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Continuance Intention Toward Second-generation Mobile Instant Messaging App of LINE in Taiwan

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ABSTRACT

The second-generation mobile instant messaging (SMIM) proliferates with various relationship management functions: group chats, audio/video chats, file sharing, real-time location sharing, and nonverbal graphics, such as emojis and stickers. This study integrates the important but often overlooked affordances theory into innovation diffusion and proposes an SMIM continuance intention model. SMIM is a social affordance platform for users to develop new friendships and maintain their relationships. Integrated diffusion of innovation and affordance theoretical frameworks, this study investigates the influence of four factors on the success of using SMIM apps to improve friendship development and relationship management. Data were collected from 231 participants using a survey questionnaire in a public university in Taiwan. The findings confirm the effects of friendship development and relationship maintenance on the intention of users to continue using SMIM apps. Implications for research and practice are discussed.

Keywords: Second-Generation Mobile Instant Messaging App, Continuance Intention, Diffusion of Innovation, Affordance Theory

Ⅰ. Introduction

Second-generation mobile instant messaging (SMIM) is social media's most frequently used platform, proliferates, and as it has evolved to add features, users continue assimilating them into their everyday lives. The LINE mobile messaging app has become popular and may be considered to be a "super app" in Japan and Taiwan (Steinberg, 2020). Similar to China's WeChat and South Korea's KakaoTalk, the LINE app grew from a chat app into a hub for Taiwan's entertainment, social, and day-to-day activities. Such SMIM apps offer various functions, including group chats, audio/video chats, file sharing, real-time location sharing, and exchanging nonverbal graphics such as emojis and stickers (Tang and Hew,

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2022). SMIMs offer more and more innovative features, allowing users to make payments, order food, hail a ride, and book a doctor's appointment. One industry report estimated 3.09 billion mobile phone users will access messaging apps to communicate in 2021, and predicted that SIMM apps will reach 3.51 billion users in 2025 (Ceci, 2022).

Users primarily use LINE in their 20s and 30s in Taiwan, and it offers various features such as texting, voice and video calls, and sharing files. Plus, it allows users to make payments or transfer money to others using LINE Pay. Users can also access LINE's other services, such as ordering items for delivery with LINE Man, and sending gifts to other users with LINE Gift (Sehl, 2021). LINE is also famous for its stickers; the platform provides a series of LINE character stickers, allowing creators to sell their stickers and themes. LINE is widely used as a messaging app in Taiwan, as approximately 90% of Taiwanese use the app (Russell, 2016). Although LINE has many advantages with its app ecosystem, the issue of retaining and expanding user growth to its platform is still a challenge (Sehl, 2021).

Previous studies suggested SMIMs' rich communication and networking medium was initially for personal use and has migrated to more business use by organizations (Cho, 2020; Kim et al., 2015). Therefore, understanding the key factors contributing to the success of LINE app continuance intention can provide valuable lessons for the business use of SMIM. This study focuses on the personal use of SMIM apps for networking purposes based on the leading SMIM in Taiwan. Integrating the theory of Affordance Theory and Diffusion of Innovations (DoI), the objective of this study is to investigate how users in Taiwan have been using LINE to develop friendships and manage friendships, and how these factors affect their intention to continue using the app. The market of SMIM apps is fragmented and has a high attrition rate. So, retaining users has become important for mobile services industries, and second-generation mobile instant messaging app providers (e.g., LINE) and other businesses. Investigating factors that influence users' intentions to adopt and continue using these apps is essential for app developers, marketers, and scholars. Understanding the drivers of continuance intention can guide the design, development, and marketing strategies of these SMIMs, ultimately improving user satisfaction and engagement. As a result, organizations may benefit from understanding how users develop continuance intentions so that they can provide new social apps and functions to meet users' needs (Gong et al., 2020; Pal et al., 2020; Tam et al., 2020).

The remainder of the paper is organized as follows. We will first review the literature on four key factors for continuance intention: critical mass, mobility, perceived ease of use (PEOU), and perceived usefulness (PU) in SMIM apps. Further discussion on their influence on new friendship development and relationship management affects the continuance intention of adopting SMIM apps follows. We develop specific hypotheses based on a review of the relevant literature. This is followed by a description of our research methodology. We then present the results of our analysis and discuss theoretical and practical implications drawn from the results. This study concludes with limitations and future research directions.

Ⅱ. Conceptual Background

2.1. Theoretical Background

Prior research has paid great attention to the adoption and diffusion of telecommunication tech-

nologies, including instant messaging (IM) and mobile instant messaging (MIM) with technology acceptance model (TAM) (Chih-Chien et al., 2005; Glass and Li, 2010; Hong et al., 2006; Rouibah, 2008; Strader et al., 2007), motivation theoretical framework (Li et al., 2005), innovation diffusion theory (Ilie et al., 2005; Van Slyke et al., 2007), expectation confirmation model (Oghuma et al., 2016; Tam et al., 2020), theory of reason action (Lu et al., 2009), network externality (Zhou and Lu, 2011), net valence theory (Pal et al., 2020), social capital theory (Chung et al., 2012), and Hofstede's cultural theory (Chen et al., 2022). Researchers have also incorporated TAM with Flow theory (Yoon et al., 2015), unified theory of acceptance and use of technology (UTAUT) (Gan and Li, 2015), media richness theory (Ogara et al., 2014; Sheer, 2011; Tseng et al., 2017), copresence theory (Xu et al., 2011), five-factor model personality motivation theory (Wang et al., 2012b), uses and gratifications theory (Ku et al., 2013; Mouakket, 2018). Findings related to the effects of PU on intention to adopt and use IM & MIM has been inconsistent; some found that PU has a significant effect on adoption and usage intention (Chih-Chien et al., 2005; Glass and Li, 2010; Ilie et al., 2005; Shen et al., 2011; Yoon et al., 2015; Zhou and Lu, 2011), while others found PU has no effect (Rouibah, 2008; Strader et al., 2007). Social characteristics of perceived critical mass (PCM), and technical characteristics of PEOU and PU were found to have influence MIM adoption through perceived enjoyment (Yoon et al., 2015). Prior studies have consensus on the findings of social characteristics of PCM, where findings consistently suggest that PCM is one of the critical factors

<Table 1> Characteristics Comparison between Second-generation Mobile Instant Messaging (SMIM) and Mobile Instant Messaging (MIM)

Characteristic	SMIM Apps	MIM Apps
Advanced Functionality and Features	Advanced features such as audio/video calls, group chats, file sharing, real-time location sharing, multimedia capabilities, and integration with third-party services	Primarily focused on basic text-based communication without extensive additional features or integrations.
Integration of Services	Integration of various services within the app, including social networking features, e-commerce platforms, games, news, and entertainment applications.	Primarily focused on direct communication between users without extensive integration with other services.
User Experience	Enhanced user experience with prioritization of a customization options, advanced notification settings, and streamlined user workflows.	Have basic user interfaces and limited customization options.
Social Networking Elements	Inclusion of social networking elements, allowing users to create profiles, follow others, join groups or communities, and discover new contacts based on shared interests.	Typically focused on one-to-one or small group conversations without extensive social networking functionalities.
Synchronization and Accessibility	Seamless synchronization across multiple devices, allowing users to access their messages and conversations from various devices without interrupting their conversations. Offering cloud storage for various types of media allow users easily access and share files across devices and enabling efficient content management.	User may experience difficulties in accessing their message history, as it might not be synchronized across different devices/ Users may need to log out from one device before logging in to another, resulting in interruptions and discontinuity in their conversation, which result in fragmentation and inflexibility.

influencing IM or MIM adoption and continuance usage (Glass and Li, 2010; Li et al., 2005; Li et al., 2010; Sledgianowski and Kulviwat, 2009; Van Slyke et al., 2007; Yoon et al., 2015; Peng et al., 2016). All these factors can contribute to user adoption and continuance intention with mobile instant messaging apps.

Hence, SMIMs continuously evolve with more hedonic, temporal, nomadic, and interoperable features than MIMs (Steinberg, 2020). Consequently, many users actively use SMIMs for socialization and daily communication and interaction activities. More recent studies investigate users' continuance intention instead of initial intention to adopt SMIM apps. For instance, perceived critical mass was found to have a direct effect on strengthening the continuance intention of SMIM users (Gong et al., 2020).

2.2. Diffusion of Innovation Theory

Continuance is not an alien concept in IS research. Related concepts have been examined variously as "implementation" (Zmud, 1982), "incorporation" (Kwon and Zmud, 1987), and "routinization" (Cooper and Zmud, 1990) in the IS implementation literature. These studies acknowledge the existence of a post-acceptance stage when IS use transcends conscious behavior and becomes part of everyday routine activity. Innovation diffusion theory comprises a five-stage adoption decision process (knowledge, persuasion, decision, implementation, and confirmation). It suggests adopters re-evaluate their earlier acceptance decision during a final "confirmation" stage and decide whether to continue or discontinue using an innovation (Rogers, 1995; Rogers, 2010).

PCM is the extent of the rate of adopting or using a new technology suddenly accelerates when a certain number of users have adopted the technology (Rogers, 1995). In previous studies in IS, critical mass was found to be an important influence on telecommunication technology adoption intention (Glass and Li, 2010; Gong et al., 2020; Li et al., 2005; Sledgianowski and Kulviwat, 2009; Van Slyke et al., 2007; Xu et al., 2011; Yoon et al., 2015).

