavior are not fully understood. Do their interactions represent the ideal of message interactivity, featuring threaded conversations, wherein the content of messages are contingent upon previous messages? Or, are they simply mindless chatter, featuring mechanistic exchanges of reactive, rather than fully interactive, messages?

Given that addictive use of media tends to be ritualistic and habitual, this dissertation hypothesized that users who are highly dependent on IM will focus more on simple mechanistic message exchanges, as their primary motivation is the excitement derived from sending and receiving messages. In contrast, those less dependent on IM were expected to appreciate message contingency, given their goal of having meaningful and interdependent conversations.

To test these hypotheses, the current study (N = 188) employed a 2 (Message Interactivity: Low vs. High) x 2 (Message Exchange: Low vs. High) x 2 (Levels of Addiction: Low vs. High) between-subjects experiment. Message interactivity and message exchange were manipulated, and level of addiction was a measured variable. Participants were asked to complete an IM chat session with a financial customer service representative (i.e., research confederate) by using their own mobile phones, with the conversation topic and content were held constant across conditions. Surprisingly, the findings revealed that both addicts and non-addicts preferred message contingency. While non-addicts’ appreciation of message contingency leads to corresponding content elaboration, addicts’ IM use is rather paradoxical—they do
appreciate and demand contingent message exchange, but their actual engagement is still at a relatively superficial experiential level, focused on being absorbed in the experience of texting rather than elaborating on the content exchanged in the experience. The discovery of this paradoxical pattern of IM use is important—not only does it confirm the process-oriented characteristic of IM addiction, but also offers us an opportunity to redefine and reevaluate media addiction in a more qualitative way, based on the nature of user engagement with interactive tools on the interface rather than on individual differences. Theoretical and practical implications are discussed.
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INTRODUCTION

From AOL Instant Messenger to iMessage, WeChat, and Facebook Messenger, instant messaging (IM) has evolved from near-synchronous, computer-based one-on-one communication programs (Lee & Perry, 2004; Nardi, Whittaker, & Bradner, 2000) to mobile instant messaging (MIM), a real-time, cross-platform, presence-enabled service that allows users to send one-on-one or group text-based messages (Church & de Oliveira, 2013; Lin & Li, 2014; Zhou & Lu, 2011). However, the widespread diffusion and adoption of instant messaging has raised concerns about addictive use of mobile devices (Igarashi, Motoyoshi, Takai, & Yoshida, 2008; Lu, Katoh, Chen, Nagata, & Kitamura, 2014; Lu et al., 2011). Given the ubiquity of wireless networks, users are now able to access an IM service anytime through mobile devices, which not only makes the text-based message exchange a major way of communication but also a major component of addictive use of mobile devices (Igarashi et al., 2008; Lam, 2012; Lapointe, Boudreau-Pinsonneault, & Vaghefi, 2013; Lu et al., 2011). Mobile phone users are often drawn to impulsively text chatting, and so what makes text chatting both so attractive and addictive? Scholars have invested significant in trying to answer this question, developing a variety of theories and models. For example, the cognitive-behavioral model of pathological Internet use (PIU) argues that the cognitive and behavioral symptoms of problematic use tend to be the outcomes of broader psychological issues, such as loneliness (Caplan, 2003), social anxiety (Caplan, 2007; Morahan-Martin, 2008), or poor social skills (Caplan, 2005). Another line of research that focuses on uses and gratifications and media habits, suggests that addictive use of a medium is developed in phases. Users might start with normal and purposive use of text
chatting (e.g., for information gathering, companionship, or self-actualization), but that use can morph into addictive behaviors or habitual use of the medium (Haridakis, 2013; LaRose, 2010; Park, 2005; Sung & Choi, 2002). Together, these accounts illustrate understand user and environmental factors that contribute to addiction (Caplan, 2010; Davis, 2001), but these accounts do not shed light on technological aspects that may play a role. What is it about IM technology that makes it so addictive?

At its core, IM is about exchanging messages. Therefore, the primary technological variable is message interactivity, which can range from non-interactive to reactive to responsive or fully interactive (Rafaeli, 1988). Assuming that IM users are interacting with others, we can say that, at a minimum, they are engaging in reactive communications, i.e., mechanistic message responses, with each message simply responding to the previous one from the partner. At its best, message interactivity can signal contingent communications, i.e., the messages refer not only to preceding ones but also those that came before in the sequence, leading to more wholesome threaded interactions. This is when message exchange is said to be responsive or fully interactive.

The volume of messages exchanged may be the same between reactive and responsive communications, but the former lacks semantic interconnectedness across a sequence of exchanged messages between interactants (Rafaeli, 1988). Reactive communication is likely to fulfill the need for ritualistic use of IM rather than serve an instrumental purpose. But, this distinction may not matter for addicted users because their use is automatic (LaRose, 2010), and lacks intentionality or controllability. Addicted users of instant messaging focus on process-oriented pleasurable experiences (Sundar & Limperos, 2013), which can be fulfilled by going through the motions of mechanistic message exchanges. In contrast, non-addicted IM users will
likely find responsive (or fully interactive) communication via text chatting to be more engaging and preferable than reactive communication because it offers a semantically interdependent and contingent conversation, and better serve the instrumental purpose behind the use of instant messaging.

The main objective of this dissertation is to test this prediction and thereby differentiate between addictive and non-addictive use of IM based on the concept of the message interactivity. If successful, this study will have identified the key role technological affordance plays in perpetuating addiction, thus adding to theories of media addiction and stimulating design of tools for diagnosing and combating media addiction.
Chapter 1
LITERATURE REVIEW

Defining Addiction

Addiction has been widely studied in clinical and psychology-related research; however, defining addiction has been quite contentious, and scholars still have not achieved a consensus definition of the concept (Sussman & Sussman, 2011; West, 2005). In order to examine addictive use of text chatting, an important first step is to construct a common understanding of this concept.

Traditional addiction scholars have defined addiction as a compulsive substance-seeking and substance-taking behavior that could negatively impact many other activities (Robinson & Berridge, 2003). Although addictive use of text chatting is not involved with abuse of an actual substance, it still exhibits the five primary elements of addiction: feeling different, preoccupation, temporary satiation, loss of control, and negative consequences (Sussman & Sussman, 2011).

Addiction, be it substance or non-substance related, can change users’ subjective experience of self, and make obsessively desire the addictive behavior in question. The allure of temporary satiation as a feeling of temporary self-sufficiency after engagement in addictive behaviors (Hirschman, 1992) increase over time whereas the desire for non-addictive decreases. Despite the tolerance effect (i.e., the need to engage in the behavior at increasingly higher levels to achieve the previous levels of appetitive effects), the relative incentive value of addictive behaviors would still be higher for addictive behaviors than non-addictive alternatives, thereby increasing one’s preoccupation with addictive behaviors (Glasner, 2004; Sussman & Sussman,
This state of preoccupation commonly involves tolerance and withdrawal (i.e.,
experiencing discomfort after stopping the behavior) effects, and leads to two observable
outcomes: 1) loss of control where individuals with a willful intention to stop addiction can
hardly control the initiation of addictive behaviors and 2) negative consequences in legal,
physical, and/or social contexts.

**Addiction, Compulsion, and Dependence**

Some scholars have used the term addiction interchangeably with other concepts such as
compulsion and dependence; however, especially for some non-drug use addictive behaviors,
such as pathological shopping, gambling, and overeating, addiction should be differentia ted from
these terms (Goodman, 1990). Addiction involves both compulsion and dependence, whereas
compulsion and dependence are not necessarily addictions. Compulsion describes “repetitive
activity to remove anxiety” (Brewer & Potenza, 2008; Sussman & Sussman, 2011, p. 4031);
however, such activity usually does not engage higher-order cognitive processing. Therefore,
compulsion involves avoiding an unpleasurable or aversive internal state (e.g., anxiety)
(Goodman, 1990). In contrast, addiction involves achieving satiation through engaging in certain
behaviors.

The emphasis on achieving a positive state makes addiction similar to dependence.
Dependence also involves an “attempt to achieve a pleasurable internal state via gratification of
needs” (Goodman, 1990, p. 1405). However, as discussed above, in addition to positive
reinforcement, aversive consequences and the associated negative reinforcement indicate that
addiction should be considered as a combination of dependence and compulsion.
In sum, addiction, which is different than compulsion and dependence, can be defined as a series of long-term automatic behaviors where individuals are obsessed with an activity and prioritize the related psychological and physical incentives by ignoring severe negative consequences and the loss of other incentives from alternative activities. It is certain that engaging in addictive behavior will cause individuals serious, sometimes devastating, social and physical consequences, yet stopping these harmful behaviors is not an easy task for addicts.

**Traditional Theoretical Explanations of Addiction**

Why is it so hard for people to stop negative addictive behaviors? Answering this question has been a major focus in addiction research (Edwards, Arif, & Hadgson, 1981), which primarily focused on two aspects, behavior and motivation. A traditional hedonic/withdrawal view argues that pleasurable experience is the starting point of addiction formation while the avoidance of unpleasant withdrawal symptoms actually maintains compulsive use (Solomon, 1977; Koob & Le Moal, 2001; Robinson & Berridge, 2003). On the other hand, stimulus-response (S-R) learning hypothesis considers addiction as an automatic habit learned from repeatedly performing cognitively guided behaviors (Robinson & Berridge, 2003). While S-R is effective in explaining drug-consuming behavior, it somewhat overlooks the motivational aspect in compulsive drug-seeking behavior. A more holistic perspective called incentive sensitization theory suggests that drug pursuit is a behavior mediated by enhanced sensitivity and salience, which is caused by the habitual use of drugs (Robinson & Berridge, 2003).

In sum, these traditional theories identified behaviors and motivations as two focal components in addiction research. Essentially, the behavioral aspect of addiction can be explained as a habitual and automatic process; in contrast, the motivational aspect is more related
to the reinforced salience of incentives derived from engaging in addictive behaviors and heightened sensitivity to addiction-related cues. Applying this knowledge to addictive use of technology, specifically text chatting, it would be safe to argue that excessive use of instant messaging is a habitual or automatic behavior that is driven by certain psychological gratifications or incentives that are perceived as more valuable. However, what exactly makes text chatting so attractive and addictive? What do users get from constantly text chatting? To answer these questions, a more refined understanding of non-substance addiction such as addictive use of technology is necessary. The following sections briefly review technology addiction with a focus on Internet addiction to support further discussion.

**Addiction in a Technology Context**

Since the 1990s, a series of studies reported negative consequences related to technology use, such as academic failure (Brady, 1996) and relationship discord (Quittner, 1997). These problematic outcomes followed a pattern that is similar to other types of addiction, such as drug, alcohol, or gambling addictions; accordingly, experts labeled obsessive technology use as technology addiction (Young, 1998; Turel, Serenko, & Giles, 2011). However like defining general addiction, defining technology addiction has also been controversial (Turel et al., 2011; Vaghefi & Lapointe, 2014). Terms such as Internet addiction disorder (Yang & Tung, 2007), compulsive Internet use (Meerkerk et al., 2010), and computer addiction (Shotton, 1991) have been used to identify different aspects of technology addiction (Turel et al., 2011). Among these topics, Internet addiction is one of the most commonly used terms, referring to all digital media devices for the sake of simplicity (Greenfield, 2007). With this logic and considering that instant
messaging is also one of the services provided by the Internet, this study will benefit from a review of major research on Internet addiction.

Building upon previous addiction research, the current study will analyze Internet addiction from its behavioral and motivational components, respectively. Three major areas of research will contribute to these two components individually: the cognitive-behavioral model of pathological Internet use (PIU) categorizes addictive use of instant messaging as a type of generalized PIU; media habits research offers a comprehensive understanding of the behavioral component of such addictive use; uses and gratifications (U&G) explains these behaviors based on user need and motivations. These researches together offer a theoretical foundation for further discussion on the role of interactivity in identifying addictive use of instant messaging.

The Cognitive-behavioral Model of Pathological Internet Use (PIU)

A major contribution of PIU is modeling the process of Internet addiction to explain the etiology, development, and outcomes associated with PIU (Caplan & High, 2007). In general, this model suggests that the cognitive and behavioral symptoms of pathological Internet use tend to be the outcomes of broader psychological problems. Therefore, users’ psychological problems could predispose individuals to have difficulties with cognitive and behavioral impulsive control, thereby lead to negative outcomes associated with Internet use (Caplan, 2010). For example, previous findings have supported that the distal necessary factors such as individuals’ loneliness (Caplan, 2003), social anxiety (Caplan, 2007; Morahan-Martin, 2008), and low social skills (Caplan, 2005) can trigger distorted cognitive thoughts about Internet and online social interaction. These distorted cognitions can lead to persistent and excessive use behaviors (Caplan & High, 2007).
More importantly, the PIU model also classified Internet addiction into specific PIU and generalized PIU. This classification offers a starting point to understand addictive use of instant messaging. According to Davis (2001), specific PIU focuses more on the abuse of certain Internet functions or content, such as online pornography, online shopping, and online gambling. In other words, the Internet serves as a convenient venue providing quick access to realize these addictive behaviors, and eventually leads to overuse of a specific function of Internet. If an online function is not accessible, users will turn to other alternative options for satisfaction. For example, a user who is addicted to pornography tends to overuse Internet when the individual realizes the online availability of the vast amounts of the materials (Davis, 2001; Cooper, Putman, Planchon, & Boies, 1999).

On the other hand, generalized PIU involves excessive use of Internet in general with no “directive purpose” (Davis, 2001). Cognitively, generalized PIU is associated with “obsessive thoughts about Internet, diminished impulse control in online activities, guilt about online use, and experiencing more positive feelings about oneself when online compared with when offline.” (Caplan, 2002, p. 558). In other words, generalized PIU tends to be developed when users are “drawn to the experience of being online in and of itself, and demonstrates a preference for virtual, rather than face-to-face, interpersonal communication” (Young, Xiao, & Li, 2007, p. 7). According to Davis (2001), generalized PIU is affected by the social contexts of users. Lack of social support could cause generalized PIU, such as overuse of chat rooms, e-mail checking, and possibly overuse of text chatting.

With this categorization in mind, the current study would argue that the addictive use of text chatting is one type of generalized PIU, which features excessive use of instant messaging without a directive purpose. However, this model is not comprehensive enough in explicating the
generalized PIU behaviors. Another line of research, media habits, offers a more complete picture of the behavioral aspect of technology addiction.

**Behavioral Aspect of Technology Addiction – Media Habits**

Media habits research (LaRose, Lin, & Eastin, 2003; LaRose, 2010; Song, LaRose, Eastin, & Lin, 2004; Vishwanath, 2015) argued that individuals habitually use a medium after repeatedly obtaining gratification from it. Media habits can be defined then as an automatic media consumption behavior, featuring a lack of awareness, attention, intentionality, and/or controllability, i.e., the media consumer is in a state of deficient self-regulation (LaRose, 2010), or behavioral presentation of addictive media consumption (Everitt & Wolf, 2002). This relationship has been corroborated by several studies, for example, LaRose and Eastin (2004) conducted a survey and found that 40% of the variance regarding Internet use could be explained by habit strength, deficient self-regulation, and Internet self-efficacy while the conventional uses and gratifications variables (e.g., social, activity, status outcome expectations) were no longer significant predictors. A more recent study indicated that deficient self-reaction, which represents the lack of controllability of media habits, was the “single most powerful predictor” of negative life consequences of media use (LaRose, Kim, & Peng, 2010).

According to LaRose (2010), media use behaviors are initially determined by conscious intentions and expected outcomes. However after repetition of a certain media use behavior, the association between the behavior and expected outcomes might be established under stable external (e.g., time, location, etc.) and internal (e.g., mood, goals, etc.) condition cues. Media selection is no longer a conscious act; instead, it becomes automatic and can be triggered when certain external or internal cues are presented.
Media habits research is helpful in that it theorizes the difference between addictive and non-addictive use of a medium. Whether use is addictive depends on the degree of self-regulation in terms of awareness, attention, intentionality, and/or controllability. Addictive use of a medium is considered as non-instrumental and ritualistic because it lacks self-regulatory components.

However, media habits are somewhat limited in explaining the motivational aspect of technology addiction. As discussed earlier, addiction is a combination of dependence (i.e., pursuing pleasurable gratifications) and compulsion (i.e., avoiding an aversive state). Scholars (LaRose, 2010; Yin & Knowlton, 2006) argued that established habitual enactment is maintained by “long-run average outcome expectation” (LaRose, 2010, p. 196) rather than momentary outcome expectations, which indicates that habitual behavior is more about avoiding an aversive state rather than pursuing pleasurable gratifications because it is no longer sensitive to the value of immediate outcome. For example, addictively checking and sending instant messages might be more about fulfilling the need for texting rather than having an informative conversation. Therefore at a behavioral level, one informative text chatting session might not make addicted users more active in future just like one awkward text chatting session might not make addicted users abandon text chatting. However, this does not imply that there is no gratification obtained from addictive instant messaging use because addicted users still have long-run average expectations. So what do addicted users expect? What is the motivation behind addictive use of text chatting? A renewed uses and gratifications perspective offers a comprehensive understanding about the motivational aspect of technology addiction.
Motivational Aspect of Technology Addiction – Process Gratification

As an audience-centered media effects theory, the uses and gratifications paradigm has been used to explain media functions in terms of both intended and unintended effects since the mid-twentieth century (Haridakis, 2013; LaRose, 2007; Rubin, 2009; Ruggerio, 2000). Early scholars such as Katz, Blumler, and Gurevich (1974) provided the theory’s basic assumptions, suggesting that media consumers with social and psychological needs are active and have different expectations when they select and use media. These expectations then lead to different media consumption patterns and generate different need satisfaction and other consequences (including unintended ones). Rubin (2009) refined the model by summarizing five central assumptions of uses and gratifications. The updated assumptions confirmed that the selection and use of media are purposive and goal-directed, and users are active in this process of selection and use. Therefore, media need to compete with other forms of communication or functional alternatives for selection and use. Moreover, individual difference, such as social and psychological factors, mediates media behavior. Finally, “people are typically more influential than the media in this process, but not always” (Rubin, 2009, p. 167). With its focus on user motives, uses and gratifications has been applied to explain media addiction (Park, 2005; LaRosa, 2011; Haridakis, 2013; Sundar & Limperos, 2013). For example, Kim and Haridakis (2009) found that Internet addiction can be predicted by different sets of personality characteristics (e.g., gender, locus of control, loneliness, sensation seeking, and shyness) and motives (e.g., entertainment, escape, and excitement). Park (2005) found that the ritualistic motives (e.g., passing time, escape, etc.) are significantly associated with mobile addiction in college students.
However, one major limitation of these studies is that the gratification typologies reported in these studies are highly overlapped for both old and new media, which tends to limit the gratifications to the ones that have already been identified and overlook new gratifications afforded by new media (Sundar & Limperos, 2013). For example, entertainment gratification has been associated with a wide range of media, including television, Internet, video games, and Twitter.

A more significant drawback of the traditional uses and gratifications theory is the theoretical contradiction between the theory’s assumption of instrumental media use and the purposelessness of addictive behavior. Moreover, this line of research has been using survey method to investigate the motivations driving addictive use of media (e.g., Park, 2005; Kim & Haridakis, 2009). However, if addiction is non-instrumental and purposeless, administering a list of rational motivations to technology addicts tends to capture the rationalization of addictive use instead of the actual motivations (LaRose, 2010). For example, social need or information need can be used to account for individuals’ excessive text chatting, but the addiction to text chatting might be the actual underlying mechanism. This speculation becomes even more plausible in considering that mobile phone users frequently engage in mobile instant messaging during social events (e.g., dinner, live events, or meetings). If using instant messaging is for social connection or informational needs, why do people continue using instant messaging when they already have in-person access to these gratifications? Does this imply that addicted users might obtain a different type of gratification from the addictive behavior?

**Content gratifications vs. process gratifications.** Studies on media gratifications have generally suggested two broad types of gratifications, content gratifications and process gratifications (Cutler & Danowski, 1980; Swanson, 1992; Song, LaRose, Eastin, & Lin, 2004).
In short, content gratifications are more instrumental and cognitively oriented, whereas process gratifications are more cultural or ritualistic (Song et al., 2004). For example, content gratification is associated with gaining new knowledge and information from specific content, which is a result of processing actual media messages (e.g., reading a newspaper or watching TV news programs). In contrast, process gratification is related to the pleasurable experience of using a certain medium, which is a result of media consumption in general (e.g., surfing the Internet without specific purposes or just for passing time) (Cutler & Danowski, 1980; Swanson, 1992). Following this discussion, it would be logical to argue that content-oriented media use is more conscious. It is rooted in users’ real-world life and activities, which could subsequently enhance their connection with their real-world environment. On the other hand, process-oriented media use is more rooted in the consumption of medium itself, which tends to draw users away from their real-world life and environment (Cutler & Danowski, 1980; Song et al., 2004).

At a behavioral level, addicted individuals are drawn away from their real-world life and are preoccupied with addictive activities. More specifically, individuals are obsessed with achieving temporary satiation from performing addictive behaviors. At a motivational level, non-instrumental pleasurable experiences from the process of using media are more likely to drive media addiction. Especially for interactive media (e.g., instant messaging) that offer various affordances, the argument can be further supported when one considers the capability of new affordances in developing new needs during interactions (Sundar & Limperos, 2013). As Sundar and Limperos (2013) suggested:

“(While content gratification,) construed broadly as the pursuit of information and entertainment, may not be altered by the technology, but the process gratifications
relating to the context and method of consuming information and entertainment are likely to be influenced by the interaction opportunities offered by the medium.” (p. 511)

Therefore, if technological features can be a source of gratifications (Lichtenstein & Rosenfeld, 1983; Ruggeiero, 2000; Sundar & Limperos, 2012), experience-based gratifications will always be available once individuals use the media features. For regular users with instrumental purposes, their goal of using an interactive medium focuses on content gratifications while process gratifications are also obtained from using the medium. Therefore, user performance and evaluation will focus on fulfillment of momentary outcome expectation of content gratifications (LaRose, 2010; Yin & Knowlton, 2006). In contrast, for addicted users, their use of an interactive medium will be associated with long-run average outcome expectations that are extracted from repeated experience with a medium (LaRose, 2010; Larose, 2015; Yin & Knowlton, 2006). In this case, addicted users’ goals can be described as process gratifications because such gratifications are always available and obtained from each interactive session. In other words, it is very plausible that, after repeated use, addicts form compulsive behavioral patterns by abstracting pleasurable process gratifications from each interactive experience into an average expectation that replaces other momentary instrumental expectations and functionally maintains their addictive use of a medium. In contrast to non-addicts who should only respond to gratifications of their instrumental needs (i.e., content-oriented gratifications), addicts might no longer actively respond to instrumental gratifications as long as process gratifications are obtained.

To answer the question what makes instant messaging so addictive, the theoretical discussion above suggests that it is more about what technology affordance could provide in order to achieve the craved process gratification? In the case of text chatting, previous research
on interactivity (Bellar & Sundar, forthcoming; McMillan & Hwang, 2002; Rafaeli, 1988; Sohn, 2011; Sundar, Bellur, Oh, Jia, & Kim, 2016; Sundar, Jia, Waddell, & Huang, 2015; Sundar, Kalyanaraman, & Brown, 2003) suggests that message interactivity is the key. Message interactivity, at its basic level, supports a reactive mechanistic message exchange, which guarantees socialness and immediacy once the exchange starts. On the other hand, previous studies have found that message interactivity can significantly enhance content processing and related user experience by supporting fully interactive communication, which makes message interactivity a great tool for facilitating interactive and meaningful interpersonal communications. This capability of improving content processing and offering a social experience makes instant messaging appealing to both addicted users (process-oriented) and regular users (content-oriented), but the non-addicts will always yearn for a fully interdependent communication emphasizing content gratifications whereas addicts tend to ignore meaning interdependency as long as mechanistic exchange is guaranteed. The following sections will specifically discuss how addiction moderates individuals’ use of message interactivity and subsequent psychological responses.

**Interactivity and Interactivity Effects Model**

Due to its ability to shift process of communication from mass transmission to a form of interpersonal exchange (Bucy, 2004; Rafaeli & Ariel, 2012; Sundar et al., 2016), interactivity has been conceptualized and operationalized in different ways over the past two decades (Sohn, 2011; Sundar et al., 2015). What does it mean when we say a medium has a high level of interactivity? Does this mean adding more interface features? Or is it purely based on subjective
user experience? Before discussing message interactivity’s role in addictive use of instant messaging, it is imperative to clarify and establish a consistent understanding of interactivity.

With contributions from different fields including communication, information science, education, and business, interactivity has been generally conceptualized in three different approaches (Sohn, 2011; Sundar et al., 2015; Bellur & Sundar, forthcoming): a functional view, a perceptual view, and a process view. The functional view of interactivity (Sundar, 2007) conceptualizes interactivity as a “technological characteristics belonging to specific media” (Sohn, 2011, p. 2). This approach operationalizes interactivity as the availability of interactive features on a medium. A medium is deemed as having a higher level of interactivity if it has more interactive functionalities, such as hyperlinks, fast responsiveness, multimedia, and etc. However, scholars have argued that such a perspective is limited because the features available on a medium indicates only the potential interactivity of a medium, but users might not be able to perceptually or physically engage with the features, which will prevent them from experiencing interactivity (Bucy, 2004; Ha & James, 1998).

Alternatively, other scholars suggested that interactivity of medium should be defined based on users’ subjective experiences (Bucy, 2004). Interactivity under this view is not only related to technology attributes, but also by individuals’ dispositional characteristics and contextual factors (Sohn, 2011). However, defining interactivity with a perceptual experience can easily confuse interactivity with other factors that can impact user experience, such as usability or even aesthetic quality of an interface. Moreover, the emphasis on usage and experience tend to treat interactivity as a reflection of an individual difference variable (Sundar, 2004), which restricts the validity of the concept as a causal agent in media effects.
The third approach views interactivity from a process perspective (Sohn, 2011; Bellur & Sundar, forthcoming). This view suggests that interaction can only happen when two partners are involved with an interaction in a reciprocal way, indicating that both parties are aware of each other, interpret the other’s intention, and cumulatively exchange semantic information (Rafaeli, 1988; Sohn, 2011). Without such reciprocity, interaction might be only a sequence of sensory or physical action-reaction, which can hardly achieve interactivity. Although some scholars argued that such definition was limited to a one-to-one interaction form that ignored other forms of communication such as mass communication (Bucy, 2004), others (Sohn, 2011; Bellur & Sundar, forthcoming) posited that individuals would still consider asynchronous and “generalized message exchange” (Bagozzi, 1975) (e.g., virtual community, bulletin board, and blogs) to be interactive because of perceived interactivity and the possibility for interaction to happen. Following this principle, Sundar, Kalyanaraman and Brown (2003) operationalized interactivity in terms of the contingency of hyperlinks on a website, which gave users idiosyncratic access to content that is contingent upon their previous actions. This view of interactivity was also labeled as the “contingency view.” (Sundar et al., 2003; Sundar et al., 2015)

Among the three perspectives in defining interactivity, the perceptual view is less appealing to the current study because of the potential confusion of interactivity with other interface and user experiential factors. On the other hand, simply adopting one of the other two perspectives would also be limited since interactivity can afford multiple action possibilities at the interface, source, and process levels, respectively. Therefore, the current study will adopt a more integrative view proposed by Sundar (2007), and define interactivity ontologically as a technology affordance that can act as a source, medium, and message feature, which can
enhance user involvement with an interface and content (Sundar & Bellur, forthcoming; Sundar, 2007). When interactivity serves as a medium feature (i.e., modality interactivity), it can be conceptualized as various methods of interaction offered by an interface. Previous studies have operationalized modality interactivity as different input and output modalities, such as clicking, mouse-over, slider, 3D carousel, and so forth (Sundar, Xu, Bellur, Oh, & Jia, 2011; Sundar et al., 2015). On the other hand, when interactivity serves as a source feature (i.e., source interactivity), it affords the possibility for users to be the source of communication. Interface features such as customization and blogging have been successful operationalizations of source interactivity in previous research (Kalyanaraman & Sundar, 2006; Sundar, Oh, Bellur, Jia, & Kim, 2012). From a process perspective, interactivity can serve as a message feature (i.e., message interactivity) in a way to support a reciprocal and interdependent communication between two interactants. As the key variable being examined in this study, further discussion on message interactivity will be provided in the following sections.

**Interactivity Effects Model**

Source, message, and medium interactivity comprise interactivity affordance. Its effects can be tested by adopting the theoretical framework of interactivity effects model from the theory of interactive media effects (TIME) (Sundar et al., 2015). As an affordance, interactivity suggests action possibilities (Gibson, 1977; Norman, 1999), which can be either perceived (as interface cues) or real (as actual functions that can be used). Therefore, according to Sundar et al. (2015), interactivity affordance can affect users in two routes, an action route (i.e., ontological user action triggered by interface features) and a cue route (i.e., perceptual consequences triggered by sheer presence of affordances). Because the current study focuses on addictive
behaviors in which individuals physically interact with the interface features, we will specifically adopt the action route. The action route suggests that user engagement and related outcome variables (e.g., knowledge, attitudes, and behaviors) will be affected by use of modality, source, and message interactivity via psychological mechanisms including perceptual bandwidth, contingency, and sense of agency, respectively (see Figure 1).

The current study adopts this model because this model helps us answer the question what makes instant messaging addictive. The affordance perspective makes it possible to precisely manipulate users' actions at different levels by varying action possibilities, which is critical to the current study. On the other hand, this model helps us answer why the specific technological affordance makes instant messaging addictive. The model encourages and identifies mediating variables. This allows the current study to explain the interaction between technological variables and instant messaging addiction, which can shed light on identifying the potential gratifications associated with addictive use of text chatting.

Figure 1. Interactivity Effects Model
Message Interactivity – A Tale of Two Interactions

Interactivity has played a fundamental role in the process of communication beginning with an earlier linear model of communication proposed by Shannon and Weaver (1949) to a bidirectional communication model, which focuses on message exchange and allows role exchange between receivers and senders. Most scholars, therefore, follow the notion of “conversational ideal” (Schudson, 1978, p. 323) and define interactivity in terms of ideal characteristics of interpersonal communication, such as bidirectional communication (Liu & Shrum, 2002), user control (Coursaris & Sung, 2012; McMillan & Hwang, 2002; Steuer, 1992), responsiveness (Coursaris & Sung, 2012; Rafaeli, 1988), synchronicity (Liu & Shrum, 2002), and reciprocal communication (Ha & James, 1998). However, simply defining interactivity with these terms might confuse the concept with its psychological effects and omit the actual technological features that could elicit these effects. With a more ontological focus on interface characteristics (or technological affordances), Sundar et al. (2003) offered a contingency view of interactivity, which can be labeled as “message interactivity” (Sundar, 2007).

The contingency model was proposed by Rafaeli (1988) to describe interpersonal communication as an iterative process in which “… any third (or later) transmission (or message) is related to the degree to which previous exchanges referred to even earlier transmissions” (Rafaeli, 1988, p. 111). Viewed from this perspective, a communication process can be categorized into three levels along a continuum of message contingency, ranging from non-interactive (i.e., messages created by two parties are independent of each other) to reactive (i.e., messages created by one party are only based on a previous message), to fully interactive (i.e., messages created by two parties are interdependent and based on several previous messages). Using a political news conference as an example, Rafaeli (1988) suggested that non-interactive
communication is a scenario that reporters are allowed to ask questions after a politician’s speech. This scenario becomes reactive communication when the politician answers a reporter’s question. However, such simple exchange is not really interactive, unless more follow-up questions from the reporter are answered by the politician in an interdependent way.

Building upon the contingency principle, message interactivity as a technology affordance can operate at a fully interactive level, the key here is interdependency or contingency of the messages in exchange (Sundar et al., 2016; Sundar et al., 2003; Sundar, 2007). In an instant messaging system, message interactivity at a contingent level suggests that the messages created and exchanged by two parties are based on their previous conversation. Such contingent message exchange helps users better connect opinions, information, or facts delivered through text chat into one threaded and coherent pattern (Bellur & Sundar, forthcoming; Sundar et al., 2016), and thereby leads to full interactive communication. Does this suggest that message interactivity will always be operated at a contingent level and support full interactive communication? Not necessarily. Interactivity affordance as action possibilities are interpreted and used by users. Having certain rounds of message exchange is a necessary condition for building interactive communication (Bellur & Sundar, forthcoming; Rafaeli, 1988; Sundar et al., 2003; Sundar, 2007); however, this does not necessarily indicate that message exchange will always lead to interactive communication. Then, can message interactivity be operated only as message exchange?

A brief examination of the early discussion on interactivity supports this assumption. Ha & James (1998) defined interactivity “in terms of the extent to which the communicator and the audience respond to, or are willing to facilitate, each other’s communication needs” (p. 461), which emphasizes interactivity as a responsive process of mutual communication actions.
Haeckel (1998) further distilled the essence of interactivity into a process of exchange. Similarly, Heeter (2000) endorsed the exchange perspective by defining interaction as “an episode or series of episodes of physical actions and reactions of an embodied human with … the environment and objects and beings in the world.” A common theme of this line of research delineates exchange as a process or actual activity of interacting, which has been a “big missing piece” in research on interactivity effects (McMillan & Hwang, 2002; McMillan, 2005).

Therefore, we can identify message exchange as another feature of message interactivity (Sohn, 2011). However, what makes message exchange different from message interactivity in a text chat? Steuer (1992) suggested, “interactivity is the extent to which users can participate in modifying the form and content of a mediated environment in real time” (p. 84). In a text chatting session, if we consider the contingency feature focusing on “modifying content,” then the process of presenting the content (i.e., message exchange) can be considered as user actions of modifying the form of a mediated environment. Taking a daily scenario of making a dinner appointment via instant messaging as an example, two people might finalize their appointment within two message exchanges (A: Having dinner at time and location. B: Sure) while other people might need multiple rounds of message exchange to make the same plan (A: Having dinner? B: Sure. A: Time. B: Sure. A: Location. B: Sure.). In this case, the two groups essentially delivered the same content but in different formats (i.e. number of message exchange).

Therefore, message exchange is not necessarily bound to message interactivity and can be different from message interactivity as it focuses more on the mechanistic aspect of exchange, or the action of message exchange.

Quiring and Schweiger (2008) divided interactivity into three dimensions: action, evaluation of situation, and exchange of meaning. With exchange of meaning referring to content
processing, the action dimension captures the mechanistic part of human-system interaction. Extending from this categorization, Sohn (2011) proposed that interactivity should be understood at three distinct dimensions: sensory (i.e., availability of multimedia or functional features), semantic (i.e., mutual recognition and involvement in meaning interpretation), and behavioral (i.e., active user control and ability to change the interaction process), which together afford interactive communication. When message interactivity is operated as message contingency, it allows users to engage at both semantic and behavioral levels, supporting full interactive communication. However, when it is operated as mechanistic message exchange, message interactivity is more associated with the behavioral dimension. In this case, users are aware of each other and can still influence the process of communication through creating and sending texts as they want. However because of the lack of interdependency, the communication between two partners is more likely to be a reactive interaction (Rafaeli, 1988).

In sum, message interactivity in an instant messaging system can afford communication at two levels, reactive communication based on mechanistic message exchange and interactive communication based on contingent message exchange. Users can engage in different types of interaction depending on how they perceive and use the affordance. According to TIME as well as the interactivity effects model (Sundar et al., 2015; Sundar, 2007), these different ways of using message interactivity could trigger different psychological mechanisms, which then influence user engagement with the content and interface, and subsequent attitudinal, cognitive, and behavioral outcomes. The following sections will discuss each type of action and related effects based on theories and previous research, which in turn will contribute to our understanding of the psychological benefits associated with message interactivity.
For the sake of clarity, this paper will use message interactivity to describe the feature of contingent message exchange. However for the feature of mechanistic message exchange, “message exchange” will be used. The following sections will focus on how message interactivity and message exchange influence cognitive, attitudinal, and behavioral outcomes via respective psychological mechanisms. Message exchange in a context of text chatting is indeed fundamental because message interactivity and contingency cannot be established without basic message exchange. However, the current study will first introduce message interactivity and related psychological mechanisms to help offer a full picture of interactive communication among regular users. Then we will move to reactive communication based on basic message exchange as it directly contributes to addictive use of text chatting.

Message Interactivity Affording Interactive Communication

**Perceived contingency and perceived interactivity.** The positive effect of message interactivity on user attitudes and behaviors have been examined and supported in multiple studies. For example, in a human-computer interaction (HCI) context, message interactivity has been operationalized as structural hyperlinks that allow users to construct an idiosyncratic path to access information during their browsing (Sundar et al., 2003; Sundar & Kim, 2005; Sundar et al., 2012). In these studies, hyperlinks embedded in websites afford action possibilities of clicking to explore content presented in multiple layers. In comparing with presenting the same content in one page (i.e., non-interactive), the studies found that message interactivity that was built through user actions of clicking hyperlinks and receiving responses (i.e., requested content) that are relevant to their previous inputs positively influenced outcomes such as attitudes, experience, content engagement, and information learning. Therefore,
H1: Message interactivity will be positively related to a) user attitude b) satisfaction, and c) behavioral intentions.

According to the interactivity effects model, one important psychological mechanism underlying the effects of message interactivity is the sense of contingency. With the enhanced interdependency of exchanged messages, users tend to perceive that interaction partners are contingently responding to them. As a result, users are more likely to engage with the interface and content, which would then lead to more positive attitudes, experience, and behavioral outcomes (Sundar et al., 2016; Sundar et al., 2015). For example, in a more recent study that operationalized message interactivity through visualizing users’ interaction history (i.e., searching and browsing records) on a movie recommendation site (Sundar et al., 2016), findings revealed that the website registering more interaction history could imbue a greater sense of contingency, which in turn enhanced user engagement, followed by improved attitudes and behavioral intention toward the site. In a context of interacting with a text-chat based health assessment system, Bellur and Sundar (forthcoming) also found that message interactivity allows interaction partners to actively respond to one another’s inputs in a more relevant and reciprocal way, thereby helping users semantically connect and process the received information. This interactivity will invite users to greater engagement and result in subsequent positive attitudinal and behavioral outcomes.

On the other hand, perceived interactivity is another psychological mechanism that could mediate the positive effects of message interactivity. For example, in Sundar et al. ’s study (2003), three versions of a political candidate’s website that had identical content but varied in message interactivity were created. The low interactivity version presented all the information on one page; in contrast, medium and high level of interactivity sites offered one and two additional
layers of hyperlinks respectively. The study supported a linear relationship between perceived interactivity and manipulated message interactivity. Moreover, their findings suggested that levels of interactivity significantly affected users’ perception of the candidate as well as attitudes toward policy positions; a medium level of interactivity was preferable to the low and high interactivity conditions. This inverted V pattern of the effects of message interactivity on impression formation could be caused by message scrutiny elicited by high interactivity, which also indicates a positive effect of message interactivity on user engagement with content.

This literature suggests that message interactivity tends to lead to positive content engagement and subsequent user attitudes and experiences via these two routes: perceived contingency and perceived interactivity. However, actual studies testing these two mediating paths have generated inconsistent findings. While perceived contingency, as expected, was positively influenced by message interactivity, Bellur and Sundar (forthcoming) actually found negative effects of message interactivity on perceived interactivity, where the low message-interactivity condition was rated as the most interactive when compared to medium- and high-message interactivity conditions. The authors suggested that such counter-intuitive findings indicated that perceived contingency and perceived interactivity might be two distinct psychological outcomes, that perceived interactivity is simply about perceiving the existence of “two-way” communication (Liu, 2003; McMillan & Hwang, 2002), so additional contingency cues embedded in the interface might actually impede this perception.

Although this interpretation is reasonable, it does not completely explain why full interactive communication based on contingency principle (Rafaeli, 1988) is not perceived as interactive. One possibility could be that perceived interactivity might be a psychological outcome mediated by perceived contingency. Bellur and Sundar (forthcoming) argued that
perceived interactivity might rest mainly in the imaginary abilities of the user; therefore, ontological manipulation of message interactivity might not necessarily lead directly to corresponding perceived interactivity. At the same time, if Rafaeli’s model is valid, a communication process that makes users feel contingent should also positively influence the perceived interactivity of the whole communication. Therefore, instead of treating perceived contingency and perceived interactivity as two parallel mediators, the current study hypothesizes:

H2: The effects of message interactivity on user attitudes, satisfaction, and behavioral intentions will be mediated by perceived contingency, perceived interactivity, and user engagement in a serial fashion.