Two general forms of perceptions include PEOU (PEOU) and PU (PU) (Davis, 1989). PEOU refers to the degree to which users believes it is easy to use the adopted information system, which is concerned with users' perceived exerted efforts when using the technology (Venkatesh and Morris, 2000). PU refers to the degree to which a user believes that he/she can enhance their productivity or job performance with the adopted technology, which is the extent to which users feel improved performance when they use the technology (Venkatesh and Morris, 2000). These two perceptions are crucial to be measured because they can affect whether users will continue or discontinue using the adopted technology. Further, these two perceptions are similar to the constructs of perceived relative advantage and perceived complexity in innovation diffusion theory, although relative advantage is broader than PU and perceived complexity is the opposite side of PEOU (Van Slyke et al., 2008).

2.3. Theory of Affordances

Affordance (Gibson, 1977) is a relational concept that considers both the technology's material features and the user's subjective perceptions and goals. In other words, affordances are based on relationships between people and the things that they interact with (Fulk, 1993; Treem and Leonardi, 2013), so the same technology might provide different affordances to different users. To ensure that technology is used effectively, good developers purposefully construct

affordances into its features and applications (Norman, 1999). The relation aspect of affordance is their relationship to immediate results from goal-directed actions interacting with an IS artifact (Volkoff and Strong, 2013). In this way, an affordance lens helps explain why people use mobile instant messaging apps in similar ways or different ways.

Social affordances are defined as designations in a computer-mediated environment that facilitate sociability (Kreijns, 2004). Instead of focusing on the features of specific technologies (e.g., voice, video calls, group chats, instant messaging), which may impact social presence or media richness, we should emphasize the affordances that allow users to enjoy social interactions (Gibson and Collins, 1982; Suthers, 2006). Social behavior is generally driven by subjective mental evaluations made by individuals in a potentially social environment (Meyrowitz, 1985). In this paper, we propose two affordances of technology-mediated environments (friendship development and relationship maintenance) that motivate members to keep using SMIM platforms. These affordances are reflective of the extent to which SIMM technology supports developing and maintaining interpersonal relationships, as explained further below.

2.4. Interpersonal Relationships

In classical interpersonal relationship communication, friendship development is referred to as the evolution of new friendships formed. The process proceeds from another party moving from a stranger to an acquaintance, then becoming a new friend, and eventually to a close friend (Canary et al., 2008; Rusbult, 1980; Trenholm and Jensen, 2007). In addition to friendship development, communication technology also enhances relationship maintenance by allowing users to keep in contact with friends, interacting and improving users' relationships with their friends. Maintaining relationships has long been recognized as intrinsic motivation (Agnew et al., 1998; Cho et al., 2005); activities that foster relationships and connections with other people are at the center of human existence and are the foundations of social behaviors (Hinde, 1979; Reis and Patrick, 1996).

We argue that these two essential social interaction affordances are important and deserving of research. Hence, further study of relationship maintenance and friendship development could offer developers and service providers new guidance to find out which social affordance is most crucial in ensuring members' continuance intention on the innovative SMIM platforms. Users' communication with friends and family has been enhanced by using interactive features such as emojis and stickers embedded in SMIM. In addition, SMIMs are built with search tools and algorithms on their sites to help users find groups and communities with other members who share similar interests. This helps users to socialize more effectively and develop new meaningful friendships.

SMIMs could have a significant social impact as they play a crucial role in facilitating interpersonal communication and social interaction. SMIMs provide platforms for individuals to connect, form new friendships, and maintain existing relationships. Exploring the effects of SMIM on friendship development and relationship maintenance contributes to our understanding of how technology shapes social dynamics. SMIMs offer unique technological affordances, such as advanced communication features, integration with third-party services, and social networking elements. Exploring these affordances and their impact on users' behavior and attitudes contributes to the theoretical understanding of how technology shapes human interactions and relationships.

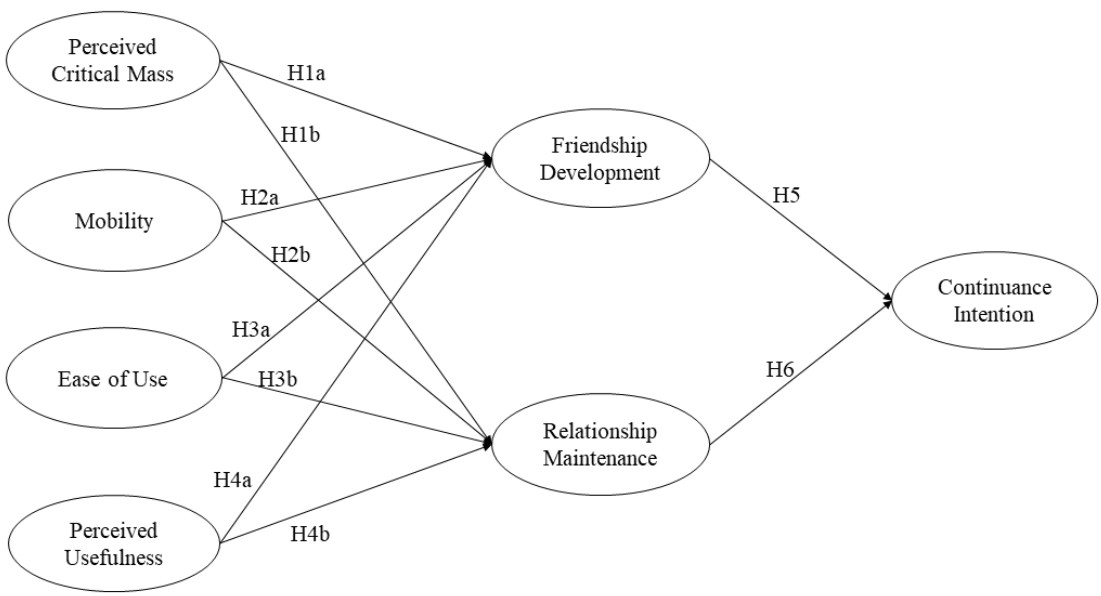
These factors of Technology Affordance Theory

(ease of use, usefulness) and Diffusion of Innovation (perceived critical mass, mobility) contribute to users' perceptions, motivations, and intentions to continue using SMIMs for friendship development and relationship maintenance, which represents the evolution and advancement of communication technology. It introduces new features, functionalities, and capabilities that go beyond the basic text-based communication of traditional MIM. By understanding and incorporating these factors into the research model, the study can analyze their impact on users' behavior and the continued use of SMIMs for socializing purposes.

A theoretical model that incorporates these elements can provide insight into how the unique characteristics of second-generation mobile instant messaging apps influence diffusion processes. This study investigates users' perceptions of technology affordances and their intentions to continue using the apps for friendship development and relationship maintenance. Moreover, our study may enable an in-depth understanding of the distinct features and capabilities of SMIM and its impact on social dynamics, which in turn drives users' continued intention. Overall, understanding and studying these advancements of SMIM is crucial to keep up with the changing landscape of communication technology; hence, it could contribute to both theoretical advancements and practical implications in the field of technology-mediated communication.

Ⅲ. Research Model and Hypotheses

<Figure 1> presents the model guiding this research. We integrated the Diffusion of Innovation theory (DOI) and Theory of Affordance to understand factors that influence continuance intentions to use SMIM. Critical mass refers to the point at which enough people adopt new communication



<Figure 1> Research Model

technologies to cause the adoption rate to spike (Rogers, 1995). Once the diffusion of a new interactive idea reaches critical mass, its further rate of adoption becomes self-sustaining. PCM refers to an individual's perception of the number of other users with whom the individual communicates (Markus, 1994). PCM has an important role in social influence. It was suggested to affect individuals' attitude (Hsu and Lu, 2004) and behavioral intention in interactive technologies such as groupware applications (Lou et al., 2000) or instant messaging applications (Ilie et al., 2005; Van Slyke et al., 2007). SMIM services, as an interactive mobile communication technology, have great potential for users to develop the perception of critical mass.

Perception of the critical number of concurrent users can drive individuals' use of communication technology (Li et al., 2005; Lou et al., 2000) and social network platforms (Chen et al., 2016). PCM represents a user's view of how widespread a technology has become and how many other people they communicate with use it as well. Users typically send messages to contacts on their contacts directory lists (e.g. family, friends, acquaintances, coworkers, etc.) and accept messages from people on those lists (Zhao and Elesh, 2008). In this way, contact lists allow IM users to evaluate PCM better. As part of their innovation, SMIMs embedded search tools and algorithms on their sites to help users find groups and communities that share similar interests with other members. This helps users to socialize more effectively and develop new meaningful friendships. The extent to which users believe that a SIMM has achieved critical mass is likely to believe that the platform would allow to maintain relationships and develop new friendships with users within the SMIM platform since users are more likely to engage in communication activities when they perceive a large user base. Also, having a larger user base increases the availability of potential friends and maintains existing relationships. Therefore, we argue that.

H1a: Perceived critical mass is positively associated with friendship development.

H1b: Perceived critical mass is positively associated with relationship management.

DOI theory postulated that technological characteristics affect the adoption of an innovation; for instance, relative advantage, complexity, compatibility, trialability, mobility, and observability (Moore and Benbasat, 1991). Relative advantage is a broad concept embodying various factors that make an innovation superior to its predecessor. In this study, we include three aspects of such advantage: perceived critical mass (as discussed earlier), mobility, and perceived usefulness.