In sum, when message interactivity operates at its best, it guarantees semantic interdependency in addition to message exchange. Subsequently, a more interactive communication will be fostered with higher levels of user engagement via enhancing perceived contingency and interactivity. Such use supports content-focused text-chatting sessions that fit most regular messaging users. However, text chatting is not always about obtaining contingency and sense of interactivity. It can also be a process-oriented activity. In this case, content is no longer important to the users. Instead, uses of instant messaging are for purely enjoying of message exchange or obtaining process gratifications from usage. Intuitively, this is unreasonable and illogical. Why do we even bother to message each other if we do not really process those exchanged content? What are the process gratifications obtained from message exchange? With the deprivation of semantic contingency, how does message exchange, as the only afforded action, influence user psychological outcomes and experience? The next section will discuss this special case of message exchange.
Message Exchange Affording Reactive Communication

As discussed, message exchange focuses on mechanistic message exchange. In this case, use of instant messaging becomes a mere behavior of exchanging texts. Communications between individuals are reactive because of a lack of semantic interdependency or contingency. According to TIME (Sundar et al., 2015), actions triggered by an interface feature tend to elicit related psychological correlates, which could subsequently foster and/or gratify related psychological needs (Sundar & Limperos, 2013). Then what are the psychological mechanisms that are associated with the process of mechanistic message exchange? According to Sundar and Limperos (2013), users expect interactive media to be responsive to their actions. Moreover, use of Internet is often associated with a need for social contact and reinforcement (Davis, 2001), which can be more salient in instant messaging use. Therefore, with users’ focus on process gratification, it seems that responsiveness and social presence in a process of message exchange are more important and provide immediate gratifications in contrast to text chatting that is interactive and contingent. The following section will further discuss these two psychological mechanisms in message exchange.

Perceived responsiveness. When Rafaeli (1988) labeled his interactivity model as a “responsiveness model,” he indicated the importance of responsiveness in an interactive communication process. However, Rafaeli’s model defined responsiveness more from a content perspective, which, to some extent, equates responsiveness to contingency. This study suggests that these two concepts should be examined separately in which contingency hinges on message interactivity and can only be realized in full interactive communication; in contrast, responsiveness is more connected to the process of message exchange and can be obtained in reactive communication.
Previous studies, such as Miles (1992), have suggested that responsiveness is more about displaying messages to the message receiver. Steuer (1992) categorized speed as one of the major components of interactivity, arguing that responsiveness is “the rate at which input can be assimilated into the mediated environment” (p. 15). Therefore, responsiveness seems to be more influenced by the mechanistic aspect of an interaction process. An example is pressing controller buttons and immediately seeing a game character move accordingly (Steuer, 1992). In a text chatting session with the same amount of content being delivered, more message exchanges tend to give users quick role exchange between two communicants. Fortin and Dholakia (2005) have suggested that such quick role exchange could give users a sense of responsiveness.

Moreover, with heightened perception of responsiveness via message exchange, the current study expects that user engagement and subsequent interaction outcomes such as attitudes, satisfaction, and behavioral intentions will also be elevated. TIME theory (Sundar et al., 2015) has proposed that perceived responsiveness could enhance user engagement. An interesting finding from Oh and Sundar’s study (2013) indicated that only in the absence of a high level of modality interactivity (i.e., slider) the mediating effects of message contingency on the relationship between message interactivity and user engagement and other attitudinal outcomes would be significant. Such a finding implied that a more responsive feature (i.e., a slider that visualizes the changes in a picture) could provide users with more direct and immediate responses to their input, which might overpower the effects of perceived contingency on user engagement. Such findings have also been identified in other contexts such as video game (Shafer, Carbonara, & Popova, 2011) and mobile phone use (Chun, Lee, & Kim, 2012). Therefore, the current study proposes:

H3: The number of messages exchanged in a text chatting session will positively
influence perceived responsiveness.

H4: Perceived responsiveness will positively influence a) user engagement, b) attitudes, c) satisfaction, and d) behavioral intentions.

**Sense of social presence.** In addition to responsiveness, having a constant message exchange with another communicant could also imbue a sense of social presence. Social presence has been explicated from both a media perspective (i.e., termed as social presence) and a user perception perspective (i.e., termed as co-presence) (Nowak & Biocca, 2003). The current study will treat social presence as a psychological outcome connected with the use of instant messaging, which will consider social presence as a sense of copresence.

Scholars have identified various factors of copresence, such as sensory awareness of others (Goffman, 1959; Nowak & Biocca, 2003; Biocca, Harms, & Burgoon, 2003) and mutual awareness (Goffman, 1959; Biocca et al., 2003). In a mediated environment, sensory awareness of others can be realized through embodiment of others as avatars or agents (Cassell, 2000; Nowak & Biocca, 2003). In contrast, mutual awareness emphasizes “persons uniquely accessible, available and subject to one another” (Goffman, 1959, p. 22), which requires others’ reactions to the user as a validation of their “existence” (Heeter, 1992). According to Biocca et al. (2003), mutual awareness can be broadly understood as “being together” (de Greef & IJsselsteijn, 2001), which is the core component of social presence. Along with this notion, previous studies have observed that users often use instant messaging indirectly for creating and maintaining a sense of connection to others by simply monitoring their buddy lists without necessarily wanting to interact (Nardi et al., 2000). These “awareness moments” (p. 84) are not for information exchange, rather just for informing users that others are around. If users could experience the “awareness moments” by just monitoring the friend list, then engaging in a
session of message exchange is very likely to enhance that experience. Especially with the ubiquity of mobile devices, instant messaging is accessible almost anytime anywhere, which allows message exchange in a more synchronous way. It has been argued that such instantaneous message exchange can imbue a sense of temporal co-presence (Nardi et al., 2000). A more recent study (Park & Sundar, 2015) has supported the argument and found that synchronicity of instant messaging positively affects participants’ sense of social presence. Regardless of the content being delivered in a text chatting session, when many messages are exchanged between two communicants it essentially suggests a more synchronous process of message exchange, which then can lead to stronger sense of social presence. Therefore, the current study proposes,

H5: Number of message exchange in a text chatting session will positively influence sense of social presence.

Sense of presence has been consistently supported as an influential factor in media users’ enjoyment, involvement, and attitudes toward websites and content (e.g., Heeter, 1995; Lombard & Ditton, 1997). Social presence could enhance a series of psychological outcomes in various contexts, user involvement with online advertising (Fortin & Dholakia, 2005), user attitudes and behavioral intention with product and brand (Choi, Miracle, & Biocca, 2001), enjoyment of interaction with robot (Lee, Peng, Jin, & Yan, 2006), effectiveness of online persuasion (Holzwarth, Janiszewski, & Neumann, 2006), and even loyalty to public computers (Sundar, 2004). Building on these previous studies, the current study proposes:

H6: Social presence will positively influence a) user engagement, b) attitudes, c) satisfaction, and d) behavioral intentions.
Moderating Effects of Level of Addiction

Two modes of using instant messaging, message interactivity and message exchange, have been described in detail. Message interactivity can afford interdependent and reciprocal information exchange between two communicants, which establishes full interactive communication deemed as more contingent and interactive. Message exchange affords only simple mechanistic message exchange between two communicants. Such use of instant messaging can establish reactive communication that could enhance users’ sense of responsiveness and social presence.

Sundar and Limperos (2013) have suggested that new interactive affordance itself could be the source of process gratifications when using the interactive feature. On the other hand, traditional uses and gratifications research have also argued that users actively select media to fulfill their instrumental, goal-oriented gratifications. Instant messaging can offer both types of gratifications via message interactivity affordance.

The current study defines addictive use of instant messaging as a type of generalized pathological Internet use, which features excessive use of instant messaging without a directive purpose. It is an automatic behavior that lacks awareness, attention, intentionality, and/or controllability. Motivationally, such addictive use is maintained by long-run average outcome expectations, which is theorized as certain process gratifications obtained from the process of using instant messaging.

Therefore, message interactivity can support contingent interaction between two communicants, which enhances semantic meaning exchange and content processing because it provides communicants with a well-connected thread of information. If users are goal-oriented and use instant messaging for content gratifications, they are more likely to value message
interactivity. On the other hand, message exchange can support only reactive communications featuring mechanistic message exchange, which emphasizes user actions and experience (e.g., sense of responsiveness and social presence). After repeated use of instant messaging, obtaining sense of responsiveness and social presence from using instant messaging might become a long-run average outcome expectation since these two process gratifications are steadily available as long as there are message exchange (LaRose, 2010; Larose, 2015; Yin & Knowlton, 2006). In other words, addicted users form a compulsive behavioral pattern by abstracting the pleasurable process gratifications (i.e., sense of responsiveness and social presence) from each interactive experience into an average expectation that replaces other momentary instrumental expectations and functionally maintains their addictive use of a medium. Therefore, addicts are less likely to respond to those momentary outcome expectations (e.g., content gratification) and tend to prioritize process-oriented experience and exclusively seek these gratifications from instant messaging use. For addicted users, interactive communication will be no longer necessary as long as they can perform enough mechanistic message exchange to fulfill their average expectations of sense of responsiveness and social presence. As discussed, the current study proposes

H7: There will be a two-way interaction effect between level of addiction and message interactivity on a) user engagement, b) attitudes, c) satisfaction, and d) behavioral intentions, in which the positive effects of high message interactivity on these outcomes will appear only for non-addicts.

H8: There will be a two-way interaction effect between level of addiction and message exchange on a) user engagement, b) attitudes, c) satisfaction, and d) behavioral intentions, in which, the positive effects of high message exchange on these outcomes will appear only for
addicts.

H9: There will be three-way interaction effects among level of addiction, message interactivity, and message exchange on a) user engagement, b) attitudes, c) satisfaction, and d) behavioral intentions. Non-addicted users will react positively to a large number of message exchanges only under high message interactivity condition; in contrast, for addicted users, their positive reactions toward a large number of message exchanges will not be a function of message interactivity.

The Role of User Engagement

In both the interactivity effects model (Sundar, 2007) and TIME (Sundar et al., 2015), user engagement has been proposed as an important mediating variable. Several studies have tested and supported that the effects of message interactivity on a list of outcome variables are mediated by user engagement (e.g., Bellur & Sundar, forthcoming; Dou & Sundar, 2013; Sundar et al., 2016; Sundar, 2007), which is also proposed in the current study. In fact, if we consider user engagement as a continuous process (Oh, Bellur, & Sundar, 2010), an entire instant messaging session (be it addictively or non-addictively) can be framed as a process of user engagement. However with user engagement being such a multi-dimensional concept, users can engage with the same media interface and content at very different levels (Oh & Sundar, 2013). Then, will the differences between addicted and non-addicted users and differences between message interactivity and message exchange lead to different levels of user engagement?

User engagement has been conceptualized in different ways — as absorption and transportation in narrative content research (Slater & Rouner, 2002); aesthetic and sensory appeal, attention focus, awareness, playfulness, and positive effects in human-computer
interaction (O’Brien & Toms, 2008; Webster & Ho, 1997); as well as cognitive effort in information processing (Stoney & Oliver, 1999; Oh, Bellur, & Sundar, 2010).

A recent study defined engagement from two aspects, psychological experience and behavioral experience, and proposing a continuum of user engagement (Oh et al., 2010). Under this framework, user engagement is initiated by physical interaction with an interface, which can lead to cognitive experience (i.e., activation of sensory mechanism and preliminary mental involvement, e.g., paying attention, preliminary information processing, visual and motion perception, etc.), that subsequently results in absorption (i.e., consciously involved in an interaction with full focused attention), and finally leads to outreach (i.e., sharing and distributing the content).

Oh et al.’s classification (2010) also makes it possible to compare between engagement with interface and engagement with content. Specifically with modern interactive media, users can start with interacting with interface features (e.g., sending and receiving text messages) and promote to more immersive experience with the system and content (e.g., information delivered by messages) (Oh et al., 2010). Moreover, Sundar et al. (2015) suggested that engagement with interactive features could enhance content engagement. Studies (e.g., Sundar et al., 2016; Sundar et al., 2003) have shown that engagement with message interactivity could trigger more systematic engagement with content via contingency. In fact, Oh and Sundar (2013) demonstrated that greater message interactivity elicits greater message elaboration, which is an indication of a higher level of content engagement. Integrating this knowledge into our earlier discussion, it is reasonable to expect that non-addicted users who focus on content will prefer message interactivity, and message interactivity that supports a contingent message exchange will lead to more content engagement as Oh et al. (2010) suggested.
Engagement with interface feature will not always trigger a higher level of content engagement, especially when users do not even have a clear intention for content processing. In this case, an interaction with interface features might be more associated with cognitive experience, which features the activation of sensory mechanism and preliminary mental involvement (Oh et al., 2010). Oh and Sundar (2013) have found that modality interactivity, such as a slider function on a website, could enhance sense of presence and imagery engagement (i.e., defined as a type of cognitive experience engagement) and subsequently resulted in attitudinal change. Such results indicated that cognitive experience engagement is more associated with actual user actions on an interface and related feedback. It could be that for addicted IM users who seek gratification from texting actions, their preference and use of message exchange features will lead to more focused and immersive experience, or absorption (Oh et al., 2010). Together, the current study proposes:

H10: A higher level of message interactivity will lead to greater content elaboration.

H11: More message exchange will lead to cognitive absorption.

H12: Level of addiction will lead to different types of user engagement in which non-addicted users tend to achieve content elaboration whereas addicted users tend to achieve cognitive absorption.
Figure 2. Proposed Model
Chapter 2

METHOD

To test the hypotheses, a 2 (Message Interactivity: Low vs. High) x 2 (Message Exchange: Low vs. High) x 2 (Levels of Addiction: Low vs. High) between-subjects factorial experiment was employed. Message interactivity and message exchange were manipulated, and level of addiction was a measured variable. A total of 196 participants completed the study. However, eight participants were not included in the analysis because of missing data. Participants were randomly assigned to one of four message interactivity conditions and asked to complete a text chatting session with a conversation partner (i.e., research confederate) by using their own cell phones. Because the purpose of this study is to examine how message interactivity will interact with users’ level of instant messaging addiction, the conversation topic and content were kept constant across the four conditions. The topic focused on choosing the first credit card for college students. The current study chose this topic because it is relevant to the participants and also offers a good context for message interactivity and message exchange manipulation.

Participants

A total of 278 participants were initially recruited from a U.S. large public university in the Northeast. Upon successful completion of the study, all the students received extra credit, as determined by their respective course instructors. Because the current study is an online experiment, to increase study validity, three validation questions, which requested specific
responses to continue the study, were inserted into the questionnaire. Participants who failed to select the specified response were directed to end the study without recording their responses. A total of 196 valid responses were obtained. In the final analysis, because a structural equation modeling approach does not tolerate missing data, another eight participants were excluded from the final analysis.

In total, 188 participants were included in the current study. Among them, 30% are male \( (n = 57) \) and 70% are female \( (n = 131) \). As all the participants are college students, participants’ ages range from 18 to 28 years old, averaging 20.49 years old \( (SD = 1.26) \). In terms of race, a majority of the participants are Caucasian \( (78.2\%) \), followed by Asian \( (10.6\%) \), Hispanic \( (6.4\%) \), African-American \( (2.7\%) \), and other \( (2.1\%) \).

**Procedure**

The current study collected data via an online experiment. After reading the informed consent statement, participants who agreed to take the study were asked to complete a pretest questionnaire measuring their levels of addiction, power usage, preference for online social interaction, issue involvement, and general media usage. After the pretest questionnaire, participants were assigned to one of the four conditions to complete an IM chat session with a service agent (i.e., researcher): high message interactivity and high message exchange \( (n = 49) \), high message interactivity and low message exchange \( (n = 46) \), low message interactivity and high message exchange \( (n = 44) \), and low message interactivity and low message exchange \( (n = 49) \). After the IM chat session, participants were instructed to finish their posttest questionnaire measuring a series of mediating variables, dependent variables, and their demographic information. Approximately, it took 30 to 40 minutes to complete the whole study session.
Participants were made to believe that they were participating in a user test on a newly launched financial service called Credit Smart, which is a collaborative project developed by the College of Information Sciences and Technology, College of Communications, and Smeal College of Business at Penn State, with a purpose to help young adults, such as college students, establish good credit history. Participants were told that this new mobile website features a messaging-based personal financial service that can be conveniently accessed on their smartphones, and their task was to test use this new service and offer feedback.

**Stimulus**

A mobile website, Credit Smart, was created by using the online webpage design tool wix.com. This website can be accessed via [http://www.crsmrt.com/](http://www.crsmrt.com/). A mobile version of the website was automatically displayed based on the device. The purpose of creating this website was to offer a platform for conducting mobile IM chats. Therefore, the content on the website was kept as constant.

Once participants were on the site, they could find a “CHAT WITH US” button on every page of the site. Participants could explore the website as much as they wanted before they started the chat session. Once they clicked the chat button, they were connected to a service agent named Ryan (i.e., the researcher) to complete a service chat. The chat function of the website was supported by Tidio Live Chat, a chat service provider that offers the live chat gadget that can be conveniently embedded in a website.

As the study focuses on examining the effects of technological affordances, the chat content and topic were controlled as constant across the conditions. However, conducting a fully scripted IM chat could also severely impede the ecologic validity and user experience. Therefore,
the current study employed a scenario-based persona that gave participants the information they needed to complete the chat session without much content variance. Participants were told that, to protect their personal privacy, they would be randomly assigned one of 12 personas, they should assume the assigned persona as their identity during their conversation with the service agent; however, all participants would receive the same persona named “Alex.”

**Scenario.** The following persona was displayed to the participants.

“Your name is Alex, and you are 20 years old. Currently, you are a sophomore at Penn State.

During your leisure time, you like to do online browsing and shopping. You also love to travel; therefore, you are interested in deals for hotel accommodations. But you do not really like flying. Instead, you like driving by yourself because you can stop at different places and cities. So you are interested in saving money on gas. Other than traveling, you also like to cook; therefore, you do not really like to dine in restaurants.

When considering your spending, understand that you recently started working as a part-time computer lab manager. You are thinking about applying for your first credit card. This is meaningful and important; however, you do not really know much about credit cards.

With this information in mind, you plan to use a new consulting service designed for young adults and students called Credit Smart. It offers very personalized financial guidance by assigning a personal consultant just for you. You decide to give it a try.”

In addition, each participant also received a persona summary that displayed persona information in a more concise way. Once participants finished reading the persona, they would be instructed to open the Credit Smart site on their mobile phone. Participants were instructed to
keep the persona summary page open on their computer screens as that they could refer back to
the persona information if they need.

**Independent Variables**

**Message interactivity.** This independent variable was manipulated based on the
principle of contingency proposed in previous studies (Rafaeli, 1988; Sundar et al., 2003; Bellur & Sundar, forthcoming). The conversations between the confederate and participants were
developed based on the provided scenario. In the low message interactivity condition,
participants would have a simple IM conversation with the confederate in a reactive way
(Rafaeli, 1988). Specifically, the low message interactivity condition was operated as simple
back-and-forth message exchanges, which could be divided into smaller action-and-reaction
segments. For this condition, the confederate would text participants either in a statement or
question format, participants would reply, and then the Confederate would move to next
question. The confederate would not refer to any previous messages and only offer standard
responses in this condition. A conversation session at the low level of message interactivity was
composed by such simple back-and-forth message exchanges (see Figure 3).
Conversely, in the high level of message interactivity condition, the conversations were constructed in a more interdependent way. After participants’ replies, the confederate would not only give tailored responses but also refer to participants’ answers in the responses. For later replies, the confederate would construct messages to not only to refer to the most immediate response but also earlier responses offered by participants (See the bolded part in Figure 4). By doing so, each conversation session at the high level of message interactivity condition was constructed in a cumulative way. This would not only make each message more reciprocal to

**Figure 3. IM Chat in the Low Message Interactivity Condition**

<table>
<thead>
<tr>
<th>Participants</th>
<th>Confederate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Thanks. Do you travel very often?</td>
</tr>
<tr>
<td>Yes</td>
<td>Hotel cards can help you earn hotel points quickly and redeem them for free nights or upgrades.</td>
</tr>
<tr>
<td>No</td>
<td>Do you do a lot of online shopping?</td>
</tr>
<tr>
<td>No</td>
<td>Cashback or reward points cards can earn cash or points rewards for making purchases.</td>
</tr>
<tr>
<td>No</td>
<td>Do you dine out frequently?</td>
</tr>
<tr>
<td>No</td>
<td>Dining cards offer more rewards for restaurant spending, even including for fast-food.</td>
</tr>
<tr>
<td>No</td>
<td>Do you fly very often?</td>
</tr>
<tr>
<td>No</td>
<td>Airline mileage credit cards are for earning airline miles to redeem flight tickets.</td>
</tr>
</tbody>
</table>
each other, but also imply potential information branching, thereby enhancing the perceived relevancy of the messages and form a complete looping mechanism through the whole conversation.

**Participants**

**Confederate**

Thanks, Alex. Do you travel very often?

Yes

**OK, since you travel often, student cards with hotel rewards can be a good option for you.** You can earn hotel points quickly and redeem them for free nights or upgrades.

In addition to traveling often, do you do a lot of online shopping?

Yes

**Sure, as you do a lot of shopping, we can also consider student cards offering purchase cashback. You can earn cash or points rewards for daily purchases.**

OK Alex, I have hotel rewards and shopping benefits checked for you. How about dining out... Do you dine out frequently?

No

**OK, then let's skip dining related card benefits.**

Then how about air travel rewards? **When you travel, do you fly very often?**

No

**No problem: Considering that you do not fly often, we can also skip the airline mileage feature.**

One more question, Alex. Since you mentioned earlier that you like road travel, I assume you are also interested in gas rewards?

Figure 4. IM Chat in the High Message Interactivity Condition
**Message exchange.** Following the conceptual definition, the current study operationalized message exchange as mechanistic exchange of text messages (i.e., back-and-forth message exchange). In a low message exchange condition, a text message conversation between each participant and the confederate consisted of relatively few rounds of message exchange. To achieve this design, each message from the confederate contained more questions requesting information from a participant; therefore, more information was communicated in each round of message exchange. Subsequently, fewer message exchanges were needed to deliver the same overall amount of information. Below is a short example excerpted from the low level of message exchange condition, where the confederate collected a participant’s name and age information within one round of message exchange:

> “**Confederate:** Sure. I will help you choose the best credit card. Can I start by asking for your name and age?

> **Participant:** Alex, 20 years old.”

In contrast, for the high message exchange condition, each round of message exchange between the confederate and participants would contain less information, requiring a greater number of message exchanges. Below is an example illustrating the high message exchange condition, where the confederate collected a participant’s name and age information in three rounds of message exchange:

> “**Confederate:** Sure! I will help you choose the best credit card. Can I first start with few questions regarding your information?

> **Participant:** Sure.

> **Confederate:** Great! What is your name?

> **Participant:** Alex
Confederate: Thank you, Alex. There are different cards for different ages. So how old are you?

Participant: 20 years old.”

There were few occasions in which some participants communicated more or less information than what confederate asked, but overall the numbers of message exchange were successfully manipulated. In a high message exchange condition, there were approximately 40 message exchanges between each participant and the confederate; by contrast, in a low message exchange condition, each participant exchanged about 18 messages with the confederate.

Level of addiction. The third independent variable, level of addiction, was adapted from the self-perception of text-message dependence scale (STDS) (Igarashi et al., 2008). This scale originally consists of 15 items capturing three sub-dimensions: perception of emotional reaction, excessive use, and relationship maintenance. However, a recent study (Lu, Katoh, Chen, Nagata, & Kitamura, 2014) suggested that emotional reaction and relationship maintenance tend to signify dependent users who are associated with higher scores on anxiety and depression and lower scores on self-directedness. In contrast, excessive use dimension tends to signify excessive users who are characterized by high-novelty seeking, co-cooperativeness and reward dependence. Considering these findings in light of the previous literature on addiction, it seems that emotional reaction and relationship maintenance better capture the concept of addictive use of text messaging whereas excessive use does not necessarily reflect strong psychological dependence and potential negative consequences of text messaging use.

In addition, excessive use in this study had a mean score of 5.12 (SD = 1.03), which indicates that most users can be classified as excessive users. Therefore, this variable should be
considered more as a measurement of the pervasiveness of IM use rather than as problematic IM use.

Hence, in the current study, addictive use will be measured based on individuals’ levels of dependence on text messaging, via using the two sub-scales from STDS: the perception of emotional reaction dimension focusing on “sensitive responses” toward text messages (e.g., “I feel disappointed if I don’t receive any text-messages”) and the relationship maintenance dimension measuring the importance of text message in maintaining personal relationships (e.g., “I cannot maintain new friendships without text-messages”). Each of the two sub-dimensions contains five items, and participants rated each item on a 7-point Likert scale with 1 being “Strongly Disagree” and 7 being “Strongly Agree.” All two subscales were reliable with Cronbach’s α = .87 for perception of emotional reaction, Cronbach’s α = .83 for relationship maintenance, and Cronbach’s α = .86 for the combined scale.

With this new scale, a participant’s score can range from the minimum of 10 to a maximum of 70. With a median value of 35, the current study categorize those participants who scored below 31 as non-dependent users (n = 66); participants who scored 32 to 39 are moderately dependent users (n = 62), and participants who scored above 40 are highly dependent users (n = 60).

**Manipulation check.** The message interactivity manipulation was examined by asking participants to evaluate the following items on a 7-point Likert scale: “The agent maintained a systematic record of my responses”; “The agent gave some smart suggestions based on my responses”; “The agent remembered my responses”; “The agent kept track of my responses”; “The agent’s responses were related to my earlier responses”; and “The agent took into account
my previous interactions with him/her.” The scale showed a good reliability with Cronbach’s $\alpha = .92$.

The message exchange manipulation was examined with: “I sent many texts to the conversation partner”; “My conversation partner sent many texts to me”; and “We exchanged many text messages during the session.” Cronbach’s $\alpha$ was .83.

**Mediating Variables**

There were five mediating variables: perceived interactivity, perceived contingency, perceived responsiveness, sense of social presence, and user engagement.

**Perceived interactivity.** Previous studies have identified a sense of two-way communication as an important dimension in measuring perceived interactivity (Liu, 2003; McMillan & Hwang, 2002). Since the current study focused on instant messaging use, perceived interactivity was measured by adopting items from two sets of measurement scales, perceived interactivity (Bellur & Sundar, forthcoming; Sundar et al., 2016) and perceived dialogue (Sundar et al., 2016). The scale contained four items: “The interaction felt like a two-way communication”; “The interaction was highly interactive”; “I felt like I was engaged in an active dialogue”; and “My interaction with the service agent felt like a conversation.” The scale demonstrated a good reliability with Cronbach’s $\alpha = .91$.

**Perceived contingency.** Six items capturing the degree to which the system gives semantically relevant responses to participants’ inputs were used. These six items were adopted from the perceived contingency measurement used in the previous studies (Bellur & Sundar, forthcoming; Sundar et al., 2016): “The service agent took into account my previous interactions with him”; “The service agent’s responses were related to my earlier replies”; “I felt that the
service agent carefully registered my responses and gave feedback based on the information I replied”; “The messages I received from the service agent were based on my previous replies”; “I felt as if the service agent gave an exclusive response to my replies”; and “I felt as if the information from the service agent was well connected to my replies.” The scale was reliable with Cronbach’s $\alpha = .92$.

**Perceived responsiveness.** This study defines responsiveness as more of a mechanistic aspect of an interaction process that focuses on the immediacy of message exchange between two partners. As a potential gratification, users expect interactive media to be responsive to their actions. This variable was measured by using two items adopted from Sundar and Limperos (2013): “The service agent was responsive to my messages” and “The service agent responded to my messages quickly.” The scale was reliable with Cronbach’s $\alpha = .81$.

**Social presence.** As a sense of co-presence, social presence in this study was measured by adopting the scale used in Park and Sundar (2015), which contained ten items capturing mutual awareness and sense of copresence between two conversational partners. These items were: “I noticed the service agent”; “The service agent noticed me”; “The service agent’s presence was obvious to me”; “My presence was obvious to the service agent”; “The service agent caught my attention”; “I caught the service agent’s attention”; “I felt a sense of actually being together with the service agent”; “I felt that I was present with the service agent and the service agent was present with me during texting”; “I felt that the service agent was present with me during texting”; and “During texting I felt as if I and the service agent are located in the same room.” The scale had a good reliability with Cronbach’s $\alpha = .92$.

**User engagement.** User engagement was measured via two sets of instruments. One set of instruments that measured user engagement as cognitive absorption (Oh et al., 2015) had three
items: “While having the text conversation, I was absorbed in what I was doing”; “While having the text conversation, I was immersed in what I was doing”; “While having the text conversation, my attention did not get diverted.” The scale was reliable with Cronbach’s $\alpha = .91$.

Another set of measurements focused more on engagement with the messages or actual content delivered during the interaction. The measurement was obtained from previous studies (Kahior, Dunwoody, Griffin, Neuwirth, & Giese, 2003; Oh & Sundar, 2013), and contained five items: “I thought about what actions I myself might take based on what I learned”; “I found myself making connections between the content from the service agent and what I’ve read or heard about elsewhere”; “I thought about how and what I had learned related to other things I know”; “I tried to think of the practical applications of what I learned”; and “I tried to relate the content from the service agent to my own life.” The scale showed a good reliability with Cronbach’s $\alpha = .94$.

**Dependent Variables**

The dependent variables of this study were user attitudes toward service agent, information, and experience, user satisfaction with the interaction, and behavioral intention.

**Attitudes toward service agent.** A set of source perception measurement adopted from Chaiken & Eagly (1983) was used to measure users’ attitudes toward the service agent. Participants were asked to rate the confederate as: likable, knowledgeable, modest, intelligent, approachable, competent, warm, trustworthy, pleasing, sincere, and friendly on a 7-point Likert scale with 1 being “Strongly Disagree” and 7 being “Strongly Agree.” The scale was reliable with Cronbach’s $\alpha = .95$. 

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**Attitudes toward interaction experience.** Users’ attitudes toward interaction experience was measured with 15 items from a previous study on website evaluation (Bellur & Sundar, forthcoming): appealing, useful, positive, good, favorable, attractive, exciting, pleasant, likable, high quality, interesting, fun, cool, imaginative, and entertaining. The scale was reliable with Cronbach’s $\alpha = .97$.

**Attitudes toward information.** Users’ attitudes toward information was measured with 11 items adopted from a previous study on website content evaluation (Olney, Holbrook and Batra, 1991): important, helpful, informative, useful, make me curious, boring, fun to see, pleasant, entertaining, enjoyable, and interesting. The scale was reliable with Cronbach’s $\alpha = .92$.

**User satisfaction.** An established user satisfaction scale (Baker, 1990) was used to measure this variable. The scale contained five items: “I am totally satisfied with my interaction with the service agent;” “Some things about my interactions with the service agent could have been better”; “I am not completely satisfied with my interactions with the service agent”; “I thought the service agent took notice of me as an individual person”; and “The service agent was very careful in considering my information needs.” The scale was reliable with Cronbach’s $\alpha = .83$.

**Behavioral intention.** This variable was measured by adopting a scale from Oh et al. (2015). The scale contained four items, which was developed for measuring digital outreach in terms of how much users will continue further engagement with a system. Along with these four items, the current study added one item to capture participants’ behavioral intention. The scale included: “I would save this service’s contact information”; “I would recommend this service to others”; “I would forward this service to my acquaintances”; “I would use this service again in
the future”; and “I am likely to follow up the service agent's recommendation.” The scale was reliable with Cronbach’s $\alpha = .94$.

**Control Variables**

**Issue involvement.** This scale was adopted from Zaichkowsky (1985). The scale had ten items that were evaluated based on a 7-point semantic differential scale. Participants’ perception of the importance of financial information was captured by asking if the information about personal credit and finance is “unimportant-important,” “irrelevant-relevant,” “means nothing to me-means a lot to me,” “worthless-valuable,” “not needed-needed,” “boring-interesting,” “unexciting-exciting,” “uninvolving-involved,” “unappealing-appealing,” and “mundane-fascinating.” The scale was reliable with Cronbach’s $\alpha = .89$.

**Preference for online social interaction.** This scale was adopted from Caplan (2005). Participants were asked to evaluate a total of six items on a 7-point Likert scale with 1 being “Strongly Disagree” and 7 being “Strong Agree.” Some example items are “I prefer communicating with other people online rather than face-to-face” and “My relationships online are more important to me than many of my face-to-face relationships.” Such scale was relevant because participants who prefer online social interaction are more likely to use IM frequently for their social interactions. The reliability test indicated that the scale was reliable with Cronbach’s $\alpha = .80$.

**Power usage.** This scale contained 12 items adopted from previous studies (Sundar & Marathe, 2010; Bellur & Sundar, forthcoming). The scale measured participants’ overall familiarity, liking, and dependence on information technologies. Some example items are: “I think most of the technological gadgets are complicated to use”; “I make good use of most of the
features available in any technological device”; and “I have to have the latest available upgrades of the technological devices that I use.” The scale was reliable with Cronbach’s $\alpha = .75$.

**Perceived message length.** Both message interactivity and message exchange manipulations can result in unequal message lengths across conditions. This was because some additional phrases were needed to build a strong contingency between messages or certain messages needed to be combined into one message to reduce message exchange. Therefore, a scale containing two items measuring perceived message length was adopted from Stacks and Sellers (1986). These two items were evaluated by using a 7-point semantic differential scale, where participants were asked if they felt the service agent’s responses are “wordy-short” and “lengthy-brief.” The scale was reliable with Cronbach’s $\alpha = .89$. 
<table>
<thead>
<tr>
<th>Table 1: List of Variables</th>
<th>Reliability Index (Cronbach’s $\alpha$)</th>
<th>Means and Standard Deviations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional reaction</td>
<td>.87</td>
<td>$M = 4.16, SD = 1.36$</td>
</tr>
<tr>
<td>Excessive use</td>
<td>.80</td>
<td>$M = 5.11, SD = 1.03$</td>
</tr>
<tr>
<td>Relationship maintenance</td>
<td>.83</td>
<td>$M = 2.89, SD = 1.21$</td>
</tr>
<tr>
<td><strong>Mediating Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived contingency</td>
<td>.92</td>
<td>$M = 5.27, SD = 1.16$</td>
</tr>
<tr>
<td>Perceived interactivity</td>
<td>.91</td>
<td>$M = 5.04, SD = 1.24$</td>
</tr>
<tr>
<td>Social presence</td>
<td>.92</td>
<td>$M = 4.89, SD = 1.07$</td>
</tr>
<tr>
<td>Perceived responsiveness</td>
<td>.81</td>
<td>$M = 5.96, SD = .82$</td>
</tr>
<tr>
<td><strong>Dependent Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Att. toward information</td>
<td>.92</td>
<td>$M = 5.26, SD = 1.02$</td>
</tr>
<tr>
<td>Att. toward agent</td>
<td>.95</td>
<td>$M = 5.48, SD = 1.01$</td>
</tr>
<tr>
<td>User experience</td>
<td>.97</td>
<td>$M = 4.84, SD = 1.11$</td>
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<td>User satisfaction</td>
<td>.83</td>
<td>$M = 4.71, SD = 1.18$</td>
</tr>
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<td>Behavioral intention</td>
<td>.94</td>
<td>$M = 4.36, SD = 1.44$</td>
</tr>
<tr>
<td>Content elaboration</td>
<td>.94</td>
<td>$M = 4.80, SD = 1.26$</td>
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<tr>
<td>Cognitive absorption</td>
<td>.91</td>
<td>$M = 4.65, SD = 1.46$</td>
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<tr>
<td><strong>Control Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived message length</td>
<td>.89</td>
<td>$M = 3.95, SD = 1.25$</td>
</tr>
<tr>
<td>Preference for online social interaction</td>
<td>.80</td>
<td>$M = 2.34, SD = .97$</td>
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<tr>
<td>Issue involvement</td>
<td>.89</td>
<td>$M = 4.86, SD = .99$</td>
</tr>
<tr>
<td>Power use</td>
<td>.75</td>
<td>$M = 4.97, SD = .68$</td>
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<tr>
<td><strong>Manipulation Check</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Message interactivity</td>
<td>.92</td>
<td>$M = 5.47, SD = 1.12$</td>
</tr>
<tr>
<td>Message exchange</td>
<td>.83</td>
<td>$M = 4.09, SD = 1.24$</td>
</tr>
</tbody>
</table>
Chapter 3

RESULTS

To examine the effects of message interactivity, message exchange, and level of addiction, the current study employed a General Linear Model (GLM) to test the main effects of independent variables and the interaction effects. Mediation tests were then conducted to test each proposed mediating path. Lastly, a Structural Equation Modeling (SEM) was employed to examine the overall structure of the core variables.

The following section starts with the results of manipulation checks, followed by the findings presented in three sub-sections. Section 1 focuses on the main effects of each independent variable on the proposed mediating variables and dependent variables. Additionally, mediation tests utilizing Hayes’ PROCESS Macro (Model 6 or 4 with 5,000 bootstrap resamples) and a phantom model approach (Macho & Ledermann, 2011) were conducted. Section 1 addresses Hypotheses 1-6 as well as Hypotheses 10-12. Section 2 focuses on the interaction effects among level of addiction, message interactivity, and message exchange on the proposed dependent variables. Section 2 addresses Hypotheses 7-9. Section 3 presents an SEM model integrating the proposed model with the current findings illustrating the relationships among variables. This model offers a comprehensive understanding of how users’ addiction levels (operationalized as level of dependency) correspond to their use of technological features of IM.
Manipulation Check

Message interactivity. An independent-samples t-test revealed that the manipulation of message interactivity was successful. The results showed that the ontological manipulation was also psychologically salient. Participants who were in the high message interactivity condition rated their interaction as more contingent ($M = 5.91, SD = .74$) than low message interactivity condition ($M = 5.0, SD = 1.26$) with $t(186) = -5.85, p < .001$

Message exchange. Another independent-samples t-test revealed that the manipulation of message exchange was also successful. The results indicated that the high message exchange condition was perceived as having more rounds of exchange ($M = 4.5, SD = 1.25$) than the low message exchange condition ($M = 3.70, SD = 1.09$) with $t(186) = -4.68, p < .001$.

Section 1 – Main Effects and Mediation Effects Testing

As the current study is also interested in testing interaction effects among independent variables, a series of three-way ANCOVAs were conducted to test both main effects and interaction effects (reported in Section 2) on user attitudes, satisfaction, behavioral intention, cognitive absorption, and content elaboration. Two manipulated independent variables, message interactivity (high vs. low) and message exchange (high vs. low), were entered into a General Linear Model (GLM) along with level of addiction. The model also included eight covariates: preference of online interaction, power usage, issue involvement, perceived message length, age, and general media usage (i.e., phone, Internet, and instant messaging).

Main effects of message interactivity. The following hypotheses examined the main effects of message interactivity on user engagement and related outcome variables...
H1: Message interactivity will be positively related to a) user attitude b) satisfaction, and c) behavioral intentions.

H10: A higher level of message interactivity will lead to greater content elaboration.

As Table 2 shows, message interactivity has significant main effects on all the dependent variables, including attitudes toward information, attitudes toward agent, attitudes toward interaction experience, user satisfaction, and behavioral intention as well as a mediator - content elaboration. According to Table 3, all these main effects are positive, indicating that a higher level of message interactivity tends to lead to more positive user attitudes, experience, and satisfaction as well as a stronger intention to use and recommend the chatting service. Moreover, participants in the high message interactivity condition also reported that they were more likely to think about the content that they learned from the service agent than their peers assigned to the low message interactivity condition. Thus, both hypotheses H1 and H10 were supported.
Table 2: Main Effects of Message Interactivity

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Statistical Test</th>
<th>Effect Size</th>
<th>Hypotheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Att. toward information</td>
<td>$F(1,168) = 10.79, p &lt; .001$</td>
<td>$\eta^2 = .06$</td>
<td>H1a</td>
</tr>
<tr>
<td>Att. toward agent</td>
<td>$F(1,168) = 17.05, p &lt; .001$</td>
<td>$\eta^2 = .092$</td>
<td>H1a</td>
</tr>
<tr>
<td>Att. toward experience</td>
<td>$F(1,168) = 11.32, p &lt; .001$</td>
<td>$\eta^2 = .06$</td>
<td>H1a</td>
</tr>
<tr>
<td>User satisfaction</td>
<td>$F(1,168) = 40.67, p &lt; .001$</td>
<td>$\eta^2 = .20$</td>
<td>H1b</td>
</tr>
<tr>
<td>Behavioral intention</td>
<td>$F(1,168) = 6.05, p &lt; .05$</td>
<td>$\eta^2 = .035$</td>
<td>H1c</td>
</tr>
<tr>
<td>Content elaboration</td>
<td>$F(1,168) = 3.87, p = .05$</td>
<td>$\eta^2 = .023$</td>
<td>H11</td>
</tr>
</tbody>
</table>

Table 3: Means and Standard Errors of the Significant Effects of Message Interactivity

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Message Interactivity - Low</th>
<th>Message Interactivity - High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Att. toward information</td>
<td>$M = 5.02, SE = .10$</td>
<td>$M = 5.48, SE = .10$</td>
</tr>
<tr>
<td>Att. toward agent</td>
<td>$M = 5.19, SE = .10$</td>
<td>$M = 5.80, SE = .10$</td>
</tr>
<tr>
<td>Att. toward experience</td>
<td>$M = 4.58, SE = .11$</td>
<td>$M = 5.11, SE = .11$</td>
</tr>
<tr>
<td>User satisfaction</td>
<td>$M = 4.20, SE = .11$</td>
<td>$M = 5.23, SE = .11$</td>
</tr>
<tr>
<td>Behavioral intention</td>
<td>$M = 4.07, SE = .14$</td>
<td>$M = 4.58, SE = .15$</td>
</tr>
<tr>
<td>Content elaboration</td>
<td>$M = 4.61, SE = .13$</td>
<td>$M = 5.00, SE = .13$</td>
</tr>
</tbody>
</table>
**Main effects of message exchange.** Two hypotheses proposed that message exchange will positively influence users’ perceived responsiveness (H3) and social presence (H5) during mobile instant messaging chats. In addition, H11 proposed that more message exchanges will lead to greater cognitive absorption. As reported in Table 4, none of the proposed effects was significant except for the one on social presence. Therefore, H3 and H11 were not supported. Also as presented in Table 5, the direction of the effect of message exchange on social presence is negative, indicating that more message exchanges tend to lower a participant’s social presence. This effect was opposite to the one proposed by H5; thereby H5 was also rejected.