Three main components, mobility, digital convergence, and mass scale were proposed in the novel nomadic information environment (Lyytinen and Yoo, 2002). Human-computer interactions (HCI) have provided insight into the characteristics, requirements, and implications of mobile technology use (Mallat et al., 2009; Wu et al., 2017). As the name implies, mobility is a key aspect of mobile technologies such as SIMM. The key difference between mobility and usefulness or relative advantage is that usefulness captures the benefits of technology as a whole. The concept of mobility, on the other hand, emphasizes the advantages that mobile technology can provide, which express time, place, service access, and use.

With mobile computing, users can access information, communication, and services anywhere and anytime. The key attribute that makes MIM different from fixed instant messaging applications

is mobility, an important functional attribute of MIM applications (Hong et al., 2006). When consumers perceive the mobility of MIM applications, they will rely on MIM applications for their routine tasks. Mobility is suggested as a functional benefit that influences users' intention to use mobile applications (Lyytinen and Yoo, 2002; Mallat et al., 2009). In SMIM, mobility facilitates seamless communication and interaction with friends. Thanks to location-based functionality, it is also convenient for users with suggested community groups nearby (Sun et al., 2017; Steinberg, 2020). For SMIM, mobility would be an important technological factor influencing users on the platform's benefits of service access, time and location, and use. SMIM offers innovative, user-friendly features, such as user portraits, emoticons (pictures expressing emotions), voice and video chatting, location sharing, and real-time communication while traveling, which reinforce the relationship among users and further develop new friendships as it allows users to stay connected with their friends and maintain relationships regardless of their physical location. Users can engage in conversations and receive real-time updates, fostering continuous interaction and strengthening relationships. Hence, we hypothesize that.

H2a: Mobility is positively associated with friendship development.

H2b: Mobility is positively associated with relationship maintenance.

DOI suggests that PU and PEOU influence intention to adopt and use a technology. Users' perceptions about ease of use and usefulness need to be reinforced. Prior research indicates that PEOU is a significant determinant of behavioral intention to use information technology (Davis, 1989; Davis et al., 1989; Gefen and Straub, 2000). PU and PEOU were found significantly influence IM's continuance intention and behavior intention (Hong et al., 2006; Lu et al., 2009; Strader et al., 2007; Van Slyke et al., 2007), also mobile applications' adoption (Deng et al., 2010; Mallat et al., 2009; Wang et al., 2012a). Furthermore, PU positively influences user's satisfaction and continuance intention to use MIM (Oghuma et al., 2016; Tam et al., 2020), satisfaction, and loyalty (Zhou and Lu, 2011).

In order for SMIM users to stay committed to using the SMIM applications, they need to feel that the mobile application is easy to use. The ease of use with intuitive interfaces and seamless navigation contribute to positive experience, encouraging users to continue using it (Yoon et al., 2015). Furthermore, they will also find that SMIM is a useful application that allows them to improve their communication, offering a more seamless interactive way for them to stay in touch with their friends and family and facilitate new meaningful friendships by enhancing intuitive, sophisticated algorithms to provide interactive features that foster user interaction.

We further contend that PU is a source of relative advantage that focuses on general utility. PU is more general than PCM and mobility, which focus on specific aspects of SIMM. Usefulness, in contrast, is relatively broad in scope. Taken together, PCM, mobility, and PU provide a reasonably comprehensive view of relative advantage in the context of SIMM. When users find SMIM useful for fostering friendships and maintaining relationships, they are more likely to continue using it. Features such as audio/video calls, file sharing, group chats, and integration with other services enhance the usefulness of the app for relationship-oriented activities. Therefore, we believe that PEOU and PU, like PCM and mobility, will affect friendship development and relationship

management, as stated below

H3a: Perceived ease of use is positively associated with friendship development.

H3b: Perceived ease of use is positively associated with relationship maintenance.

H4a: Perceived usefulness is positively associated with friendship development.

H4b: Perceived usefulness is positively associated with relationship maintenance.

Social affordances are defined as socializing mechanisms in a computer-mediated environment that foster sociability (Kreijns, 2004). Focus should be on the features that allow users to enjoy social interactions rather than specific features of specific technologies (Gibson and Collins, 1982; Gibson, 1977; Suthers, 2006). Two essential relationship factors suggested and studied are friendship development and relationship maintenance (Evans et al., 2017; Rusbult, 1980); these factors are social affordances across digital and non-digital media. As defined in classical interpersonal relations research, friendship development refers to the gradual emergence of new friendships that progress from strangers into acquaintances, then to new friends, then to a close friend (Canary et al., 2008; Rusbult, 1980; Trenholm and Jensen, 2007). Aside from developing friendships, communication technology also fosters relationship maintenance by allowing users to keep in contact with family and friends, interacting and improving users' relationships with their close family and peer networks (Agnew et al., 1998).

Users' good experience and satisfaction with IM would reinforce their continuance intention (Gong et al., 2020; Wang et al., 2012a). Maintaining relationships with family and friends drives users to continue using IM, as does seeking and building new relationships. Users tend to utilize communication mechanisms provided by IM service providers (Jang et al., 2013; Ku et al., 2013; Wang et al., 2012a). MIM, with a high degree of media richness features, strengthens the engagement in communication for presentation and exchange of information that allows users to develop a friendship among MIM users since these media richness features allow members to express themselves efficiently (Sheer, 2011; Sheer and Rice, 2017). SMIM, e.g. LINE, offers new services and features that make users' lives more convenient and fun. These include messages, voice & video calls, themes, emoji conversation personalization, webhook events for group chat, and access to various services and content, with LINE Voom to provide user tools to discover nearby users and develop new friendships. Therefore, we hypothesize that.

H5: Friendship development is positively associated with continuance intention.

H6: Relationship maintenance is positively associated with continuance intention.

Ⅳ. Research Methodology

4.1. Measurement Items

The survey research method is adopted to understand the influence of technology adoption and diffusion of innovation factors on friendship development and relationship management, thereby affecting the intention of users to continue adopting SMIM applications.

All questions used to measure each construct were modified from previously published journal papers. The seven constructs in the research model were adapted from prior studies in the context of IM use.

The friendship development construct was measured based on Sheer (2011)'s study. The perceived critical mass, relationship maintenance, and continuance intention scales were adapted from Ku et al. (2013)'s study. The perceived usefulness and perceived ease of use were adapted from Venkatesh and Morris (2000). The survey instrument adopted a 7-point Likert's scale with 1 = "strongly disagree" and 7 = "strongly agree."

4.2. Data Collection

We posted our survey on a bulletin board of a public university in Taiwan. Users of the bulletin boards are students attending and faculty teaching in the university. Four prizes were prepared for subjects participating in the study. The first prize is a US$17 gift card from the popular convenience store 7-11 in Taiwan. The second prize is a $10 gift card, followed by $7 and $3 gift cards as the third and fourth prizes. The prizes were drawn after the one-week deadline.

A total of 253 subjects participated in the study, but only 231 responses were retained for the final analysis after removing 22 invalid responses (<Table 2>). About 33.8% of these subjects are aged 31-39 years old, followed by 30.3% aged 23-30 years old, 26.8% aged 18-22 years old, the remaining 9.1% aged 40 years and older (<Table 2>). Males represent 51.1% of total subjects, and females represent 48.9%. When asked how often to use LINE daily, 31.6% of all respondents used 2-4 times, followed by at least 10 times (28.6%), 5-6 times (19.5%), one time (11.7%), and 7-9 times (8.6%). When asked how much time to spend on the LINE each time, 31.6% of all respondents spend 5-10 minutes, followed by less than 5 minutes (22.9%), more than 20 minutes (16.9%), 10-15 minutes (14.7%), and 15-20 minutes (13.9%).

<Table 2> Descriptive Statistics of Respondents

Categories	Variables	Frequency	Percentage (%)
Age	18-22 years old	62	26.8
	23-30 years old	70	30.3
	31-39 years old	78	33.8
	40 years and older	21	9.1
Gender	Male	118	51.1
	Female	113	48.9
How many times do you use the SMIM: LINE daily?	One time	27	11.7
	2-4 times	73	31.6
	5-6 times	45	19.5
	7-9 times	20	8.6
	At least 10 times	66	28.6
How much time do you spend on the SMIM: LINE each time?	Less than 5 minutes	53	22.9
	5-10 minutes	73	31.6
	10-15 minutes	34	14.7
	15-20 minutes	32	13.9
	More than 20 minutes	39	16.9

Ⅴ. Results

5.1. Measurement Model

The measurement model assessment to examine measurement items' reliability, which includes composite and indicator reliabilities as well as convergent validity and discriminant validity, was conducted (Hair et al., 2017). The reliability of the survey instrument was verified with Cronbach's alpha value higher than the threshold value of 0.7, indicating high reliability (Kerlinger, 1973). All items had significant loading on their intended latent variables, as shown in <Table 3>. <Table 3> lists Cronbach's alpha values of all survey questions. These reliability test results indicate that our survey instrument has high

<Table 3> Item Loadings of the Measurement Model

Construct	Items	Loading	t-value
Continuance Intention (CI)	CI1	0.965	139.64
	CI2	0.974	123.04
	CI3	0.968	129.59
Perceived Critical Mass (PCM)	CM1	0.931	87.61
	CM2	0.942	72.53
	CM3	0.908	41.77
Friendship Development (FD)	FD1	0.881	43.31
	FD2	0.891	51.09
	FD3	0.871	46.02
	FD4	0.874	39.49
	FD5	0.786	21.99
	FD6	0.797	22.39
Mobility (MOB)	MOB1	0.860	33.19
	MOB2	0.915	73.68
	MOB3	0.798	25.51
	MOB4	0.863	34.73
Perceived Ease of Use (PEOU)	PEOU1	0.934	73.43
	PEOU2	0.927	53.24
	PEOU3	0.912	38.18
	PEOU4	0.935	74.56
Perceived Usefulness (PU)	PU1	0.937	66.93
	PU2	0.961	95.82
	PU3	0.959	102.56
	PU4	0.962	149.91
Relationship Management (RM)	RM1	0.936	72.01
	RM2	0.946	100.38
	RM3	0.862	26.09

reliability.