Moreover, although not proposed, the researcher also examined whether message exchange has direct effects on user attitudes, satisfaction, and behavioral intention. The effects were not significant except for user satisfaction. The result indicates that number of message exchanges negatively influence user satisfaction, i.e., more message exchanges tend to lower user satisfaction (see Table 4).

Although the results generally indicate that message exchange does not directly influence outcome variables, these findings do not prevent us from further examining the proposed mediating effects, because having a significant direct effect is not a necessary condition in testing mediating effects. Therefore, the following section will focus on testing all the proposed mediation paths.
Table 4: *Main Effects of Message Exchange*

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Statistical Test</th>
<th>Effect Size</th>
<th>Hypotheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived responsiveness</td>
<td>$F(1,168) = 2.52, p = .11$</td>
<td>$\eta^2 = .02$</td>
<td>H4</td>
</tr>
<tr>
<td>Social presence</td>
<td>$F(1,168) = 4.25, p &lt; .05$</td>
<td>$\eta^2 = .025$</td>
<td>H6</td>
</tr>
<tr>
<td>Absorption</td>
<td>$F(1,168) = .15, p = .70$</td>
<td>$\eta^2 = .001$</td>
<td>H12</td>
</tr>
</tbody>
</table>

Table 5: *Means and Standard Errors of the Significant Effects of Message Exchange*

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Message Exchange - Low</th>
<th>Message Exchange - High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social presence</td>
<td>$M = 4.63, SE = .15$</td>
<td>$M = 4.18, SE = .15$</td>
</tr>
</tbody>
</table>
**Mediation effects.** The current study proposed three mediation paths. For message interactivity, the study proposed that its effects on user attitudes, satisfaction, and behavioral intention would be serially mediated by perceived contingency, perceived interactivity, and content elaboration (H2). For message exchange, H3 to H6 proposed that its effects on the dependent variables would be serially mediated by perceived responsiveness and absorption (H3 and H4) as well social presence and absorption (H5 and H6). To test the mediation path proposed by H2, Hayes’ PROCESS Macro was utilized to test the effects of perceived contingency, perceived interactivity, and content elaboration as serial mediators. To test mediation paths proposed in H3 to H6, in addition to Hayes’ PROCESS Macro, additional analyses using a phantom model approach were also conducted to test mediation models that include parallel mediators followed by a sequential mediator (i.e., absorption).

*Perceived contingency and perceived interactivity.* Hayes’ PROCESS Macro - model 6 with 95% bias-corrected confidence intervals using 5,000 bootstrap resamples - was employed to estimate the direct effect of message interactivity as well as the indirect effects of message interactivity on dependent variables through perceived contingency → perceived interactivity → content elaboration in a serial fashion. The result from this bootstrapping test is presented in Table 6.

![Figure 5. Indirect Effects of Perceived Contingency, Perceived Interactivity, and Content Elaboration Using Hayes’ PROCESS](image_url)
Table 6: Phantom Model Analysis testing the Path via Perceived Contingency, Perceived Interactivity and Content Elaboration

<table>
<thead>
<tr>
<th>Message Interactivity → Perceived Contingency → Perceived Interactivity → Content Elaboration</th>
<th>B Estimates</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Att. toward information</td>
<td>.08 (SE = .03)</td>
<td>.04 - .15</td>
</tr>
<tr>
<td>Att. toward agent</td>
<td>.05 (SE = .02)</td>
<td>.03 - .11</td>
</tr>
<tr>
<td>Att. toward experience</td>
<td>.09 (SE = .03)</td>
<td>.04 - .18</td>
</tr>
<tr>
<td>User satisfaction</td>
<td>.04 (SE = .02)</td>
<td>.01 - .08</td>
</tr>
<tr>
<td>Behavioral intention</td>
<td>.13 (SE = .04)</td>
<td>.06 - .23</td>
</tr>
</tbody>
</table>

Consistent with the hypothesis, the indirect effect of message interactivity on each of the five dependent variables via perceived contingency → perceived interactivity → content elaboration was positive and significant. Thus, H2 was supported.

**Perceived responsiveness and social presence.** To test the mediating role of perceived responsiveness and social presence on the relationship between message exchange and the dependent variables, the same PROCESS model (i.e., #4) with 95% bias-corrected confidence intervals using 5,000 bootstrap resamples was employed. The results indicate that neither perceived responsiveness ($B = -.03$, $SE = .05$, CI = -.13 to .06) nor social presence ($B = -.10$, $SE = .08$, CI = -.27 to .05) was a significant mediator. It appears that message exchange failed to influence both mediators at the first step, which is counter to all our theoretical predictions.
A quick reexamination of participants’ average score on the manipulation check scale, perceived message exchange, showed that the mean for the high message exchange condition is somewhat low ($M = 4.5$ on a 7-point scale). Therefore, it is plausible that the current results are caused by a “floor effect,” in which participants who were in high message exchange condition did not actually perceive that they exchanged many messages. As one solution, the perceived message exchange was added as a first step mediator, followed by mediation paths proposed in H4 through H7. The whole mediation model was examined by creating a phantom model with 95% bias-corrected confidence intervals using 5,000 bootstrap resamples (see Figure 7). The results indicated that the new first-step mediator, perceived message exchange, significantly influences social presence ($B = .17, p < .01$) but not responsiveness ($B = -.05, p = .30$), which partially supports the “floor effect”. Together, as displayed in Table 7, the results support H4 and H6, showing that the effects of message exchange on the dependent variables are all mediated via this path: perceived message exchange $\rightarrow$ social presence $\rightarrow$ absorption. However, the other parallel path, perceived message exchange $\rightarrow$ perceived responsiveness $\rightarrow$ absorption, was not significant on any of the dependent variables. Thus, H3 and H5 were rejected.
Figure 7. Indirect Effects of Perceived Responsiveness and Social Presence Using Phantom Model.

Table 7: Phantom Model Analysis Testing Paths Perceived Responsiveness and Social Presence

<table>
<thead>
<tr>
<th>Path</th>
<th>B Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message exchange → Perceived</td>
<td></td>
</tr>
<tr>
<td>Message Exchange → Perceived</td>
<td></td>
</tr>
<tr>
<td>Responsiveness → Absorption</td>
<td></td>
</tr>
<tr>
<td>Att. toward information</td>
<td>-.004 (SE = .005)</td>
</tr>
<tr>
<td>Att. toward agent</td>
<td>-.004 (SE = .005)</td>
</tr>
<tr>
<td>Att. toward experience</td>
<td>-.005 (SE = .006)</td>
</tr>
<tr>
<td>User satisfaction</td>
<td>-.004 (SE = .005)</td>
</tr>
<tr>
<td>Behavioral intention</td>
<td>-.006 (SE = .007)</td>
</tr>
<tr>
<td>Message exchange → Perceived</td>
<td></td>
</tr>
<tr>
<td>Message Exchange → Social</td>
<td></td>
</tr>
<tr>
<td>Presence → Absorption</td>
<td></td>
</tr>
<tr>
<td>Att. toward information</td>
<td>.02** (SE = .012)</td>
</tr>
<tr>
<td>Att. toward agent</td>
<td>.02** (SE = .011)</td>
</tr>
<tr>
<td>Att. toward experience</td>
<td>.04** (SE = .015)</td>
</tr>
<tr>
<td>User satisfaction</td>
<td>.021** (SE = .011)</td>
</tr>
<tr>
<td>Behavioral intention</td>
<td>.03** (SE = .017)</td>
</tr>
</tbody>
</table>

Note: ** p < .01

Main effects of level of addiction. H12 proposed that level of addiction will lead to different types of user engagement in which non-addicted users tend to achieve content elaboration whereas addicted users tend to achieve cognitive absorption. To support this hypothesis, the current study expected to find a positive main effect for IM dependency on cognitive absorption (i.e., high dependency, stronger absorption) and a negative main effect on content elaboration (i.e., high dependency, lower content elaboration). However, the results indicated that neither of these proposed effects was significant, with $F(1,168) = 1.79, p = .17$ for absorption and $F(1,168) = .30, p = .74$ for content elaboration. Therefore, H13 was rejected.
Section 2 – Moderating Effects of Level of Addiction

H7 and H8 proposed that level of addiction would moderate the effects of message interactivity and the effects of message exchange on different types of user engagement and dependent variables. H9 further proposed a three-way interaction among these three independent variables. To test these three hypotheses, a series of three-way ANCOVAs was conducted on each dependent variable, along with these covariates: preference for online interaction, power usage, issue involvement, perceived message length, age, and general media usage (i.e., phone, Internet, and instant messaging).

**Interaction effects between message interactivity and level of addiction.** As displayed in Table 8, there were no interaction effects between message interactivity and level of IM dependency on user engagement. The same was true for all five dependent variables, with the exception of behavioral intention. As illustrated in Figure 8, the positive effect of message interactivity on participants’ behavioral intentions was significantly moderated by level of IM dependency, such that the effect became weaker as users’ psychological dependence on text message increased; and ultimately, the positive effect is absent for those individuals who are heavily dependent on instant messaging. This finding lends support to H7.
Table 8: Two-way Interactions between Message Interactivity and Level of IM Dependency

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Statistical Test</th>
<th>Effect Size</th>
<th>Hypotheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content elaboration</td>
<td>$F(2,168) = .29, p = .75$</td>
<td>$\eta^2 = .003$</td>
<td>H8a</td>
</tr>
<tr>
<td>Absorption</td>
<td>$F(2,168) = .51, p = .60$</td>
<td>$\eta^2 = .006$</td>
<td>H8a</td>
</tr>
<tr>
<td>Att. toward information</td>
<td>$F(2,168) = 1.15, p = .32$</td>
<td>$\eta^2 = .014$</td>
<td>H8b</td>
</tr>
<tr>
<td>Att. toward agent</td>
<td>$F(2,168) = .19, p = .83$</td>
<td>$\eta^2 = .002$</td>
<td>H8b</td>
</tr>
<tr>
<td>Att. toward experience</td>
<td>$F(2,168) = .55, p = .58$</td>
<td>$\eta^2 = .007$</td>
<td>H8b</td>
</tr>
<tr>
<td>User satisfaction</td>
<td>$F(2,168) = .04, p = .96$</td>
<td>$\eta^2 = .000$</td>
<td>H8c</td>
</tr>
<tr>
<td>Behavioral intention</td>
<td>$F(2,168) = 3.39, p &lt; .05$</td>
<td>$\eta^2 = .039$</td>
<td>H8d</td>
</tr>
</tbody>
</table>

Table 9: Means and Standard Errors of the Significant Two-way Interaction Effects on User Experience Outcomes

<table>
<thead>
<tr>
<th>Behavioral Intention: Message Exchange x Level of IM Dependency</th>
<th>Message Interactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Non-dependent Users</td>
<td>3.87 (.26)</td>
</tr>
<tr>
<td>Moderately Dependent Users</td>
<td>3.79 (.25)</td>
</tr>
<tr>
<td>Highly Dependent Users</td>
<td>4.55 (.26)</td>
</tr>
</tbody>
</table>

Note: Standard errors are presented in parentheses

Figure 8. Message Interactivity x Level of IM Dependency on Behavioral Intention
Interaction effects between message exchange and level of addiction. As displayed in Table 10, there were no interaction effects between message exchange and level of IM dependency on user engagement or any of the five dependent variables (user satisfaction, behavioral intention, attitudes toward information, agent, and experience). Therefore, H8 was rejected.

Table 10: Two-way Interactions between Message Exchange and Level of IM Dependency

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Statistical Test</th>
<th>Effect Size</th>
<th>Hypotheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content elaboration</td>
<td>$F(2,168) = .89, p = .41$</td>
<td>$\eta^2 = .01$</td>
<td>H9a</td>
</tr>
<tr>
<td>Absorption</td>
<td>$F(2,168) = 2.64, p = .08$</td>
<td>$\eta^2 = .03$</td>
<td>H9a</td>
</tr>
<tr>
<td>Att. toward information</td>
<td>$F(2,168) = .44, p = .64$</td>
<td>$\eta^2 = .005$</td>
<td>H9b</td>
</tr>
<tr>
<td>Att. toward agent</td>
<td>$F(2,168) = .57, p = .56$</td>
<td>$\eta^2 = .007$</td>
<td>H9b</td>
</tr>
<tr>
<td>Att. toward experience</td>
<td>$F(2,168) = .96, p = .39$</td>
<td>$\eta^2 = .011$</td>
<td>H9b</td>
</tr>
<tr>
<td>User satisfaction</td>
<td>$F(2,168) = .62, p = .54$</td>
<td>$\eta^2 = .007$</td>
<td>H9c</td>
</tr>
<tr>
<td>Behavioral intention</td>
<td>$F(2,168) = .44, p = .65$</td>
<td>$\eta^2 = .005$</td>
<td>H9d</td>
</tr>
</tbody>
</table>

Three-way interactions. H9 proposed that there would be three-way interactions where addicts would consistently prefer a large number of message exchanges whereas non-addicts would react to high message exchanges positively only if the exchanges were coupled with high message interactivity. The results (see Table 11) indicated that there were significant three-way interaction effects on all five dependent variables, as well as absorption.
Table 11: Three-way Interactions among Message Interactivity, Message Exchange, and Level of IM Dependency

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Statistical Test</th>
<th>Effect Size</th>
<th>Hypotheses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content elaboration</td>
<td>$F(2,168) = 1.3, p = .28$</td>
<td>$\eta^2 = .015$</td>
<td>H10a</td>
</tr>
<tr>
<td>Absorption</td>
<td>$F(2,168) = 3.31, p &lt; .05$</td>
<td>$\eta^2 = .04$</td>
<td>H10a</td>
</tr>
<tr>
<td>Att. toward information</td>
<td>$F(2,168) = 6.5, p &lt; .01$</td>
<td>$\eta^2 = .07$</td>
<td>H10b</td>
</tr>
<tr>
<td>Att. toward agent</td>
<td>$F(2,168) = 4.26, p &lt; .05$</td>
<td>$\eta^2 = .05$</td>
<td>H10b</td>
</tr>
<tr>
<td>Att. toward experience</td>
<td>$F(2,168) = 5.56, p &lt; .01$</td>
<td>$\eta^2 = .06$</td>
<td>H10b</td>
</tr>
<tr>
<td>User satisfaction</td>
<td>$F(2,168) = 3.48, p &lt; .05$</td>
<td>$\eta^2 = .04$</td>
<td>H10c</td>
</tr>
<tr>
<td>Behavioral intention</td>
<td>$F(2,168) = 4.86, p &lt; .01$</td>
<td>$\eta^2 = .06$</td>
<td>H10d</td>
</tr>
</tbody>
</table>

All these three-way interactions followed a similar pattern (Figure 9a ~ 9f), but the pattern was somewhat contrary to the hypothesis. For non-dependent users, having a high level of message interactivity tended to lead to more positive attitude toward agent and information, user experience, satisfaction, absorption, and behavioral intention regardless of the number of message exchanges. For moderately dependent users, when there were few rounds of message exchange, message interactivity displayed strong positive effects on user absorption and all other attitudinal and experience outcomes; In contrast, when there were many rounds of message exchanges, it compensated for the lack of message interactivity and still help maintain a positive user attitude and experience. Highly dependent users presented an opposite pattern, in which users generally had positive attitudes and experiences when there were less rounds of message exchange regardless of message interactivity; however, when there were more message exchanges, a high level of message interactivity could effectively maintain their positive attitudes and experiences.

In sum, this implies that message interactivity is preferred by different types of users. However, for moderately dependent users, high message exchange can act like high message interactivity, which could still maintain a relatively positive user experience and engagement.
when message interactivity is absent. Whereas for highly dependent users, they actually prefer fewer message exchanges; in fact, more message exchanges tend to negatively influence their user experience and engagement, especially when message interactivity is absent. Although the result for non-dependent users is consistent with the hypothesis, the result for highly dependent users is actually quite opposite to the prediction; therefore, H9 was rejected.
Table 12: Means and Standard Errors of the Significant Three-way Interaction Effects on User Experience Outcomes

<table>
<thead>
<tr>
<th>Att. toward Agent: Message Exchange (ME) x Message Interactivity (MI) x Levels of IM Dependency</th>
<th>Non-dependent Users</th>
<th>Moderately Dependent Users</th>
<th>Highly Dependent Users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ME - Low</td>
<td>ME - High</td>
<td>ME - Low</td>
</tr>
<tr>
<td>MI - Low</td>
<td>5.18 (.24)</td>
<td>5.13 (.26)</td>
<td>4.71 (.23)</td>
</tr>
<tr>
<td>MI - High</td>
<td>5.73 (.25)</td>
<td>5.67 (.23)</td>
<td>6.10 (.23)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Att. toward Info: Message Exchange (ME) x Message Interactivity (MI) x Levels of IM Dependency</th>
<th>Non-dependent Users</th>
<th>Moderately Dependent Users</th>
<th>Highly Dependent Users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ME - Low</td>
<td>ME - High</td>
<td>ME - Low</td>
</tr>
<tr>
<td>MI - Low</td>
<td>5.1 (.23)</td>
<td>4.85 (.25)</td>
<td>4.68 (.22)</td>
</tr>
<tr>
<td>MI - High</td>
<td>5.55 (.24)</td>
<td>5.89 (.22)</td>
<td>5.78 (.22)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Experience: Message Exchange (ME) x Message Interactivity (MI) x Levels of IM Dependency</th>
<th>Non-dependent Users</th>
<th>Moderately Dependent Users</th>
<th>Highly Dependent Users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ME - Low</td>
<td>ME - High</td>
<td>ME - Low</td>
</tr>
<tr>
<td>MI - Low</td>
<td>4.51 (.26)</td>
<td>4.32 (.29)</td>
<td>4.15 (.25)</td>
</tr>
<tr>
<td>MI - High</td>
<td>5.07 (.27)</td>
<td>5.23 (.25)</td>
<td>5.54 (.25)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Behavioral Intention: Message Exchange (ME) x Message Interactivity (MI) x Levels of IM Dependency</th>
<th>Non-dependent Users</th>
<th>Moderately Dependent Users</th>
<th>Highly Dependent Users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ME - Low</td>
<td>ME - High</td>
<td>ME - Low</td>
</tr>
<tr>
<td>MI - Low</td>
<td>4.06 (.35)</td>
<td>3.67 (.38)</td>
<td>3.64 (.33)</td>
</tr>
<tr>
<td>MI - High</td>
<td>5.02 (.35)</td>
<td>5.11 (.33)</td>
<td>4.98 (.33)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Satisfaction: Message Exchange (ME) x Message Interactivity (MI) x Levels of IM Dependency</th>
<th>Non-dependent Users</th>
<th>Moderately Dependent Users</th>
<th>Highly Dependent Users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ME - Low</td>
<td>ME - High</td>
<td>ME - Low</td>
</tr>
<tr>
<td>MI - Low</td>
<td>4.35 (.27)</td>
<td>3.83 (.29)</td>
<td>4.35 (.26)</td>
</tr>
<tr>
<td>MI - High</td>
<td>5.36 (.27)</td>
<td>5.1 (.26)</td>
<td>5.36 (.25)</td>
</tr>
</tbody>
</table>
Absorption: Message Exchange (ME) x Message Interactivity (MI) x Levels of IM Dependency

<table>
<thead>
<tr>
<th></th>
<th>Non-dependent Users</th>
<th></th>
<th>Moderately Dependent Users</th>
<th></th>
<th>Highly Dependent Users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ME - Low</td>
<td>ME - High</td>
<td>ME - Low</td>
<td>ME - High</td>
<td>ME - Low</td>
</tr>
<tr>
<td>MI - Low</td>
<td>4.3 (.35)</td>
<td>4.87 (.38)</td>
<td>3.89 (.33)</td>
<td>4.49 (.39)</td>
<td>5.3 (.39)</td>
</tr>
<tr>
<td>MI - High</td>
<td>4.47 (.36)</td>
<td>5.05 (.33)</td>
<td>5.28 (.33)</td>
<td>3.87 (.42)</td>
<td>4.91 (.45)</td>
</tr>
</tbody>
</table>

Note: Standard errors are presented in parentheses.
Figure 9a. Three-way Interaction on Attitude toward Agent

Figure 9b. Three-way Interaction on Attitude toward Information

Figure 9c. Three-way Interaction on Experience
Figure 9d. Three-way Interaction on Behavioral Intention

Figure 9e. Three-way Interaction on User Satisfaction

Figure 9f. Three-way Interaction on Absorption
Section 3 – Structural Equation Modeling

As shown in the Sections 1 and 2, the interactions between message interactivity, message exchange, and level of IM dependency were somewhat counter-intuitive and also contradictory to the hypothesized pattern. Such an unexpected pattern shows that there are differences between highly dependent users and non-dependent users in terms of their use and experience of mobile instant messaging. However, why did they have such differences? If the proposed theoretical account was not supported, then what is the real mechanism behind these findings?