Moreover, we tested our survey instrument's convergent and discriminant validity to ensure the existence of high construct validity by following Fornell and Larcker (1981)'s criteria and Heterotrait-Monotrait ratio (HTMT) criteria (<Table 4>). The entire HTMT ratio values are less than the threshold of 1.0 (Hair et al., 2017) or conservative threshold of 0.90 (Henseler et al., 2015). <Table 5> shows the discriminant validity that contains a correlation matrix with the square roots of the Average Variance Extracted (AVE) values reported on the diagonal of the matrix. The square root values are larger than their cross-correlations. This finding shows that the variance that each construct can explain is larger than the measurement error variance. Therefore, the

<Table 4> Convergent Validity Testing Results

Construct	Mean	Standard deviation	AVE	Composite Reliability	Cronbach's Alpha
Continuance Intention	5.242	1.113	0.939	0.979	0.968
Perceived Critical Mass	5.227	1.085	0.859	0.948	0.918
Friendship Development	4.670	1.118	0.724	0.940	0.923
Mobility	4.759	1.125	0.739	0.919	0.882
Perceived Ease of Use	5.264	1.001	0.860	0.961	0.946
Perceived Usefulness	4.301	1.193	0.912	0.976	0.968
Relationship Management	5.081	1.102	0.838	0.939	0.903

<Table 5> Discriminant Validity

		1	2	3	4	5	6	7
Continuance Intention	1	**0.98**						
Critical Mass	2	0.72	**0.96**					
Friendship Development	3	0.60	0.64	**0.92**				
Mobility	4	0.52	0.56	0.64	**0.93**			
Perceived Ease of Use	5	0.75	0.75	0.53	0.50	**0.96**		
Perceived Usefulness	6	0.51	0.48	0.69	0.49	0.46	**0.98**	
Relationship Management	7	0.79	0.74	0.66	0.54	0.73	0.56	**0.96**
Heterotrait-Monotrait Ratio (HTMT)								
Continuance Intention	1							
Critical Mass	2	0.76						
Friendship Development	3	0.63	0.62					
Mobility	4	0.56	0.80	0.64				
Perceived Ease of Use	5	0.78	0.51	0.53	0.50			
Perceived Usefulness	6	0.53	0.80	0.69	0.49	0.46		
Relationship Management	7	0.84	0.80	0.72	0.60	0.78	0.61	

Note: *Leading diagonal shows the square root of AVE of each construct*

survey instrument has high discriminant validity. In addition, all items loaded are greater than 0.5 on their associated constructs, indicating that all questions have high validity (Wixom and Watson, 2001). The evidence of high discriminant and convergent validity ascertains that the survey instrument used in this study established construct validity.

We conducted Harman's single-factor test to address the presence of common method variance (CMV) by performing an exploratory factor analysis consisting of all scale items and no rotation using the eigenvalue greater than one extraction method (Podsakoff et al., 2003). We found no single factor accounted for the majority of the variance. The result showed that the most influential factor accounted for 48.56% of the total variance. Also, common method bias is usually existed by high correlation among variables (with $r > 0.90$) (Bagozzi et al., 1991). The correlation matrix (<Table 4>) indicates that the highest correlation is 0.79 between RM and CI. These results suggested the absence of serious CMV.

5.2. Structural Model Results

SmartPLS 3.3.9 was used to perform the Partial Least Squares Structural Equation Modeling (PLS-SEM) analysis (Ringle et al., 2015) to analyze measurement and structural models that were drawn from our research model and scales. PLS-SEM is widely used in information system research (Gefen et al., 2011; Ringle et al., 2012) and is an appropriate method where the focus is on identifying constructs that affect outcome constructs of interest, as is the case for our research (Hair et al., 2019). Because our interest is in explaining variance in the outcome variables in our model rather than assessing the fit of a model to our particular data set, PLS-SEM is a more appropriate choice. Also, PLS-SEM is useful for examining complex structural models (Hair et al., 2017).

Prior to analyzing the structural model that reflected our research model, we tested whether four control variables (age, gender, frequency of use, and amount of time spent on LINE SMIM app) had significant relationships with outcome variables, including friendship development, relationship maintenance, and continuance intention. Only gender has a significant relationship with friendship development ($\beta = -0.09$, $p < 0.05$).

<Table 6> provides adjusted R^2 and Q^2 values for each of the endogenous latent variables in our model. Q^2 represents the predictive relevance of a set of predictors. When Q^2 is greater than zero, predictive relevance exists (Hair et al., 2017). The predictive relevance for continuance intention, friendship development, and relationship maintenance is large, with Q^2 effect size results following the rule of thumps (Hair et al., 2017).

<Table 7> presents results related to the hypotheses derived from our research model. Results indicate overall support for the model, with seven of ten hypotheses supported (at $p < 0.01$). The unsupported hypotheses were, H2b (Mobility → Friendship Development), H3a (PEOU → Friendship

<Table 6> Adjusted R^2 and Q^2 Values

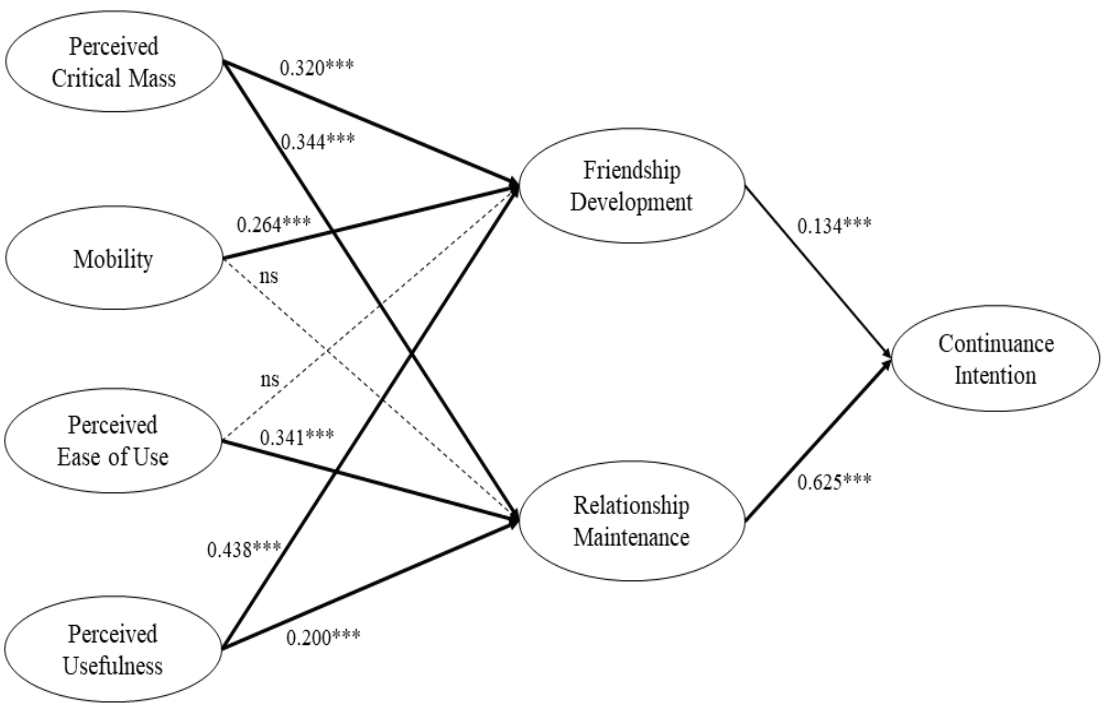
Variable	R^2-adjusted	Q^2
Friendship development	0.654	0.466
Relationship management	0.660	0.480
Continuance intentions	0.652	0.533

Development), and H5 (Friendship Development → Continuance Intention).

The structural equation model proposed for this study is assessed, as shown in <Figure 2>. With an adequate measurement model, the hypotheses were tested by examining the structural model. The R^2 value was used to assess the proportion of variance in the endogenous constructs that could be explained

<Table 7> Results Related to Research Model

Hypothesis/Path	Coefficient	t-statistics	p-value	Support
H1a: PCM → FD	0.320	4.51	< 0.001	Yes
H1b: PCM → RM	0.344	4.03	< 0.001	Yes
H2a: MOB → FD	0.264	4.11	< 0.001	Yes
H2b: MOB → RM	0.076	1.17	0.242	No
H3a: PEOU → FD	0.046	0.71	0.476	No
H3b: PEOU → RM	0.341	4.98	< 0.001	Yes
H4a: PU → FD	0.438	8.21	< 0.001	Yes
H4b: PU → RM	0.200	3.82	< 0.001	Yes
H5: FD → CI	0.134	1.95	0.056	Yes
H6: RM → CI	0.625	8.83	< 0.001	Yes



Note: ** p < 0.05, ** p < 0.01, *** p < 0.001, ns: insignificant at the 0.05 level*

<Figure 2> Structural Model Testing Results

<Table 8> Total Effects of Antecedent Variables on Outcomes

	Continuance Intention	
	Total effect	p-value
PCM	0.289	< 0.001
MOB	0.078	0.068
PEOU	0.239	< 0.001
PU	0.199	< 0.001

by the antecedent constructs. These values were high in each instance.