In addition, mediation tests indicated that the effects of message interactivity on dependent variables were mediated by perceived contingency, perceived interactivity, and content elaboration in a serial fashion, whereas the effects of message exchange on the dependent variables were mediated only by a serial path via social presence and absorption. Because one of the study’s purposes is to differentiate between message interactivity and message exchange by hypothesizing their respective focus on content processing versus mechanistic exchange, neither the effects of message interactivity on social presence and perceived responsiveness nor the effects of message exchange on perceived contingency and perceived interactivity were proposed. Practically, however, it is very plausible that each independent variable might follow all three mediation paths because message interactivity and message exchange often operate together in an IM chat session. In other words, message interactivity and message exchange are not fully orthogonal because message interactivity has to be built on certain level of message exchange.

Moreover, as Oh and Sundar (2015) suggested, user engagement is more likely to be a continuum that can be divided into stages, from cognitive absorption and content elaboration to
behavioral outreach. Therefore, modeling the effects of each independent variable as well as level of addiction on each stage of engagement could offer a more comprehensive view of how different technological features and user types lead to different paths of user engagement.

Driven by the theoretical questions and the results discussed previously, a revised structural model shown in Figure 10 was tested. Two dependent variables, attitudes toward information and attitudes toward agent, were not included in the model because do not pertain directly to user experience of the IM chat.

As the current model focuses on how uses of different IM affordances change users’ psychological states (i.e., psychological experience of contingency and message exchange), which then lead to subsequent gratifications (e.g., interactivity, social presence), engagement, and outcomes, what really matters are the associations among the psychological states, gratifications, and outcomes (O’Keefe, 2003). Therefore, the manipulated independent variables were replaced by perceived message contingency and perceived message exchange in the revised model to better explore underlying mechanisms for different types of users.

In addition, as sense of responsiveness was not significantly predicted by any independent variables and did not significantly predict any subsequent dependent variables in the model, this variable was dropped from the final model, in the interest of parsimony.

With these changes, a revised model (Figure 10) was constructed and tested.
Before testing the structural model, a confirmatory factor analysis (CFA) was conducted to examine the measurement model. A total of 9 latent variables were included in the model (Figure 11). The measurement model yielded a good model fit, \( \chi^2 = 535.28, df = 341, p < .001, \) CFI = .96, RMSEA = .055, 90% CI = .05 to .06. All the factor loadings were substantial, ranging from .70 to .97.
Figure 11. Measurement Model
To test the structural model, perceived contingency and perceived message exchange were entered as exogenous variables. Since AMOS does not accommodate testing for interactions among latent variables, a multiple group analysis approach was employed to examine the moderating effects of level of IM dependency on message interactivity and message exchange. Three groups that were created in the previous analyses, non-dependent users, moderately dependent users, and highly dependent users, were employed in the model. In addition, due to a relatively small sample size \( n = 188 \), the current model employed latent composite approach. SEM was employed with 2,000 bootstrapping re-sample and 95% bias-corrected confidence intervals.

Similar to an interaction effect test, the multiple group analysis is able to show that the paths for one group differ from the paths for another group in an SEM context. This approach achieves the goal by comparing the model fit of a constrained nested model against the model fit of unconstrained base model. To be more specific, the following steps were performed in this study:

(1) An unconstrained base model was established first, which allowed the groups to be different on all of the parameters. Although the model estimated parameters differently for each group, it had the same fit indices (e.g., \( \chi^2 \), CFI, RMSEA) for both groups as they are both part of the same model. In the model, perceived interactivity and social presence were correlated as well as absorption and content elaboration.

(2) With the base model, to test whether all three groups are structurally different, another model that constraind all the path coefficients to be equal across the groups was created. As a constrained model fixes the path coefficients to be the same across the groups, the fit of the model tends to decrease (indicated by increased \( \chi^2 \) )
compared to the fit of the unconstrained model. Therefore, if the $\chi^2$ difference ($\Delta\chi^2$) between a constrained model and the unconstrained model is significant, it indicates that the two groups are not invariant. Following this logic, the fit of the constrained model was compared against the fit of the unconstrained base model to examine the degree of invariance between highly dependent users and non-dependent users.

For the unconstrained base model, the model fit results indicated a good fit with $\chi^2 = 63.623$, $df = 30$, $p < .001$, CFI = .95, RMSEA = .078, 90% CI = .05 to .10. In contrast, the fit indices for the constrained model is $\chi^2 = 126.52$, $df = 70$, $p < .001$, CFI = .92, RMSEA = .07, 90% CI = .05 to .08. The results indicated that the three groups are not invariant at the structural level, where the $\chi^2$ difference between the base model and the constrained model is 62.90 with $df = 40$, $p < .05$. 

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Figure 12a. Multiple Group Analysis – Non-dependent Users

Figure 12b. Multiple Group Analysis – Moderately Dependent Users

Figure 12c. Multiple Group Analysis – Highly Dependent Users
The model comparisons indicated that there were structural differences among groups in their uses of IM. The next step then is to investigate how each psychological mediator influences subsequent engagement and user experience, satisfaction, and behavioral intention? A more comprehensive analysis of each mediating path in each model would be more appropriate. In the interest of convenience and parsimony, the current study employed user-defined estimands, which enables AMOS to estimate a specific indirect effect within a structural model via Visual Basic or C# script. Estimands were created to estimate indirect effect of each exogenous variable (i.e., message interactivity or perceived message exchange) on each of the outcome variables (i.e., user satisfaction, user experience, and behavioral intention) via each possible mediating path (e.g., perceived interactivity → content elaboration, or social presence → absorption, etc.) in each model (i.e., highly dependent users or non-dependent users). A list of significant mediation paths can be found in Tables 13, 14, and 15.

Table 13: User-defined Estimands Testing Indirect Effects of Exogenous Variables for Non-Dependent Users

<table>
<thead>
<tr>
<th>Perceived Message Contingency</th>
<th>B Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social presence → Content elaboration → Satisfaction</td>
<td>.22* (SE = .11)</td>
</tr>
<tr>
<td>Social presence → Content elaboration → Behavioral intention</td>
<td>.22* (SE = .10)</td>
</tr>
<tr>
<td>Social presence → Content elaboration → Experience</td>
<td>.09* (SE = .06)</td>
</tr>
</tbody>
</table>

Note: * p < .05

Table 14: User-defined Estimands Testing Indirect Effects of Exogenous Variables for Moderately Dependent Users

<table>
<thead>
<tr>
<th>Perceived Message Contingency</th>
<th>B Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived interactivity → Absorption → Satisfaction</td>
<td>.11* (SE = .07)</td>
</tr>
<tr>
<td>Perceived interactivity → Absorption → Experience</td>
<td>.16* (SE = .08)</td>
</tr>
<tr>
<td>Perceived interactivity → Absorption → Behavioral intention</td>
<td>.15* (SE = .08)</td>
</tr>
<tr>
<td>Social presence → Content elaboration → Satisfaction</td>
<td>.10* (SE = .08)</td>
</tr>
<tr>
<td>Social presence → Content elaboration → Experience</td>
<td>.06* (SE = .06)</td>
</tr>
<tr>
<td>Social presence → Absorption → Experience</td>
<td>.06* (SE = .05)</td>
</tr>
</tbody>
</table>
Social presence → Absorption → Satisfaction  \( .04^* \) (SE = .04)
Social presence → Absorption → Behavioral intention  \( .05^* \) (SE = .05)
Note: * \( p < .05 \)

Table 15: User-defined Estimands Testing Indirect Effects of Exogenous Variables for Highly Dependent Users

<table>
<thead>
<tr>
<th>Perceived Message Contingency →</th>
<th>B Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social presence → Absorption → Experience</td>
<td>.17* (SE = .16)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Perceived Message Exchange →</th>
<th>B Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social presence → Absorption → Experience</td>
<td>.13* (SE = .13)</td>
</tr>
</tbody>
</table>

Note: * \( p < .05 \)

Considering these mediation effects together with the corresponding model, the results suggest that highly dependent users, moderately dependent users, and non-dependent users use instant messaging very differently, which leads to subsequent attitudinal and behavioral outcomes. For highly dependent users, excluding all the non-significant paths and variables, the model suggests that social presence and absorption are two key mediators. They actively respond to both high message contingency and high message exchange, which tend to elicit strong social presence and subsequent cognitive absorption, thereby resulting in a positive user experience.

On the other hand, both moderately dependent users and non-dependent users respond only to perceived message contingency in IM use. While moderately dependent users tend to experience both perceived interactivity and social presence and engage at both content and experience levels, non-dependent users tend to experience social presence and engage with content exclusively.
Summary of Findings

In sum, besides examining the hypotheses proposed in this study, the current study also performed a series of modeling tests to further probe the interactions between users’ levels of addiction and technology features. The major findings are summarized below.

**Effects of technology affordances.** The positive effects of message interactivity on attitudinal and behavioral outcome variables were fully mediated by perceived contingency, perceived interactivity, and content elaboration in a sequential fashion.

On the other hand, message exchange as another manipulated independent variable failed to influence either of the proposed mediators (social presence and perceived responsiveness). Further exploration indicated that such results were probably caused by the manipulation of message exchange being relatively subtle. Therefore, perceived, rather than manipulated, message exchange was utilized in further mediation analyses and model tests. The results indicated that social presence followed by absorption positively mediated the effects of message exchange on outcome variables.

**Effects of level of addiction.** Level of addiction in this study was measured based on individuals’ levels of IM dependency. The results indicated that the proposed main effect of level of IM dependency on user engagement was not supported, but the variable did strongly moderate the effects of the two technology variables reported in the previous section. On the one hand, a two-way interaction effect between dependency and message interactivity was found on behavioral intention, which suggested that the positive effect of message interactivity on behavioral intention was very salient for non-dependent users, moderate for moderately dependent users, and disappeared for highly dependent users. Such results showed that non-dependent users generally preferred higher level of message interactivity in their IM chat.
whereas highly dependent users might be less interested in message interactivity.

In addition, a series of three-way interactions was also found on user engagement, attitudes, experiences, satisfaction, and behavioral intentions. The interactions consistently suggested that all three groups, non-dependent users, moderately dependent users, and highly dependent users, valued message interactivity in general. Specifically, non-dependent users valued message interactivity regardless of message exchanges. Moderately dependent users appreciated high message interactivity only when there were few message exchanges; coupling both high message interactivity and high message exchange tended to decrease user attitudes and experience. However, when message interactivity was low, more message exchange was preferred over less. Finally, it was surprising to see that highly dependent users preferred high message interactivity as well; even more surprisingly, they actually disliked high message exchange if there was no message interactivity. These three interactions are contrary to the predictions proposed at the outset of the study. A structural model was subsequently created to probe the theoretical mechanisms behind these effects.

The structural model employed a multiple group analysis approach to examine the moderating effects of levels of IM dependency, and found that the three groups responded to IM chat differently at different stages. At the first step, both non-dependent users and moderately dependent users actively responded to message contingency only, whereas highly dependent users responded to both message contingency and message exchange. Subsequently, social presence was a baseline mediator for all three groups; however, moderately dependent users could also obtain perceived interactivity mediating their experience with IM, which did not appear for non-dependent users and highly dependent users. Finally, when it comes to engagement level, non-dependent users tended to engage at the content level (i.e., content
elaboration), highly dependent users tended to engage at the experience level (i.e., absorption), and moderately dependent users tended to engage at both content and experience levels.

The next chapter interprets these results in light of the theoretical mechanisms tested and also discusses their practical implications.
Chapter 4

DISCUSSION

The primary goal of this study is to examine if and how addicted and non-addicted users of instant messaging will use and respond differently to two components of IM - message interactivity, featuring contingent text messaging conversation, and message exchange, featuring simple and mechanistic activity of exchanging messages without much contingency.

One of the key contributions of the study lies in examining the psychological mechanisms behind the addictive use of IM by identifying the significant correlates that connect technological affordances with addictive use and experience. This study empirically supports that media affordances can shape user needs and offer distinctive gratifications while also revealing the motivational differences between addicts and non-addicts.

More importantly, the study conceptualizes the same affordance (i.e., message interactivity) in two different dimensions: contingent message interactivity and mechanistic message exchange. It further shows that these dimensions could generate different types of gratifications and lead to different types of user engagement. Considering that all these findings were obtained in an experiment that controlled for content, it isolates the role of technology in shaping the psychology of IM use.

While revealing the role and significant psychological correlates of technology, the current study also illustrated how users’ levels of addiction can moderate technology’s effects. Findings of this study suggest that, when user addiction is considered, there is a difference in technology use, psychological gratifications, and user engagement between addicted and non-addicted users. By showing commonalities and differences between addicts and non-addicts, the
findings highlight baseline gratifications across user groups; on the other hand, the paradoxical IM use confirms the nature of addictive use, signals irrationality in general media choice and use, and calls for better interface design to facilitate and regulate media consumption.

**Gratifications in Addictive Use of IM**

The current study attempted to theorize the addictive use of instant messaging at both motivational and behavioral levels. For the motivation aspect, the study integrated the theory of interactive media effects (TIME) (Sundar et al., 2015) with a refined uses-and-gratifications frame for emergent media (Sundar & Limperos, 2013) to propose that IM users’ actions triggered by different technological features tend to be associated with certain psychological states, which could gratify related psychological needs. Addicted users who pursue experience-oriented process gratifications were expected to be gratified by the sense of responsiveness and social presence obtained from their mechanistic message exchanges, thereby leading to their further cognitive absorption and positive evaluations. On the other hand, non-addicted users were expected to be more interested in goal-oriented instrumental gratifications and would tend to be gratified more by perceived contingency and perceived interactivity from their use of contingent message exchanges. Such psychological gratifications were expected to lead to stronger engagement with message content and positive user experience.

However, the data suggest a different story. A series of three-way interaction effects consistently suggests that non-dependent users respond more positively to message interactivity regardless of message exchange. However, highly dependent users respond more positively to both high message exchange and high message interactivity. More surprisingly, when message interactivity is at a low level, highly dependent users actually respond negatively to high
message exchange whereas moderately dependent users respond positively to high message exchange.

At first glance, this counter-theoretical finding seems to imply that highly dependent users try to avoid message exchanges as much as possible and are in fact more interested in a meaningful and contingent conversation. However, the SEM model reveals that the difference between highly dependent users and non-dependent users is more complicated.

Before moving to detailed discussion, as we clarified earlier, the SEM model focused on exploring structural relationships among the underlying psychological correlates. Since previous analyses have shown that ontological manipulation of message interactivity and message exchange could effectively change the corresponding perceptual variables (perceived contingency and perceived message exchange), perceived contingency and perceived message exchange were used as exogenous variables in the model. However, they should still be considered as psychological experience that can explain user behaviors rather than as experimentally manipulated independent variables that are being tested and explained (O’Keefe, 2003).

One major pattern emerging from the SEM analysis is that social presence is a common psychological experience that can be elicited by perceived contingency across all three groups of users. If we view these psychological correlates as new gratifications induced by a technological affordance (Sundar & Limperos, 2013), this finding indicates that social presence and perceived contingency are two fundamental psychological gratifications obtained from the interactivity affordance in an IM context. As Nardi et al. (2000) suggested, users could obtain a sense of social presence by simply monitoring their IM contact list without actual interaction. Therefore, it is theoretically plausible that any message exchange, regardless of contingency, could imbue a
sense of social presence. In addition, as previous research (e.g., Sundar et al., 2016; Bellur & Sundar, forthcoming) has repeatedly supported, perceived contingency is an important mediator in CMC and HCI contexts. Therefore, it is not surprising to find that both social presence and perceived contingency are always salient across groups, and are also the only two significant psychological correlates for non-dependent users.

In this study, users’ levels of addiction were operationalized based on their dependence on IM. Therefore, for non-dependent users who use different media and personal channels to manage their relationship, they probably do not engage in frequent and long IM conversations. Their uses of text messaging tend to be managed by certain immediate outcome expectations, such as obtaining information or making social connections. If this is true, such outcome expectations can be quickly met by experiencing social presence from contingent message exchange. It is psychologically meaningful for non-dependent users to fulfill their immediate outcome expectations in this way. Perceived contingency and social presence are by themselves salient psychological gratifications for non-dependent users.

On the other hand, for highly dependent users who have been repeatedly using IM in their daily lives, social presence has also been repeatedly obtained from their daily uses. According to media habits literature, such repetition tends to establish the so-called “long-run average outcome expectation,” which is a consequence of abstracting the repeated gratification into an average expectation. This average expectation can function as a minimum level of motivation to maintain the addictive use of the medium. Therefore, it is very plausible that message contingency and social presence function as average outcome expectations for highly dependent users, which tends to sustain their addictive use patterns.
However, simply fulfilling the average outcome expectation might not be enough for highly dependent users. As the current study defines addiction as a combination of dependence (i.e., attempt to achieve a pleasurable internal state via gratification of needs) and compulsion (i.e., avoiding aversive internal state), obtaining basic gratifications to fulfill the average outcome expectation could only help highly dependent users avoid the aversive state. To complete an addiction circle, these users often demand a higher level of satiation. Especially after long-term use, they tend to become more tolerant of the addictive activity, which requires them to engage in the behavior at increasingly higher levels to achieve the same level of satiation. Therefore, it was expected that highly dependent users tend to be more responsive to message exchange. As our path analysis showed, perceived message exchange can indeed influence user experience via social presence. This mediation path is unique to highly dependent users indicating that being able to perform addictive behavior (even at a perceptual level) itself is psychologically rewarding and important to highly dependent users.

However, this finding seems to contradict the three-way interaction effect showing that highly dependent users actually evaluated high message exchange condition negatively and preferred low message exchange when there was low message interactivity. One possible explanation might be the inconsistency between manipulated message exchange and actual addictive message exchange behaviors. Scholars have found that IM is often used as social tool for maintaining relationships (Lam, 2013); therefore, the majority of IM messages tend to be low-information and focusing on quick social grooming or coordination (Ling, 2005). This might be especially true for the highly dependent users in this study as they rely on IM for relationship management and maintenance. With this in mind, it is possible that highly dependent users send and receive many IM messages in the course of a day, but these exchanges tend to consist of
many quick and short chat sessions instead of a few long IM chat sessions. Such speculation is supported by a study conducted by Oulasvirta, Rattenbury, Ma, and Raita (2012), which found that a major characteristic of habitual smartphone use is short and brief usage sessions that are spread evenly throughout the day. Moreover, the applications that are frequently involved in this type of checking behavior and short usage are email and messages, contact book, and social media. In contrast, in the current study, participants were asked to complete a task-oriented service chat regarding choosing a credit card, which had approximately 38 to 43 message exchanges during a chat session in the high message-exchange condition. Such a lot of exchanges in one IM chat session might actually impede highly dependent users’ experience, which was reflected in the three-way interaction. However, the perception of a large amount of message exchange itself, as used in the model, can still induce strong social presence and positive experience, as evidenced in the SEM model. In other words, perceived message exchange entered in the SEM model, is an important psychological experience for highly dependent users, which could positively influence subsequent psychological correlates and outcome experiences; however, to correctly induce this perception, users need to have short but frequent message exchange sessions throughout the day rather than have a long focused chatting session that have many exchanges, which was the manipulation of high message exchange in this study. The contradictory interaction pattern might be caused by this kind of manipulation.

Perceived Interactivity

The previous discussion showed that social presence and perceived contingency are two basic gratifications obtained from IM use, this leads to a further question: What about perceived interactivity? Why does perceived interactivity fail to be a significant mediator for both highly
dependent users and non-dependent users? As many scholars have argued, perceived interactivity is one of the defining characteristics of interactive communication. If this argument is correct, then we should find perceived interactivity as a significant mediator that can lead to a series of positive effects. However, the current structural model did not support the mediating effects of perceived interactivity for non-dependent users and highly dependent users.

To address this question, it is important to clarify the difference between reactive communication and fully interactive communication. According to Rafeali (1988), contingency is the key in defining real interactive communication, whereas a simple two-way message exchange can be deemed only as reactive communication. Non-dependent users might not be able to clearly distinguish between these two types of communication. This could be because non-dependent users do not rely on IM to build or maintain their relationships; instead they use IM more consciously for instrumental purposes (e.g., customer service chat). Therefore, as long as there is contingency that could actually help them chat and understand each other effectively, they will be satisfied. If there is no contingency, non-dependent users can still obtain social presence, which could motivate them to continue content processing as illustrated in the model. In either case, it seems that perceived interactivity was either not being recognized or being ignored by non-dependent users. In contrast, highly dependent users rely on IM to maintain their relationships, which is more about maintaining a sense of copresence with others. Therefore, sense of interactivity might not offer any unique contribution in addition to social presence. Only for moderately dependent users, who might be skilled and also motivated enough to tease out the sense of interactivity as a unique psychological experience in their uses of IM, the model indicates that perceived interactivity is a significant mediator.
Considering the current findings with previous research indicates a potential problem of employing perceived interactivity as one of the key variables in studying interactive communication because perceived interactivity is not a reliable psychological outcome that can be consistently predicted and operationalized. For example, a recent study (Bellur & Sundar, forthcoming) found that participants rated the low interactivity condition as the most interactive compared to medium and high interactivity conditions. As a result, perceived interactivity negatively mediated the effects of manipulated interactivity on user attitudes and engagement instead of doing so positively, as hypothesized. Although in the current study, perceived interactivity was not a significant mediator in most cases, the fact that perceived interactivity could be influenced by both perceived contingency and perceived message exchange (only for highly dependent users) indicated that users’ evaluations of perceived interactivity might be very contextually driven and therefore an invalid indicator of the actual affordance of interactivity in a system (Bellur & Sundar, forthcoming).

**Message Interactivity and Perceived Contingency**

One set of robust findings in the current study is the positive effects of message interactivity. The hypothesized positive main effect of message interactivity on each dependent variable was supported. Moreover, a series of three-way interaction effects showed that message interactivity was preferred by all three groups of users. This pattern was replicated in the SEM model showing that perceived contingency was psychologically meaningful across groups. Overall, perceived contingency can result in a stronger sense of social presence and engagement, which subsequently improves users’ satisfaction, experience and behavioral intention. These findings directly corroborate previous research on the positive effects of message contingency on
user engagement and media experiences (e.g., Sundar et al., 2003; Sundar et al., 2016; Bellur & Sundar, forthcoming) and confirm the psychological importance of message contingency.

Moreover, the current study showed that the same technology affordance could engender different types of psychological experience and engagement for different users. Non-dependent users who have minimal psychological dependence on IM tend to perceive and use IM as a communication tool for instrumental purposes rather than for social relationship maintenance. Therefore, they appreciate the utility value – threaded and interdependent communication – offered by message interactivity; in contrast, for moderately dependent and highly dependent users who focus more on the social aspects of IM use, a positive communication experience is not necessarily determined by the effectiveness of communication; therefore, message contingency tends to be used for obtaining a sense of social connection and absorbing experiences. These findings are also consistent with previous literature arguing that the same technology affordance can be interpreted and utilized differently by different user groups (Norman, 1999; Sundar, 2008), which then lead to different types of user experience and engagement.

**Engagement in Addictive Use of IM**

Following Oh, Bellur, and Sundar (2015), the current study divided cognitive engagement into content elaboration and absorption. The study’s results showed the subtle difference between highly dependent users and non-dependent users in how they engage with IM, which also offered strong support to this nuanced distinction.

According to the user engagement continuum, initiated by interface engagement, users will move to experience more content-focused engagement, which is labeled as “absorption,”
featuring more focused attention and more immersive experience. Based on this framework, the current study further divided this content-level engagement into two dimensions, including immersive experience (absorption) and pure content engagement (elaboration), to examine how levels of addiction can moderate user engagement. As the structural model and mediation analyses indicated, for non-dependent users, content elaboration was the only significant engagement mediator; in contrast, for highly dependent users, absorption was the only significant engagement mediator. In other words, non-dependent users are more likely to focus on the actual content processing in IM chatting whereas highly dependent users seem care more about their immersive experience with IM chatting via the system interface. Such findings are consistent with our hypotheses. As we consider addictive use of IM as a type of habitual use, it tends to focus on process-oriented pleasurable experience, which can be captured by this absorption aspect, featuring more focused attention and immersive experience. In contrast, for regular or non-addictive use of IM, the current study argues that it tends to focus more on instrumental goal of communication. Therefore, users in this category are more likely to focus on content gratification obtained from more engaged content processing and elaboration.

Unlike highly dependent users and non-dependent users, moderately dependent users seem to be a more special case: they focus on both content elaboration and absorption during IM use. Considering this engagement pattern together with their gratifications, it seems that moderately dependent users are in an initiation stage from a non-dependent state to a highly dependent state (though they will not necessarily become highly dependent users eventually). According to the operant conditioning model of addiction (Marlatt, Baer, Donovan, & Kivlahan, 1988), addictive consumption behaviors can take place in four stages: initiation, transition to ongoing use, addiction, and behavioral change. At the initiation stage, a media consumption
behavior tends to be experienced as pleasurable and rewarding (LaRose, Lin, & Eastin, 2009). In this case, moderately dependent users who have been familiar with IM use can obtain pleasurable experiences such as contingent and interactive communication as well as social presence from their IM chats. However, they are not addicted to the behavior yet at this point. They tend to have a mixed experience where their using behaviors are somewhat automatic (e.g., process-oriented) while still remaining conscious (e.g., instrumental-oriented) (LaRose, et al., 2009). Therefore, in addition to more complicated gratifications, the current model also found that moderately dependent users engaged with IM at both the experiential level and content elaboration level.

**Paradoxical Pattern of Addictive Use of IM**

If we were to model IM communications in an ideal theoretical world, we would expect that full interactive communication supported by message interactivity facilitates users to better focus on extracting and processing meaningful information and subsequently enhances user experience and satisfaction. On the other hand, mechanistic message exchange could at best support reactive communication, which is more associated with a simplified sense of social presence. In addition, because of its lack of contingency, user engagement due to message exchanges will be more about having an absorbing experience with IM system instead of doing so with meaningful content. However, the actual findings indicate that highly dependent users value message interactivity and sense of contingency just as non-dependent users. If this is true, as we discussed before, should we not expect to find highly dependent users to be more engaged with content processing?

These findings suggest a paradoxical pattern of addictive IM use. Specifically, as highly
dependent users heavily rely on text message to maintain their relationships, it is plausible that they need a certain level of interactive communication to achieve this goal, which makes perceived contingency a necessary component in their use of IM. After their repeated use, highly dependent users become good at capturing contingency from their IM use, and perceived contingency probably becomes an indispensable gratification, in addition to social presence. Meanwhile, repeated use of IM also makes them become accustomed to frequent message exchanges, which can fulfill their compulsiveness for texting behavior. Therefore, their appreciation of message contingency does not necessarily change the nature of addictive use of IM, which is still a habitual, experience-oriented activity. Hence, highly dependent users’ engagement is at an experiential level rather than at its corresponding content-level, even though they prefer high levels of contingency.

If we consider that sense of contingency and sense of social presence reflect users’ motivations in IM use while different types of engagement indicate the psychological outcomes of their IM use, the paradoxical pattern of IM use shows a misalignment between intentions and consequences for addicted users.

One reason that might cause such a pattern is the conflict between the assumed role of IM and the actual use of IM. According to previous research, IM has been consistently used as a tool for social connections and maintaining personal relationships (Katz & Aakhus, 2002; Lam, 2013). For example, Doring (2002) found that more than half of the messages were used for relationship maintenance. Ling (2005) reported that 75% of all mobile messages fell into the categories of simple coordination, social grooming, and quick questions and answers. These studies are consistent with the current finding that social presence is a baseline gratification of IM use, they further imply that IM tend to be perceived as a medium for communicating
informal, low-information messages (Lacohee, Wakeford, and Pearson, 2003; Lam, 2013).

On the other hand, even though previous studies have also found that IM can be used as an effective tool in content-focused communication (Joyce & Weibelzahl, 2006; Haug, Meyer, Dymalski, Lippke, & Ulrich, 2012), as Lam (2013) suggested, when given a choice, users still overwhelmingly chose e-mail over IM as the medium for more instrumental communications. This line of research indicates that users are not necessarily rational when they choose and use a medium. They tend to be steered by habitual use of media. This can be especially true for addicts. In this study, although both highly dependent users and non-dependent users share the same instrumental goal (i.e., choosing the best credit card), highly dependent users still tend to use IM based on their average outcome expectations focusing on interactive experience while non-dependent users, in this case, use IM to achieve their immediate outcome expectations – learning information about credit cards.

In addition, addicts tend to strictly follow the rule of immediacy in their IM use. Sundar, Dou, and Lee (2013) argued that with the pervasiveness of ubiquitous computing technologies, users tend to make inferences about other people’s access to their mobile devices and assume they have such access anywhere anytime, which leads to an expectation for immediate response in electronic communication (Taylor & Harper, 2003). In this study, highly dependent users probably strongly adopt the rule of instant reply (i.e., Taylor and Harper (2003) identified it as “obligation to reciprocate”), and prioritize prompt replies over meaningful replies in their IM use. Considering that highly dependent users often exchange a great number of messages, this will not give them enough time to process each message if they also want to reply to each message within a short time. These factors together might force highly dependent users to quickly capture the contingency in their message chats so that they can be responsive but also
prevent them from digging into more meaningful content engagement and reflection. If this is the case, having a sense of contingency might actually harm these users’ IM communication in a way that, even for some functional use of IM, the sense of contingency might give them a certain level of confidence that they have adequately processed the messages so that they can maintain the use of IM at a hedonic level without being worried about actual content processing. In sum, addicts use IM seemingly at the content level, as they also value perceived contingency; however, due to their habitual use of IM for social connection and emphasis on response immediacy, use of message interactivity and the actual experience of contingency does not guarantee content processing. If anything, it might give them a false sense of confidence to skip content processing, so that they can fully focus on immersive experience during their IM uses.

Theoretical Implications

This study is theoretically meaningful because it does not only illustrate the difference between non-addicts and addicts in their use of IM, but it also offers new ways of defining and studying IM addiction. In addition, it also contributes to interactivity research by further clarifying the roles of interactivity and contingency and their significant psychological correlates. Finally, the current study also confirms the validity of the user engagement continuum. Specifically, the theoretical implications can be categorized as follows:

**Understanding IM addiction.** One interesting finding of the study is the highly dependent users’ paradoxical use of IM where can and often utilize IM at its full potential, but their actual uses are often experiential or relatively superficial. This can be considered as one of the qualitative standards in defining addictive use of IM. Specifically, previous studies on technology addiction have been controversial in terms of defining addiction. Scholars have
attempted to capture addictive use from different aspects such as perceived excessive use, dependence symptoms, or functional impairment. In general, most of these studies defined and studied technology addiction by following previous substance-addiction literature and applying similar definitions. These definitions captured some variance, but do not capture that which is unique about technology addiction. With the paradoxical pattern of IM use reported in this study, the findings offer kind of contribution by highlighting the unique aspect of technology addiction, which is not simply about excessive use or heavy psychological dependence. Rather, technology addiction signifies that different psychological mechanisms can be obtained from the same piece of technology. In the context of IM addiction, highly dependent users tend to engage with message interactivity at both message-contingent and mechanistic levels, and their appreciation of contingency does not negate the experience-driven nature of their use of the medium; in fact, perceived contingency as a psychological gratification might actually function as a pleasurable experience that enhances reactive communication. Therefore, besides quantifying the usage of technology, the current study suggests that future studies should also look at how technology is used, which can be an effective way to distinguish between addictive and non-addictive use of a medium.

In addition to offering a more qualitative way of viewing technology addiction, the current study also suggests a need for the reexamination of perceived interactivity in defining and measuring interactivity.

**Interactivity, perceived message contingency, and perceived interactivity.** Message contingency and its related psychological correlate, perceived contingency, have received consistent support in several recent studies, as important variables in enhancing user engagement, attitudes, and experience in the context of HCI (Sundar et al., 2003; Sundar & Kim,
The current study successfully replicated the previous findings in the context of IM use, which extends our understanding into a new CMC context. More importantly, the effects of message contingency are very consistent and robust in the current study, which confirms message contingency as a valid way of conceptualizing interactivity. In addition, consistent links between ontological manipulation and participants’ perceptual evaluations also corroborate the validity of operationalizing interactivity in this way.

This runs counter to suggestions made by some scholars that perceived interactivity should be used to define the interactivity of a medium. The current study argues that perceived interactivity is an unreliable concept that can easily be confused with other psychological variables, which could add further confusion to the understanding of interactivity and interactive communication.

Ideally, there should be a positive association between interactivity and perceived interactivity, in that a real interactive medium should also be perceived as more interactive by the users. However, as reported by previous studies (e.g., Bellur & Sundar, forthcoming), perceived interactivity seems to measure a more general perception toward a communication medium rather than specifically capturing the interactivity concept. This notion was also confirmed by the current study, as users were able to experience a sense of interactivity even when they engaged in reactive communication. This suggests that users probably presume high interactivity when they see an IM interface and know that they are chatting with another human. However, does this mean any IM chat with a human is actually interactive? Absolutely not. In this case, perceived interactivity might be confused with other psychological experiences, such as social presence; alternatively, perceived interactivity might function as a perception triggered by social presence.
Regardless, it suggests that perceived interactivity as a measured variable should be treated with caution in future research on interactivity.

**User engagement.** The current study maps different types of engagement to different types of users. Specifically, highly dependent users focus on experience absorption whereas non-dependent users focus on content engagement. This finding confirms that addicts’ IM use is more process-oriented whereas non-addicts’ use is more content-oriented. Furthermore, it suggests that engagement at the cognitive level might be a multi-dimensional concept, indicating that absorption does not necessarily imply content processing. This differentiation might not be true in a context of traditional, non-interactive media because these media cannot offer much process gratifications in addition to content gratifications (e.g., the absorbing experience from reading a book is mostly from the content rather than the process of flipping pages). However, for interactive media, a user can be absorbed by the content as well as the process of interacting with the system. This is consistent with Oh and Sundar’s (2015) findings indicating that modality interactivity tends to induce stronger absorption whereas message interactivity tends to enhance content elaboration. Therefore, it becomes critical and meaningful to make such a differentiation between content elaboration and absorption as it could be used to categorize and map technology affordances and user groups. Further analysis confirming such differentiation would be a meaningful extension.

**Methodological Implication**

For addiction research, because of the sensitivity of the topic, almost all the previous quantitative research employed a survey approach. While these studies could offer a broader and
more generalizable understanding of addictive use of media, they also come with all the limitations of the survey approach, such as low internal validity. In the current study, the researcher employed an experimental design to examine interaction effects between participants’ levels of addiction and their technology uses. By illustrating how level of addiction moderates the effects of technology on related mediating and outcome variables, the study offers a more valid test on the role of technology in the addictive use of IM. This design can be further applied to testing the effects of other technological affordances in other types of addictive use of media while maintaining relatively high internal validity. For example, other than IM use, social media use is another major activity with smartphones. As social media can offer a wide variety of affordances and content, as a first step, researchers could conduct a survey to find the major affordances that are associated with dependent use. To further explore how these affordances are used by addicted users and non-addicted users and corresponding psychological mechanisms, a similar experiment illustrating the moderating role of level of addiction on the effects of the technology affordances on user experiences will be able to offer more internally valid answers than a survey research simply asking participants’ motivations and gratifications.

In addition, this study manipulated message interactivity as a structural feature by merely embedding contingency cues into each individual message. The manipulation differed from previous studies (e.g., Oh & Sundar, 2015; Bellur & Sundar, forthcoming) focusing on human-computer interaction where contingency cues can be directly manipulated as system interface features (e.g., hyperlinks). Such a difference implies that in a CMC context — because of technology’s role as a medium — directly adding extra interface cues to signal contingency might be perceived as intrusive. Therefore, the current study offers a subtle but effective solution to deliver contingency via structuring messages differently. This can be used in future tests on
the effects of message contingency in CMC communication in different contexts. For example, in health communication, will contingency influence users’ engagement, attitudes, and behaviors in a mediated doctor-patient communication? Research questions like this can be empirically examined by adopting a similar manipulation.

**Practical Implications**

Aside from the theoretical and methodological contributions, one must ask how the findings from this study contribute to actual interface design as well as media addiction intervention. For interface design, a chatting function has been widely adopted by individual users as well as businesses. For example, Facebook recently debuted chatbots for its Messenger app, which allows users to chat with bots from different businesses in order to complete certain tasks (e.g., getting weather reports, shopping, or receiving latest news). However, the actual user experience was disappointing; one major problem was that these bots could not offer fully tailored responses (Perez, 2016). In other words, the conversations with the bots were not contingent, which is revealed by the current study to be a critical variable that could enhance users’ information processing and experience, especially if they are regular users of IM. A practical implication is that designers should emphasize the contingency cues on an IM interface so that users can easily see how their communications with conversation partners, be it a bot or real person, are interdependent and tailored. Features that allow each IM interactant to quickly refer to and cite previous messages or clearly highlight those related messages in a chat window might be helpful. For example, according to Consumer Reports (2015), one of the top irritants in customer service is that service agents repeatedly ask for the same information. This essentially implies the lack of contingency in conversations between service agents and customers. In this
case, an IM app that can automatically refer to and display the prior messages that are thematically relevant to the current conversation will be very helpful for both service agents and users to have a more efficient and satisfying conversations.

The results also suggest that addicts appreciate contingency but rarely use it for further content processing. Such knowledge implies that in diagnosing media addiction, clinical professionals should refine their evaluation strategy by adding observation of individuals’ actual uses of technology. For example, in addition to completing a diagnostic questionnaire, individuals can be asked to complete certain instrumental tasks (e.g., reading and writing) for further evaluation. Their performances can be compared against standard values to determine whether their uses are addictive. This could provide a more objective evaluation, rather than self-report, of the detrimental effects of addictive use of technology.

In addition, for further intervention strategies, instead of simply focusing on individuals’ psychological and pathological factors, professionals should also remodel addicts’ objectives and gratification expectations to value actual content. Specifically, the paradoxical pattern of IM use indicates that users might be following a different set of rules (e.g., immediate replies) that prevent them from processing content carefully. Therefore, future IM apps could integrate more contextual cues informing addicted users about which messages require brief replies (e.g., those social grooming messages from friends), which ones require content processing but not replies (e.g., news content or billing information), and which ones require more careful processing and prompt replies (e.g., urgent business messages from working partners). Such contextual information might help emphasize immediate outcome expectations, thereby guide and regulate addicts’ IM use.
Furthermore, a new text-chatting app can be designed to promote more regulated and effective use of this medium, such as an instant messaging app that pushes meaningful content such as news or educational materials in a text-chatting interface and highlights key content and information in each message might be effective solutions to enhance heavy users’ information processing efficiency as well as maintain a reasonable level of gratification. Equally important, as social agents have been increasingly integrated into technology interfaces (e.g., Siri or live chat bots), by knowing that social presence is a baseline gratification obtained from IM use, one promising use is to design interfaces in a more contingent fashion so that users can quickly build strong social connections as well as better engage with the technology. For example, pro-health apps and systems could integrate an interface that can push diet information and exercise advice based on users’ daily activities. Rather than simply nudging users to exercise every one hour, a wearable health tracker could push this information in a more contingent way (e.g., “Remember your goal for today is to walk 8,000 steps; let’s do a 5-minute walk now to add another 800 steps to your current record of 5,000 steps!”). This type of social and tailored communication might significantly enhance users’ engagement and behavioral change.

Limitations

As a lab experiment, a major limitation of the current study is its ecological validity. Even though it employed a persona-based script, which allowed participants to engage in the IM conversation freely, it still could not fully represent their uses of IM in the real world. On one hand, as reported by previous research, most IM messages are about social connection and relational communication, which essentially are less instrumental and goal oriented. In this study, the conversation topic focused on choosing the best credit card for college students, which
was highly instrumental. Although the findings showed addicts’ experiential engagement even in an instrumental IM conversation, which gave a strong illustration of their process-oriented use of IM, conducting the study in a social context might offer a more ecologically valid examination of the difference between addicts and non-addicts. It would be interesting to see if addicts and non-addicts still present the different types of engagement in a social context in a future study.

Another factor that might negatively influence the ecological validity of the study is using researcher as the conversation partner. Although the study was framed as a chat with a service agent, which is a scenario that could happen in our daily use of IM, IM chatting with a stranger might elicit a psychological experience that is different from chatting with a friend. As the researcher expects that social presence will continue to be a major psychological experience in this context, other mediators might be perceived differently. For example, will perceived responsiveness become a significant mediator in a context of chatting with a friend because addicts might have even higher expectations of responsiveness while non-addicts might be more tolerant?