After computing path estimates in the structural model, the PLS software was used to perform a bootstrap to obtain the corresponding t-values. Support for each hypothesis can be determined by examining the sign (positive or negative) and the statistical significance of t-value for its corresponding path. All hypotheses were accepted with a significance level of 0.01, as represented in <Figure 2>. In the next section, we discuss these results, including their implications for research and practice.

<Table 8> shows the total effects of the antecedents on outcomes. Based on our results, the total effect antecedents on continuance intention suggest that PCM has the strongest effect on CI (total effect 0.289, $p < 0.001$). PEOU and PU has significant effect on CI (total effect 0.239 and 0.199, $p < 0.001$). In contrast, MOB has no significant effect on CI (total effect 0.078; $p = 0.16$).

Ⅵ. Discussion and Implications

6.1. Theoretical Implications

This study integrates the affordance theory into the technology adoption theory and uses friendship development and maintenance as the intermediate variables of SMIM adoption and continuance intention as the dependent variables. The new research design helps increase the generalizability of the current technology adoption theory in relationship management.

Previous studies suggested that PU and PEOU have the strongest effects on the intention to use (Ilie et al., 2005; Li et al., 2005). In our study, PU and PEOU do not have the strongest effect on the SMIM continuance intention. PCM has the strongest total effect (0.289, compared with 0.239 for PEOU and 0.199 for PU), which suggests that increasing perceptions of critical mass may bring about noteworthy increases in continuance intention. When users interact with SMIM apps, users' PU can help increase the chances of new friendship development and relationship management. However, users' PEOU of SMIM apps effectively increases the success of relationship maintenance but not friendship development. This study offers additional insights into the applicability of diffusion innovation and affordance theories in explaining SMIM adoption behaviors for friendship management. Furthermore, this study adds the continuance intention to the research model as the dependent variable. This addition can help understand what contributes more to the continuance intention of SMIM users: relationship development or relationship maintenance.

One contribution of our research is in our broad conceptualization of utility. Perceived usefulness is typically conceptualized about the impacts of a tech-

nology on tasks, especially work-related tasks. Utility is broader when one considers social applications of technology. We include three types of utility in our model: perceived usefulness, perceived critical mass, and mobility. All of these add to the overall utility of SMIM, and all contribute to continuance intentions, but in different ways. Perceived usefulness focuses on effectiveness, productivity, and performance. As noted earlier, conceptually it is a general notion of utility. Perceived critical mass, in contrast, is focused on reach, and mobility represents independence of constraints related to time and place. All of these matter to continuance intentions, but in different ways and to different extents.

These findings affirm the need for IS and technology adoption researchers to be more context-specific in their theorizing. Although perceived usefulness is certainly a useful concept, it lacks specificity (which is both a strength and a weakness). Our model includes context-specific aspects of utility that are related to the affordances of the technology in question. SMIM offers unique technological affordances, such as advanced communication features, integration with third-party services, and social networking elements. Exploring these affordances and their impact on users' behavior and perception contributes to the theoretical understanding of how technology shapes human interactions and relationships. This is important because technology is a critical aspect of the context in IS studies (Van Slyke, 2007). So, we encourage scholars to consider other, more context-specific aspects of utility when building and testing theories of technology adoption and continuance. Doing so will provide richer explanations of important technology-related phenomena.

The value of a more fully contextualized and nuanced view of utility is borne out by our empirical results. The effects of perceived usefulness were notably stronger for friendship development than for relationship maintenance (0.438 and 0.200 respectively). A plausible explanation for this is users would perceive rich features useful in friendship development more, LINE SMIM have emphasized on developing more service and community apps in the app eco-systems, which suggested groups features to encourage users engaging more into developing meaningful friendship. Interestingly, mobility had a significant effect on friendship development (0.264), but not relationship maintenance (0.076). In contrast, the effects of perceived critical mass were of similar strength for friendship development (0.320) and relationship maintenance (0.344).

Based on these results, having a critical mass of current and potential frames available on a platform important in a relationship's development and maintenance stages. Perceived usefulness is similarly important, but more so in the development stage. Mobility, however, is only important in the development stage. It may be that overcoming time and space barriers is especially important in the early stages of a friendship. Being able to immediately send a message to a relatively new friend may help cement the relationship while established friendships are less affected by communication delays caused by time and space.

Perceived ease of use affects relationship maintenance, but not friendship development. So, it appears that the utility features offered by SMIM are more important than ease of use for friendship development. However, the effect size for perceived ease of use to relationship maintenance is similar to that for critical mass, and larger than perceived usefulness or mobility. A plausible explanation is when users maintain communication with their established relationship, they could use different mean of communication methods. In context specific of

LINE SMIM, the app eco-system focuses more on features for finding new contacts and embedded search tools and algorithms on their sites to help users find groups and communities that share similar interests with other members. This helps users to socialize more effectively and develop new meaningful friendships. Many studies also warrant special attention to the use of PEOU in explaining new technology adoption behaviors because TAM is contextually specific and needs to adapt to different situations (Hansen et al., 2018). Our study recognizes the context-specific nature of PEOU and applies it to the context of friendship management. Our study shows that PEOU affects relationship maintenance but not friendship development. So, it appears that the utility features offered by SMIM are more critical than PEOU for friendship development. The finding adds additional insights to the limited applicability of PEOU in the context of friendship management. The results suggest that the functionality that users tend to explore most often in SMIM is related to finding and forming new friendship, which suggests that developers should focus more on the affordances & functionality for friendship development, such as public channels, features related to social bonding community activity, etc.

We also find it interesting that relationship maintenance has a much stronger effect on continuance intentions than friendship development. This finding demonstrates the importance of examining different technology affordances, even if those affordances are closely related. One possible reason for the stronger effects of relationship maintenance is that maintenance is more of an ongoing process than friendship development. To simplify matters, consider a single potential new friendship. The development stage of the relationship is critically important; if the friendship never develops, then there is no relationship to be maintained. But, temporally, the development stage is likely to be limited. Either the friendship will form and require ongoing maintenance of the relationship, or the friendship will not develop, and no ongoing maintenance is required. A friendship that takes a few months to develop may require maintenance for many years. So, if a user finds that SMIM offers features that afford relationship maintenance, it seems reasonable to expect that this perception will have a strong effect on continuance intentions.

This study also builds upon the integrated affordance and technology adoption theories that can help understand the purposes of using SMIM in the context of friendship development and relationship management, as well as the reasons causing the results of continuance intention (Rogers, 1995). SMIM apps are an innovation taking place at the individual level. The diffusion of innovations in social network services relies on critical mass (Gong et al., 2020; Ku et al., 2013; Van Slyke et al., 2007) and mobility (Mallat et al., 2009; Yoon et al., 2015). This study examines the influence of these two utility factors on the adoption of SMIM apps for friendship development and maintenance purposes. Our study shows that critical mass is critical to the increased success of these two purposes.

In comparison, the mobility of SMIM apps can significantly influence the success of friendship development. However, SMIM mobility only has a marginal influence on the success of relationship maintenance. These findings offer additional insights into the applicability of innovation diffusion theory to adopting SMIM apps for friendship management purposes. The interdisciplinary approach to combining technology adoption theory and affordance theory helps explain SMIM continuance intention and behavior better by advancing our understanding of SMIM continuance intention within friendship

management.

6.2. Practical Implications

Our study shows that to maintain and retain users, fostering perceived critical mass of SMIM platform among adopters is important. SMIM apps should focus not only on free communication services (e.g., texting, video calling, file sharing, etc.) but also on promoting exchanging virtual interactive graphics (e.g., online stickers, avatars, and emoticons) and other suggested and paid services (e.g., community events, gaming) to generate revenues. SMIM adopters tend to expand their social contacts; therefore, developing and advertising these features on the platform is important. New SMIM apps vendors should offer free, fun services to potential users to get the word out and grow their user base to reach the critical mass. After reaching critical mass, SMIM apps can start offering paid, fun services to help their users expand their social networks and increase revenues.

SMIM apps fit the mobility lifestyles of the youth for new friendship development and relationship management. Many people rely on SMIM apps to enrich their local adventures by making new friends. SMIM apps' expanded communication channels and social presence allow users to access large numbers of matched friends based on location, advanced filters, and likes. Some SMIM apps have recommendation and tracking features to help users learn who visits their profiles or whether the visitors match them. All the mobility features provide additional textual information (e.g., likes, dislikes, comments, shares, friends). SMIM is a useful application that allows users to improve their communication efficiency, offering a more convenient interactive way to stay in touch with their friends and family and develop new meaningful friendships by enhancing intuitive, sophisticated algorithms to provide interactive features that facilitate user interaction. These features enable SMIM users to connect with people from the local places. These people could be from different cultures and have diversified interests. SMIM apps vendors can measure the success rate of making new friends against various features and promote those most valuable features. Doing so can ultimately increase the continued intention of using SMIM apps, thus increasing users' continuance intention and reducing the attrition rate. However, mobility features are not necessarily beneficial to help improve the existing relationships based on this study's findings. To reconnect with them for emotional support and positive social interactions, SMIM apps can partner with other social media sites that target similar user profiles to help their users maintain relationships with their new friends. This cross-fertilization approach can thus help grow the number of users for SMIM apps and their affiliated social media partners.