In addition, the current study only examined message interactivity affordance and measured four related psychological gratifications. Future studies should include other technology-induced gratifications such as sense of control and sense of activeness. Especially if we consider addicts are more process-driven while non-addicts are more content-driven, some gratifications that are typically obtained from HCI will become relevant in this CMC context. Likewise, other types of interactivity affordances might be relevant and should also be examined. Although message interactivity is the core affordance of IM, other kinds of interactivity, such as source interactivity and modality interactivity, might also show differences between addicts and non-addicts. Especially in considering the tolerance effects of addiction, addicts might need to
engage in interactive behaviors at increasingly higher levels in order to achieve the same level of satiation; therefore, they might be forced to seek more gratifications by integrating other affordances into their IM use. For example, addicts might be more likely to share pictures, videos, GPS locations, or use emoticon in their messages in comparison to non-addicts who probably will use more plain text. It would be both theoretically and practically important to include these new variables in future studies to better understand addictive use of IM as well as other communication technologies.

Conclusion

This study shows how the effects of message interactivity affordance can be moderated by users’ levels of addiction. By examining the interaction effects between technology and addiction, the current study is able to distinguish between addicts and non-addicts in terms of their technology use in a qualitative way. In the end, addicts and non-addicts are actually not that different, as they do share social presence and perceived contingency as a basic gratification from their IM use. What really separates them are their differential styles of engagement and appreciation of mechanistic message exchange. These differences are critical as they not only confirm technology’s role in the process of addictive media use, but also offer an opportunity to rethink and reexamine media addiction research. Instead of simply defining and understanding media addiction from a series of user factors, it would be important to add a technological aspect into the evaluation. The importance of the findings is not only limited to its current context. The results highlight the role played by technology in perpetuating addiction, which could subsequently inspire new strategies and tools to combat addictive use of a whole host of media.
REFERENCES


Church, K., & de Oliveira, R. (2013). What’s up with whatsapp?: Comparing mobile instant messaging behaviors with traditional SMS. *15th International Conference on Human-Computer Interaction with Mobile Devices and Services (MobileHCI’13)*, 352–361. doi:10.1145/2493190.2493225


community, and culture on social network sites (pp. 59-81). New York: Routledge, Taylor and Francis.


Liu, Y., & Shrum, L. J. (2002). What is interactivity and is it always such a good thing? Implications of definition, person, and situation for the influence of interactivity on advertising effectiveness. *Journal of Advertising, 31*(4), 53-64.


**Appendix A. Condition Script**

**Condition: High Message Exchange with High Message Interactivity**

<table>
<thead>
<tr>
<th>Confederate</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hello, thank you for choosing Credit Smart. My name is Ryan; I am your personal advisor. What can I help you with today?</td>
<td>Sure, I would like to select a credit card.</td>
</tr>
<tr>
<td>Sure! I will help you choose the best credit card. Can I first start with few questions regarding your information?</td>
<td>Sure</td>
</tr>
<tr>
<td>Great! What is your name?</td>
<td>Alex</td>
</tr>
<tr>
<td>Thank you, Alex. There are different cards for different ages. So how old are you?</td>
<td>20</td>
</tr>
<tr>
<td>OK, because you are 20 years old (and you said that you this is gonna be your first credit card), I assume that you do not have a long credit history. I will then focus on cards for young adults. These cards are easy to approve. Are you a student?</td>
<td>Yes</td>
</tr>
<tr>
<td>Thanks, Alex. Considering your age and student status, let’s narrow our focus down to student credit cards. These are designed for college students to help them build a credit history. What year of college are you in?</td>
<td>sophomore</td>
</tr>
<tr>
<td>Cool! I think I have enough info about you, Alex. As you are a sophomore with a short credit history, we have several student card options for you. Now let’s look at some card benefits like shopping cashback, airline mileage, hotel points, or gas rebates. So next, I will be asking you a few questions, this will help me find the student card that fits you best. Let's get started, OK?</td>
<td>Sure</td>
</tr>
<tr>
<td>Thanks, Alex. Do you travel very often?</td>
<td>Yes</td>
</tr>
<tr>
<td>OK, since you travel often, student cards with hotel rewards can be a good option for you. You can earn hotel points quickly and redeem them for free nights or upgrades. In addition to traveling often, do you do a lot of online shopping?</td>
<td>Yes</td>
</tr>
<tr>
<td>Sure, as you do a lot of shopping, we can also consider student cards offering purchase cashback. You can earn cash or points rewards for daily purchases.</td>
<td>Yes</td>
</tr>
<tr>
<td>OK Alex, I have hotel rewards and shopping benefits checked for you. How about dining out… Do you dine out frequently?</td>
<td>No</td>
</tr>
<tr>
<td>OK, then let’s skip dining related card benefits.</td>
<td>Not really</td>
</tr>
<tr>
<td>Then how about air travel rewards? When you travel, do you fly very often?</td>
<td>No</td>
</tr>
<tr>
<td>No problem. Considering that you do not fly often, we can also skip the airline mileage feature.</td>
<td></td>
</tr>
<tr>
<td>One more question, Alex. Since you mentioned earlier that you like road travel, I assume you are also interested in gas rewards?</td>
<td>Absolutely</td>
</tr>
<tr>
<td>Yep, that’s what I thought. As you do road travel frequently, gas</td>
<td>Sure</td>
</tr>
</tbody>
</table>
rewards are definitely something we want. It can help you earn more on fuel purchases.

OK Alex, with your interests in hotel rewards, shopping cashback, and gas rewards, let me find a card that combine these features.

Also, in considering that you are a college student and you need a student card to build your credit history, I would recommend the Discover it® for Students card, which is easy to approve and offers the travel and shopping benefits that you are interested.

Great! Is there any other question I can help you with, Alex?

Sure, thank you for contacting Credit Smart. Have a good day!

Please return to your computer to complete the user experience survey. Thank you.
### Condition: High Message Exchange with Low Message Interactivity

<table>
<thead>
<tr>
<th>Confederate</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hello, thank you for choosing Credit Smart. My name is Ryan; I am your personal advisor. What can I help you with today?</td>
<td>Sure, I would like to select a credit card.</td>
</tr>
<tr>
<td>Sure! Can I first start with a few questions regarding your information?</td>
<td>Sure</td>
</tr>
<tr>
<td>Great! What is your name?</td>
<td>Alex.</td>
</tr>
<tr>
<td>Thank you. How old are you?</td>
<td>20.</td>
</tr>
<tr>
<td>OK, are you a student?</td>
<td>Yes</td>
</tr>
<tr>
<td>Thanks. The differences between regular credit cards and student credit cards are: Regular cards offer more card benefits but can be difficult to manage and pose more financial risks; student cards usually come with features that are appealing to college students and designed for students who are beginning to build a credit history. What year of college are you in?</td>
<td>Sophomore.</td>
</tr>
<tr>
<td>Cool! Now let’s look at some card benefits like shopping cashback, airline mileage, hotel points, or gas rebates. Let's get started, OK?</td>
<td>Sure</td>
</tr>
<tr>
<td>Thanks. Do you travel very often?</td>
<td>Yes</td>
</tr>
<tr>
<td>Hotel cards can help you earn hotel points quickly and redeem them for free nights or upgrades.</td>
<td></td>
</tr>
<tr>
<td>Do you do a lot of online shopping?</td>
<td>Yes</td>
</tr>
<tr>
<td>Cashback or reward points cards can earn cash or points rewards for making purchases.</td>
<td></td>
</tr>
<tr>
<td>Do you dine out frequently?</td>
<td>No</td>
</tr>
<tr>
<td>Dining cards offer more rewards for restaurant spending, even including for fast-food.</td>
<td></td>
</tr>
<tr>
<td>Do you fly very often?</td>
<td>Not really</td>
</tr>
<tr>
<td>Airline mileage credit cards are for earning airline miles to redeem flight tickets.</td>
<td></td>
</tr>
<tr>
<td>Are you interested in gas rewards?</td>
<td>Absolutely</td>
</tr>
<tr>
<td>Gas cards can offer you more rewards on fuel purchases.</td>
<td>Sure</td>
</tr>
<tr>
<td>OK, let me find a card.</td>
<td></td>
</tr>
<tr>
<td>I would recommend the Discover it® card, which offers dining, travel, shopping, and airline mileage benefits.</td>
<td>Thanks</td>
</tr>
<tr>
<td>Great! Is there any other question I can help you with?</td>
<td>No</td>
</tr>
<tr>
<td>Thank you for contacting Credit Smart. Have a good day!</td>
<td></td>
</tr>
<tr>
<td>Please return to your computer to complete the user experience survey. Thank you.</td>
<td></td>
</tr>
</tbody>
</table>
**Condition: Low Message Exchange with High Message Interactivity**

<table>
<thead>
<tr>
<th>Confederate</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hello, thank you for choosing Credit Smart. My name is Ryan; I am your personal advisor. What can I help you with today?</td>
<td>Sure, I would like to select a credit card.</td>
</tr>
<tr>
<td>Sure. I will help you choose the best credit card. Can I start by asking for your name and age?</td>
<td>Alex, 20 years old.</td>
</tr>
<tr>
<td>Thank you, Alex. Since you are 20 years old (and you said that you this is gonna be your first credit card), I assume that you do not have a long credit history. I will then focus on cards for young adults. These cards are easy to approve. Are you a student? And what year of college are you in?</td>
<td>Yes I am. Sophomore.</td>
</tr>
<tr>
<td>Cool! I think I have enough info about you, Alex. Considering your age and student status, let’s narrow our focus down to student credit cards. These cards are designed for college students to help them build a credit history.</td>
<td></td>
</tr>
<tr>
<td>Now, because we have several student card options for you, let’s look at some card benefits like shopping cashback, airline mileage, hotel points, or gas rebates. This will help me find the student card that fits you best. So, Alex, what are some activities that you do very often: staying at hotels, online shopping, dining out, air travel, and road travel?</td>
<td>Hotel, online shopping, and road travel</td>
</tr>
<tr>
<td>Thank you, Alex. Since you mentioned that you are interested in road travel and online shopping, I will focus on cards that offer hotel and gas rewards and shopping cashback, and avoid those that reward air travel and dining out. These features will help you earn more rewards on hotel stays and gas purchases during your road travel, as well as your daily online shopping. Let me try to find a card that combine these features.</td>
<td>Sure</td>
</tr>
<tr>
<td>Also, in considering that you are a college student and need a student card to build your credit history. I would recommend the Discover it® for Students card, which is easy to approve and offers the travel and shopping benefits that you are interested.</td>
<td>Sure, thanks.</td>
</tr>
<tr>
<td>Great! Is there any other question I can help you with, Alex?</td>
<td>No</td>
</tr>
<tr>
<td>Thank you for contacting Credit Smart. Have a good day! Please return to your computer to complete the user experience survey. Thank you.</td>
<td></td>
</tr>
<tr>
<td>Confederate</td>
<td>Participants</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>Hello, thank you for choosing Credit Smart. My name is Ryan; I am your personal advisor. What can I help you with today?</td>
<td>Sure, I would like to select a credit card.</td>
</tr>
<tr>
<td>Can I start by asking for your name and age?</td>
<td>Alex, 20 years old.</td>
</tr>
<tr>
<td>Thank you.  Are you a student?  What year of college are you in?</td>
<td>Yes. Sophomore.</td>
</tr>
<tr>
<td>Thanks.  The differences between regular credit cards and student credit cards are: Regular cards offer more card benefits but can be difficult to manage and pose more financial risks; student cards usually come with features that are appealing to college students and designed for students who are beginning to build a credit history.</td>
<td></td>
</tr>
<tr>
<td>Now, let’s look at some card benefits like shopping cashback, airline mileage, hotel points, or gas rebates. What are some activities that you do very often, among staying at hotels, online shopping, dining out, air travel, and road travel?</td>
<td>Hotel, online shopping, and road travel</td>
</tr>
<tr>
<td>There are many cards that can help you earn more rewards when you use your card on dining out, hotels, shopping, gas, and taking flights. Let me find a card.</td>
<td>Sure</td>
</tr>
<tr>
<td>I would recommend the Discover it® card, which offers dining, shopping, and airline mileage benefits.</td>
<td>Sure, thanks.</td>
</tr>
<tr>
<td>Great! Is there any other question I can help you with?</td>
<td>No</td>
</tr>
<tr>
<td>Thank you for contacting Credit Smart. Have a good day! Please return to your computer to complete the user experience survey. Thank you.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix B. Measurement

Pretest Questionnaire

Text Message Addiction – Emotional Reaction
1. After sending a text message, I check my mailbox repeatedly to see if I received a response
2. I feel disappointed if I don’t get a reply to my message immediately
3. I feel anxious when people don’t immediately reply to my text message
4. I often check my mailbox to see if I have a new text message
5. I feel disappointed if I don’t receive any text messages

Text Message Addiction – Perception of Excessive Use
1. I sometimes send text messages while engaging in a conversation with another person
2. I sometimes spend many hours on text messages
3. I often exchange many text messages in a short period of time
4. I use text messages even while I am talking with friends
5. I consider myself a quick typist on mobile phones

Text Message Addiction – Relationship Maintenance
1. I cannot form any new relationships without using text messages
2. I cannot maintain new friendships without text messages
3. I think my relationships would fall apart without text messages
4. Without text messages, I would not be able to contact friends whom I cannot meet on a daily basis
5. Without using text messages, I can’t say what is on my mind

Generalized Addictive Use of Internet
1. How often do you find that you stay online longer than you intended?
2. How often do you neglect household chores to spend more time online?
3. How often do you prefer the excitement of the Internet to intimacy with your partner?
4. How often do you form new relationships with fellow online users?
5. How often do others in your life complain to you about the amount of time you spend online?
6. How often do your grades or schoolwork suffer because of the amount of time you spend online?
7. How often do you check your e-mail before something else that you need to do?
8. How often does your job performance or productivity suffer because of the Internet?
9. How often do you become defensive or secretive when anyone asks you what you do online?
10. How often do you block out disturbing thoughts about your life with soothing thoughts of the Internet?
11. How often do you find yourself anticipating when you will go online again?
12. How often do you fear that life without the Internet would be boring, empty, and joyless?
13. How often do you snap, yell, or act annoyed if someone bothers you while you are online?
14. How often do you lose sleep due to late-night log-ins?
15. How often do you feel preoccupied with the Internet when off-line, or fantasize about being online?
16. How often do you find yourself saying "just a few more minutes" when online?
17. How often do you try to cut down the amount of time you spend online and fail?
18. How often do you try to hide how long you've been online?
19. How often do you choose to spend more time online over going out with others?
20. How often do you feel depressed, moody, or nervous when you are off-line, which goes away once you are back online?

**Power Usage measures**
1. I think most of the technological gadgets are complicated to use.
2. I make good use of most of the features available in any technological device.
3. I have to have the latest available upgrades of the technological devices that I use.
4. Use of information technology has almost replaced my use of paper.
5. I love exploring all the features that any technological gadget has to offer.
6. I often find myself using many technological devices simultaneously.
7. I prefer to ask friends how to use any new technological gadget instead of trying to figure it out myself.
8. Using any technological device comes easy to me.
9. I feel like information technology is a part of my daily life.
10. Using information technology gives me greater control over my work environment.
11. Using information technology makes it easier to do my work.
12. I would feel lost without information technology.

**Preference for Online Social Interaction measures**
1. I prefer communicating with other people online rather than face-to-face.
2. I feel like I have more control over conversations online than I do in face-to-face conversations.
3. Meeting and talking with people is better when done online than in face-to-face situations.
4. I am willing to give up some of my face-to-face relationships to have more time for my online relationships.
5. My relationships online are more important to me than many of my face-to-face relationships.
6. I am happier being online than I am offline.

**Demographics**
1. What is your age? Please enter in numbers. For example, if you are 20-years old, just enter the numbers 20 in the box below.
2. What is your gender? 1. Male 2. Female
3. What race group do you belong to? White/Caucasian / African American / Hispanic / Asian / Native American / Pacific Islander Other ____________________
Posttest Questionnaire

Manipulation Check – Meaning Contingency
1. The replies I received from my conversation partner were coherent.
2. The whole conversation ran consistently like one thread.
3. The conversation was relevant.
4. The conversation was connected.

Manipulation Check – Message Exchange
1. I sent many texts to the conversation partner.
2. My conversation partner sent many texts to me.
3. We exchanged many text messages over the session.
4. The number of messages exchanged was more than normal.

Perceived Interactivity
1. Interaction felt primarily like a one-way communication. (Reverse)
2. The interaction felt like a two-way communication.
3. The interaction was highly interactive.
4. I felt like I was engaged in an active dialogue.
5. My interaction with the service agent felt like a conversation.

Perceived contingency
1. The service agent took into account my previous interactions with him.
2. The service agent’s responses were related to my earlier replies.
3. I felt that the service agent carefully registered my responses and gave feedback based on the information I supplied.
4. The messages I received from the service agent were based on my previous replies.
5. My interaction with the service agent felt like a continuous thread or a loop.
6. I felt as if the service agent gave an exclusive response to my replies.
7. I felt as if the information from the service agent was well connected to my replies.

Perceived responsiveness (adapted from Sundar & Limperos, 2013 and Wu, 2005)
1. The service agent was responsive to my messages.
2. I could communicate with the service agent directly for further questions if I wanted to.
3. The service agent responded to my messages quickly and efficiently.

Social presence
1. I noticed the service agent.
2. The service agent noticed me.
3. The service agent’s presence was obvious to me.
4. My presence was obvious to the service agent.
5. The service agent caught my attention.
6. I caught the service agent’s attention.
7. I felt a sense of actually being together with the service agent.
8. I felt that I was present with the service agent during texting.
9. I felt that the service agent was present with me during texting.
10. During texting, I felt as if the service agent and I are located in the same room.

**Attitudes toward service agent**
- Likable
- Knowledgeable
- Modest
- Intelligent
- Approachable
- Competent
- Warm
- Trustworthy
- Pleasing
- Sincere
- Friendly

**Attitudes toward content**
- Fun to see
- Pleasant
- Entertaining
- Enjoyable
- Important
- Helpful
- Informative
- Useful
- Make me curious
- Boring
- Interesting

**Attitudes toward the interaction experience**
- Appealing
- Useful
- Positive
- Good
- Favorable
- Attractive
- Exciting
- Pleasant Likeable
- High Quality
- Interesting
- Fun
- Cool
- Imaginative
- Entertaining
User satisfaction
1. I am totally satisfied with my conversation experience.
2. Some things about my conversation experience could have been better.
3. I am not completely satisfied with my conversation experience.
4. I thought the service agent took notice of me as an individual person.
5. The service agent was very careful in considering my information needs.

User engagement – Cognitive absorption
1. While having the text conversation, I was absorbed in what I was doing.
2. While having the text conversation, I was immersed in what I was doing.
3. While having the text conversation, my attention did not get diverted.

User engagement – Content elaboration
1. I thought about what actions I myself might take based on what I learned.
2. I found myself making connections between the content from the service agent and what I’ve read or heard about elsewhere.
4. I thought about how and what I had learned related to other things I know.
5. I tried to think of the practical applications of what I learned.
6. I tried to relate the content from the service agent to my own life.

User engagement – Outreach or behavioral intention
1. I would save this service’s contact information.
2. I would recommend this service to others.
3. I would forward this service to my acquaintances.
4. I would use this service again in the future.
Appendix C. Bivariate Correlations for Mediating and Dependent Variables

Table 17: Bivariate Correlations for Mediating and Dependent Variables

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<td>2. Perceived Contingency</td>
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<td>3. Social Presence</td>
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<td>4. Perceived Responsiveness</td>
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<td>6. Absorption</td>
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<td>7. Behavioral Intention</td>
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<td>9. Satisfaction</td>
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<td>10. Att. toward Agent</td>
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<td>11. Att. toward Information</td>
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Note: **p < .01
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Mu Wu

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EDUCATION
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• M.A. in Applied Communication Theory & Methodology, Cleveland State University, 2010
• B.A. in English Language and Literature, Northwest Normal University, 2007

TEACHING
• COMM 418 – Media Effects: Theory and Research, Spring 2015
• COMM 420 – Research Methods in Advertising and Public Relations, Fall 2014
• COMM 304 – Mass Communication Research, Spring 2013 and Fall 2012

SAMPLE PUBLICATIONS

SAMPLE CONFERENCE PAPERS

AWARDS
• Translational Communication Research Funding ($5,000), College of Communications, 2015
• Brigham Young University Top Ethics Paper Award, International Public Relations Research Conference, Miami, FL, March, 2013