Our study suggests that users' perception of SMIM's app's ease of use is ineffective at developing new friendships. Simply focus on ease of use of a new feature may not result in users increasing their intention to continue SMIM apps, but together with usefulness of the feature would motivate users' intention. Some SMIM apps make connecting easier for users but make it challenging to configure safety tools, such as filtering, reporting, and blocking harmful content (Hansen et al., 2018). Although these SMIM features can improve users' PEOU, they can potentially bring unpleasant friendship development experiences. In contrast, PU can positively impact friendship development. Therefore, new SMIM vendors need to emphasize improving features' usefulness.

As for relationship maintenance, users' PEOU and PU positively impact using SMIM apps to maintain

relationships. This finding corroborates the previous study that SMIM apps are practical tools to help users maintain and strengthen personal relationships (Sheer and Rice, 2017). A closer examination of our findings shows that PEOU is more effective than PU at assisting users to use SMIM apps to maintain relationships. SMIM vendors can first and foremost develop features emphasizing improving the adopted users" PEOU of SMIM apps to maintain their current social networks.

Our study shows that relationship maintenance has five times more influence than friendship development on the intention of users to continue using SMIM apps. The four-month attrition rate for SMIM apps is 71% (Ceci, 2021). SMIM app vendors struggling with a high attrition rate must prioritize their efforts in developing friendship development features because they effectively address user attrition issues. SMIM app vendors with a large loyal user base can focus on developing features to help users create new friendships or maintain current friendships for their users.

6.3. Limitations and Future Research

The study has several imitations even after conducting a rigorous design and control of survey instruments and data analysis. First, this study surveyed only subjects who use the leading SMIM app LINE in Taiwan. The LINE app used in the study has specific features to help users develop and maintain relationships. However, the findings based on these limited features may need to be more generalizable to other SMIM apps with different features. Future research can survey users who use other SMIM apps, such as WhatsApp and Twitter, in the survey.

Second, SMIM apps are widespread cross-cultural communication and friendship development tools. However, this study did not conduct a cross-cultural study or examine the potential influence of national cultures on the adoption behaviors of Taiwanese subjects. Future studies may want to replicate this study with users having different cultural backgrounds, such as high individualism, low uncertainty avoidance, high femininity, and low power distance. Thus, a comparative study can be conducted to provide cross-cultural perspectives on SMIM adoption behaviors.

Third, this study adopts innovation diffusion and affordance theories. The factors derived from these two theories provide limited observations about SMIM adoption behaviors. Future research can adopt task-technology fit, social anxiety, social cognitive, and other theories to provide a holistic, interdisciplinary perspective of SMIM adoption behaviors. Our study did not include several factors from the innovation diffusion theory; therefore, we encourage future research to examine all three main technological factors within the innovation diffusion theory, including trialability, complexity, compatibility, and observability, to broaden the understanding of these factors on SMIM.

Fourth, the survey methodology has limitations, which may not be able to minimize the CMV concern and may not fully capture the broader effects of technological changes embedded in SMIM. Also, our findings are about users' perceptions about using SMIM apps to develop and maintain friendships. Future research can use qualitative or mixed methodology to interview users to gain first-hand experiences using SMIM apps in everyday life. The qualitative approach can help cross-examine the findings of this study and provide richer observations of SMIM adoption behaviors within the context of friendship management.

Ⅶ. Conclusion

This study integrates the important but often overlooked social affordances into innovation of diffusion and proposes an SMIM continuance intention model. SMIM apps are now social fabrics for meeting and interacting with new and old friends. The relative advantages of mobility, PEOU, and PU over other communication media allow SMIM apps to quickly reach the critical mass adoption stage. Empirical testing of the proposed model offers insights on the impact of four technology diffusion of innovation factors (perceived critical mass, perceived ease of use, perceived usefulness, and mobility) on sociability affordances of friendship development and relationship maintenance using SMIM apps. Specifically, the results suggested the important role of perceived usefulness and perceived critical mass on both relationship development and relationship maintenance and its key drivers on continuance intention on LINE SMIM app. Scholars and practitioners interested in SMIM app retaining users can use our research model and findings to help continuously improve people forming meaningful social relationship management in their everyday lives.

<References>

[1] Agnew, C. R., Van Lange, P. A., Rusbult, C. E., and Langston, C. A. (1998). Cognitive interdependence: Commitment and the mental representation of close relationships. *Journal of Personality and Social Psychology*, *74*(4), 939. https://doi.org/10.1037/0022-3514.74.4.939

[2] Bagozzi, R. P., Yi, Y., and Phillips, L. W. (1991). Assessing construct validity in organizational research. *Administrative Science Quarterly*, 421-458.

[3] Bere, A. (2018). Applying an extended task-technology fit for establishing determinants of mobile learning: An instant messaging initiative. *Journal of Information Systems Education*, *29*(4), 239-252.

[4] Canary, D. J., Cody, M. J., and Manusov, V. L. (2008). *Interpersonal Communication: A Goals-Based Approach* (4th ed.). Boston: Bedford-Martin.

[5] Ceci, L. (2022). Global number of mobile messaging users 2018-2025, Statista. Retrieved from https://www.statista.com/statistics/483255/number-of-mobile-messaging-users-worldwide

[6] Chen, C., Han, J. A., and Ractham, P. (2022). Cultural influence on using mobile instant messaging applications to develop and maintain friendships. *Cogent Social Sciences*, *8*(1), 2141428. https://doi.org/10.1080/23311886.2022.2141428

[7] Chen, R., Sharma, S. K., and Raghav Rao, H. (2016). Members' site use continuance on Facebook: Examining the role of relational capital. *Decision Support Systems*, *90*, 86-98. https://doi.org/10.1016/j.dss.2016.07.001

[8] Chih-Chien, W., Hsu, Y., and Fang, W. (2005). Acceptance of technology with network externalities: An empirical study of internet instant messaging services. *Journal of Information Technology Theory and Application*, *6*(4), 15.

[9] Cho, H. K., Trier, M., and Kim, E. (2005). The use of instant messaging in working relationship development: A case study. *Journal of Computer-Mediated Communication*, *10*(4), 10-44. https://doi.org/10.1111/j.1083-6101.2005.tb00280.x

[10] Cho, J. (2020). Effects of organizational use of Kakaotalk, a mobile instant messaging (Mim) service, on employees' attitudes toward current organization in Korea. *Asia Pacific Journal of Information Systems*, *30*(1), 120-142. https://doi.org/10.14329/apjis.2020.30.1.120

[11] Choi, S. (2013). An empirical study of social network

service (Sns) continuance: Incorporating the customer value-satisfaction-loyalty model into the Is continuance model. *Asia Pacific Journal of Information Systems*, *23*(4), 1-28.

[12] Chung, N., Han, H. J., and Koo, C. (2012). Mediating roles of attachment for information sharing in social media: Social capital theory perspective. *Asia Pacific Journal of Information Systems*, *22*(4), 101-123.

[13] Cooper, R. B., and Zmud, R. W. (1990). Information technology implementation research: A technological diffusion approach. *Management Science*, *36*(2), 123-139. https://doi.org/10.1287/mnsc.36.2.123

[14] Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319-340.

[15] Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, *35*(8), 982-1003. https://doi.org/10.1287/mnsc.35.8.982

[16] Deng, Z., Lu, Y., Wei, K. K., and Zhang, J. (2010). Understanding customer satisfaction and loyalty: An empirical study of mobile instant messages in China. *International Journal of Information Management*, *30*(4), 289-300. https://doi.org/10.1016/j.ijinfomgt.2009.10.001

[17] Evans, S. K., Pearce, K. E., Vitak, J., and Treem, J. W. (2017). Explicating affordances: A conceptual framework for understanding affordances in communication research. *Journal of Computer-Mediated Communication*, *22*(1), 35-52. https://doi.org/10.1111/jcc4.12180

[18] Fulk, J. (1993). Social construction of communication technology. *Academy of Management Journal, 36*(5), 921-950. https://doi.org/10.2307/256641

[19] Gan, C., and Li, H. (2015). Understanding continuance intention of mobile instant messaging: Motivators and inhibitors. *Industrial Management & Data Systems, 115*(4), 646-660. https://doi.org/10.1108/IMDS-11-2014-0331

[20] Gefen, D., and Straub, D. W. (2000). The relative importance of perceived ease of use in Is adoption: A study of e-commerce adoption. *Journal of the Association for Information Systems*, *1*(1), 8-20. https://doi.org/10.17705/1jais.00008

[21] Gefen, D., Rigdon, E. E., and Straub, D. (2011). Editor's comments: an update and extension to Sem Guidelines for administrative and social science research. *MIS Quarterly*, iii-xiv.

[22] Gibson, E. J., and Collins, W. (1982). The concept of affordances in development: The renascence of functionalism. In W.A. Collins Ed., *Minnesota Symposium on Child Psychology: The Concept of Development* (Vol. 15, pp. 55-81). Hillsdale, NJ: Lawrence Erlbaum.

[23] Gibson, J. J. (1977). The theory of affordances. *Hilldale, USA*, *1*(2), 67-82.

[24] Glass, R., and Li, S. (2010). Social influence and instant messaging adoption. *Journal of Computer Information Systems*, *51*(2), 24-30. https://doi.org/10.1080/08874417.2010.11645465

[25] Gong, X., Lee, M. K., Liu, Z., and Zheng, X. (2020). Examining the role of tie strength in users' continuance intention of second-generation mobile instant messaging services. *Information Systems Frontiers*, *22*(1), 149-170. https://doi.org/10.1007/s10796-018-9852-9

[26] Hair, J. F., Hult, G. T. M., Ringle, C., and Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (Pls-Sem).* SAGE Publications.

[27] Hair, J. F., Risher, J. J., Sarstedt, M., and Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2-24. https://doi.org/10.1108/EBR-11-2018-0203

[28] Han, J., Kang, S., and Moon, T. (2013). An empirical study on perceived value and continuous intention to use of smart phone, and the moderating effect of personal innovativeness. *Asia Pacific Journal of Information Systems*, *23*(4), 53-84. https://doi.org/10.14329/apjis.2013.23.4.053

[29] Hansen, J. M., Saridakis, G., and Benson, V. (2018). Risk, trust, and the interaction of perceived ease

of use and behavioral control in predicting consumers' use of social media for transactions. *Computers in Human Behavior*, *80*, 197-206. https://doi.org/10.1016/j.chb.2017.11.010

[30] Henseler, J., Ringle, C. M., and Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115-135. https://doi.org/10.1007/s11747-014-0403-8

[31] Hinde, R. A. (1979). *Towards Understanding Relationships.* London: Academic Press.

[32] Hong, S., Thong, J. Y., and Tam, K. Y. (2006). Understanding continued information technology usage behavior: A comparison of three models in the context of mobile internet. *Decision Support Systems*, *42*(3), 1819-1834. https://doi.org/10.1016/j.dss.2006.03.009

[33] Hsu, C. L., and Lu, H. P. (2004). Why do people play online games? An extended Tam with social influences and flow experience. *Information & Management*, *41*(7), 853-868. https://doi.org/10.1016/j.im.2003.08.014

[34] Huang, Y., and Miao, W. (2021). Re-domesticating social media when it becomes disruptive: Evidence from China's "Super App" WeChat. *Mobile Media & Communication*, *9*(2), 177-194. https://doi.org/10.1177/2050157920940765

[35] Ilie, V., Van Slyke, C., Green, G., and Lou, H. (2005). Gender differences in perceptions and use of communication technologies: A diffusion of innovation approach. *Information Resources Management Journal*, *18*(3), 13-31. https://doi.org/10.4018/irmj.2005070102

[36] Jang, Y. J., Lee, S. H., and Kim, H. W. (2013). Examining the impact of online friendship desire on citizenship behavior. *Asia Pacific Journal of Information Systems*, *23*(4), 29-51. http://dx.doi.org/10.14329/apjis.2013.23.4.029

[37] Jun, J., Lee, K. J., and Kim, B. G. (2016). Factors affecting user acceptance of mobile commerce services. *Asia Pacific Journal of Information Systems*, 26(4), 489-508. https://doi.org/10.14329/apjis.2016.26.4.489

[38] Jung, W., and Hong, S. K. (2014). The effects of metaphors in the interface of smartphone applications on users' intention to use. *Asia Pacific Journal of Information Systems*, *24*(3), 255-279. http://dx.doi.org/10.14329/apjis.2014.24.3.255

[39] Kerlinger, F. N. (1973). *Foundations of behavioral Research* (2nd ed.). Holt, Rinehart and Winston.

[40] Kim, B. (2017). Understanding key antecedents of user loyalty toward mobile messenger applications: An integrative view of emotions and the dedication-constraint model. *International Journal of Human–Computer Interaction*, *33*(12), 984-1000. https://doi.org/10.1080/10447318.2017.1304607

[41] Kim, H. W., Chan, H. C., and Gupta, S. (2015). Social media for business and society. *Asia Pacific Journal of Information Systems*, *25*(2), 211-233.

[42] Kreijns, K. (2004). Sociable CSCL environments: Social affordances, sociability, and social presence. Unpublished doctoral dissertation, Open University of the Netherlands, The Netherlands.

[43] Ku, Y. C., Chen, R., and Zhang, H. (2013). Why do users continue using social networking sites? An exploratory study of members in the United States and Taiwan. *Information & Management*, *50*(7), 571-581. https://doi.org/10.1016/j.im.2013.07. 011

[44] Kwon, T. H., and Zmud, R. W. (1987). Unifying the fragmented models of information systems implementation. In *Critical Issues in Information Systems Research* (pp. 227-251).

[45] Lee, K. Y., Lee, M., and Kim, K. (2017). The differential impacts of 'communication' and 'computing' functions in smartphones on individuals' performance and the moderating role of organizational roles. *Asia Pacific Journal of Information Systems*, *27*(4), 191-215. https://doi.org/10.14329/apjis.2017.27.4.191

[46] Li, D., Chau, P. Y., and Lou, H. (2005). Understanding individual adoption of instant messaging: An empirical investigation. *Journal of the Association for Information Systems*, *6*(4), 5. https://doi.org/10.17705/1jais.00066

[47] Li, D., Chau, P. Y., and Van Slyke, C. (2010). A

comparative study of individual acceptance of instant messaging in the US and China: A structural equation modeling approach. *Communications of the Association for Information Systems*, *26*(1), 5. https://doi.org/10.17705/1CAIS.02605

[48] Liu, C. T., and Guo, Y. M. (2015). The role of sense of belonging in social media usage: A tale of two types of users. *Asia Pacific Journal of Information Systems*, *25*(2), 403-422. https://doi.org/10.14329/apjis.2015.25.2.403

[49] Lou, H., Luo, W., and Strong, D. (2000). Perceived critical mass effect on groupware acceptance. *European Journal of Information Systems*, *9*(2), 91-103. https://doi.org/10.1057/palgrave.ejis.3000358

[50] Lu, Y., Zhou, T., and Wang, B. (2009). Exploring Chinese users' acceptance of instant messaging using the theory of planned behavior, the technology acceptance model, and the flow theory. *Computers in Human Behavior*, *25*(1), 29-39. https://doi.org/10.1016/j.chb.2008.06.002

[51] Lyytinen, K., and Yoo, Y. (2002). Research commentary: The next wave of nomadic computing. *Information Systems Research*, *13*(4), 377-388. https://doi.org/10.1287/isre.13.4.377.75

[52] Mallat, N., Rossi, M., Tuunainen, V. K., and Öörni, A. (2009). The impact of use context on mobile services acceptance: The case of mobile ticketing. *Information & Management*, *46*(3), 190-195. https://doi.org/10.1016/j.im.2008.11.008

[53] Markus, M. L. (1994). Electronic mail as the medium of managerial choice. *Organization Science*, *5*(4), 502-527. https://doi.org/10.1287/orsc.5.4.502

[54] Meyrowitz, J. (1985). *No Sense of Place: The Impact of Electronic Media On Social Behavior*. Oxford University Press.

[55] Moore, G. C., and Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, *2*(3), 192-222. https://doi.org/10.1287/isre.2.3.192

[56] Mouakket, S. (2018). Information self-disclosure on mobile instant messaging applications: Uses and gratifications perspective. *Journal of Enterprise Information Management, 32*(1), 98-117. https://doi.org/10.1108/JEIM-05-2018-0087

[57] Norman, D. A. (1999). Affordance, conventions, and design. *Interactions*, *6*(3), 38-43. https://doi.org/10.1145/301153.301168

[58] Ogara, S. O., Koh, C. E., and Prybutok, V. R. (2014). Investigating factors affecting social presence and user satisfaction with mobile instant messaging. *Computers in Human Behavior*, *36*, 453-459. https://doi.org/10.1016/j.chb.2014.03.064

[59] Oghuma, A. P., Libaque-Saenz, C. F., Wong, S. F., and Chang, Y. (2016). An expectation-confirmation model of continuance intention to use mobile instant messaging. *Telematics and Informatics*, *33*(1), 34-47. https://doi.org/10.1016/j.tele.2015.05.006

[60] Pal, D., Funilkul, S., and Patra, S. (2020). Paying by your messaging application? a trust model. In *Proceedings of the 11th International Conference on Advances in Information Technology* (pp. 1-10).

[61] Peng, X., Zhao, Y. C., and Zhu, Q. (2016). Investigating user switching intention for mobile instant messaging application: Taking WeChat as an example. *Computers in Human Behavior*, *64*, 206-216. https://doi.org/10.1016/j.chb.2016.06.054

[62] Pinho, J. C. M. R., and Soares, A. M. (2011). Examining the technology acceptance model in the adoption of social networks. *Journal of Research in Interactive Marketing, 5*(2/3), 116-129. https://doi.org/10.1108/17505931111187767

[63] Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., and Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879-903. https://doi.org/10.1037/0021-9010.88.5.879

[64] Reis, H. T., and Patrick, B. C. (1996). Attachment and intimacy: Component processes. In E. T. Higgins and A. W. Kruglanski (Eds.), *Social Psychology: Handbook of Basic Principles*. New York: Guilford Press.

[65] Ringle, C. M., Sarstedt, M., and Straub, D. W. (2012).

Editor's comments: A critical look at the use of Pls-Sem in Mis Quarterly. *MIS Quarterly*, iii-xiv.

[66] Ringle, C. M., Wende, S., and Becker, J.-M. (2015). Smartpls 3, Boenningstedt: SmartPLS GmbH. Retrieved from http://www.smartpls.com

[67] Rogers, E. (1995). *Diffusion of Innovations* (5th ed.). Free Press.

[68] Rogers, E. M. (2010). *Diffusion of Innovations*. Simon and Schuster.

[69] Rouibah, K. (2008). Social usage of instant messaging by individuals outside the workplace in kuwait: A structural equation model. *Information Technology & People*, 21(1), 34-68. https://doi.org/10.1108/09593840810860324

[70] Rusbult, C. E. (1980). Satisfaction and Commitment in Friendships. *Representative Research in Social Psychology*, *11*(2), 96-105.

[71] Russell, J. (2016). Understanding Line, the Chat App Behind 2016's Largest Tech Ipo. Retrieved from https://techcrunch.com/2016/07/14/understanding-line-the-chat-app-behind-2016s-largest-tech-ipo.

[72] Sehl, K. (2021). What Is the Line App? Everything Brands Need to Know, Hootsuite. Retrieved from https://blog.hootsuite.com/line-app.

[73] Sheer, V. C. (2011). Teenagers' use of msn features, discussion topics, and online friendship development: The impact of media richness and communication control. *Communication Quarterly*, *59*(1), 82-103. https://doi.org/10.1080/01463373.2010.525702

[74] Sheer, V. C., and Rice, R. E. (2017). Mobile instant messaging use and social capital: Direct and indirect associations with employee outcomes. *Information & Management*, *54*(1), 90-102. https://doi.org/10.1016/j.im.2016.04.001

[75] Shen, A. X., Cheung, C. M., Lee, M. K., and Chen, H. (2011). How social influence affects We-Intention to use instant messaging: The moderating effect of usage experience. *Information Systems Frontiers*, *13*(2), 157-169. https://doi.org/10.1007/s10796-009-9193-9

[76] Sledgianowski, D., and Kulviwat, S. (2009). Using social network sites: The effects of playfulness, critical mass and trust in a hedonic Context. *Journal of Computer Information Systems*, *49*(4), 74-83. https://doi.org/10.1080/08874417.2009.11645342

[77] Steinberg, M. (2020). LINE as super app: Platformization in East Asia. *Social Media+ Society*, *6*(2). https://doi.org/10.1177/2056305120933285

[78] Strader, T. J., Ramaswami, S. N., and Houle, P. A. (2007). Perceived network externalities and communication technology acceptance. *European Journal of Information Systems*, *16*(1), 54-65. https://doi.org/10.1057/palgrave.ejis.3000657

[79] Sun, Y., Liu, D., Chen, S., Wu, X., Shen, X.-L., and Zhang, X. (2017). Understanding users' switching behavior of mobile instant messaging applications: An empirical study from the perspective of push-pull-mooring framework. *Computers in Human Behavior*, *75*, 727-738. https://doi.org/10.1016/j.chb.2017.06.014

[80] Suthers, D. D. (2006). Technology affordances for intersubjective meaning making: A research agenda for CSCL. *International Journal of Computer-supported Collaborative Learning*, *1*(3), 315-337. https://doi.org/10.1007/s11412-006-9660-y

[81] Tam, C., Santos, D., and Oliveira, T. (2020). Exploring the influential factors of continuance intention to use mobile apps: Extending the expectation confirmation model. *Information Systems Frontiers*, *22*(1), 243-257. https://doi.org/10.1007/s10796-018-9864-5

[82] Tang, Y., and Hew, K. F. (2022). Effects of using mobile instant messaging on student behavioral, emotional, and cognitive engagement: A quasi-experimental study. *International Journal of Educational Technology in Higher Education*, *19*(1), 1-22. https://doi.org/10.1186/s41239-021-00306-6

[83] Treem, J. W., and Leonardi, P. M. (2013). Social media use in organizations: Exploring the affordances of visibility, editability, persistence, and association. *Annals of the International Communication Association*, *36*(1), 143-189. https://doi.org/10.1080/23808985.2013.11679130

[84] Trenholm, S., and Jensen, A. (2007). *Interpersonal*

Communication. New York, NY: Oxford University Press.

[85] Tseng, F. C., Cheng, T., Li, K., and Teng, C. I. (2017). How does media richness contribute to customer loyalty to mobile instant messaging? *Internet Research, 27*(3), 520-537. https://doi.org/10.1108/IntR-06-2016-0181

[86] Van Slyke, C. (2007). Putting Is research in context. *Information Resources Management Journal*, *20*(4), 1-5.

[87] Van Slyke, C., Ilie, V., Lou, H., and Stafford, T. (2007). Perceived critical mass and the adoption of a communication technology. *European Journal of Information Systems*, *16*(3), 270-283. https://doi.org/10.1057/palgrave.ejis.3000680

[88] Van Slyke, C., Johnson, R. D., Hightower, R., and Elgarah, W. (2008). Implications of researcher assumptions about perceived relative advantage and compatibility. *ACM SIGMIS Database: The DATABASE for Advances in Information Systems*, *39*(2), 50-65. https://doi.org/10.1145/1364636.1364642

[89] Venkatesh, V., and Morris, M. G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly*, 115-139.

[90] Volkoff, O., and Strong, D. M. (2013). Critical realism and affordances: Theorizing It-Associated organizational change processes. *MIS Quarterly*, 819-834.

[91] Wang, W., Hsieh, J. J., and Song, B. (2012a). Understanding user satisfaction with instant messaging: An empirical survey study. *International Journal of Human-Computer Interaction*, *28*(3), 153-162. https://doi.org/10.1080/10447318.2011.568893

[92] Wang, W., Ngai, E., and Wei, H. (2012b). Explaining instant messaging continuance intention: The role of personality. *International Journal of Human-Computer Interaction*, *28*(8), 500-510. https://doi.org/10.1080/10447318.2011.622971

[93] Wixom, B. H., and Watson, H. J. (2001). An empirical investigation of the factors affecting data warehousing success. *MIS Quarterly*, 17-41.

[94] Wu, T., Lu, Y., Gong, X., and Gupta, S. (2017). A study of active usage of mobile instant messaging application: An attachment theory perspective. *Information Development*, *33*(2), 153-168. https://doi.org/10.1177/0266666916646814

[95] Xu, B., Zhang, W., and Li, D. (2011). Copresence and Its social-relational antecedents in computer-mediated communication: The case of instant messenger. *International Journal of Human-Computer Interaction*, *27*(10), 991-1009. https://doi.org/10.1080/10447318.2011.555316

[96] Yoon, C., Jeong, C., and Rolland, E. (2015). Understanding individual adoption of mobile instant messaging: A multiple perspectives approach. *Information Technology and Management*, *16*(2), 139-151. https://doi.org/10.1007/s10799-014-0202-4

[97] Zhao, S., and Elesh, D. (2008). Copresence as "Being with" social contact in online public domains. *Information, Communication & Society*, *11*(4), 565-583. https://doi.org/10.1080/13691180801998995

[98] Zhou, T., and Lu, Y. (2011). Examining mobile instant messaging user loyalty from the perspectives of network externalities and flow experience. *Computers in Human Behavior*, *27*(2), 883-889. https://doi.org/10.1016/j.chb.2010.11.013

[99] Zmud, R. W. (1982). Diffusion of modern software practices: Influence of centralization and formalization. *Management Science*, *28*(12), 1421-1431. https://doi.org/10.1287/mnsc.28.12.1421

<Appendix A> Measurement Items

Constructs	Wording	Reference
Perceived Critical Mass (PCM)	• Many people I communicate with use LINE • The people I communicate with will continue to use LINE in the future • The people I communicate with using LINE will continue to use LINE in the future	Ku et al. (2013); Sledgianowski and Kulviwat (2009)
Mobility (MO)	• Using LINE is independent of time • Using LINE is independent of place • I can substitute the need for face-to-face meeting by using LINE • Communicating with someone using LINE is convenient because LINE is usually with me	Mallat et al., (2009)
Perceived Ease of Use (PEOU)	• It is easy for me to become skillful in using LINE • I find LINE easy to use • I find it easy to use LINE to do what I want it to do • Learning to use LINE is easy for me	Venkatesh and Morris (2000)
Perceived Usefulness (PU)	• Using LINE enhances my daily productivity • I find LINE useful in my daily activities • Using LINE enhances my effectiveness in daily activities • Using LINE improves my performance in daily activities	Venkatesh and Morris (2000)
Friendship Development (FD)	• LINE helps me meet new people • LINE helps me develop friendships with new people • LINE helps me obtain others' personal information I am interested in • LINE helps me know others well. • LINE helps me to maintain strong relationships with my friends • LINE likely helps me maintain long-term relationships with my friends	Sheer (2011)
Relationship Management (RM)	• I use LINE to keep in contact with family and friends • I use LINE to interact with my family and friends easily • I use LINE to improve my relationship with family and friends	Ku et al. (2013)
Continuance intention to adopt SMIM (CON)	• I plan to keep using this LINE in the future • I intend to continue using this LINE in the future • I expect my use of this LINE to continue in the future	Ku et al. (2013)

<Appendix B> Literature Review Table

Author	Theory	Theoretical Implication	Practical Implication
Chih-Chien et al. (2005)	Integrated TAM & Network Externality	• Tech Utility (TU) influence Perceived Usefulness (PU) and Behavior Intention (BI) & indirectly affects BI through PU. • Network externality and network influence IMS acceptance	• Emphasize value of IMS usefulness and ease of use, provides the required tools to learn how to use the service correctly.
Li et al. (2005)	Motivation Model from Davis et al 1992	• Explain the behavioral intention to continue using IM by integrating the Motivational Model and interpersonal relationship theories • Perceived usefulness & perceived enjoyment were significant in explaining an individual's behavioral intention to continue using IM	• Casual conversations among current employees may be the lubricants for their existing relationships, suggesting that the relationship is maintained as intended. • Connections with the organization, group members, or customers. Critical mass of the IM virtual community to promote shared understandings, facilitate idea generation and knowledge dissemination, and cultivate organization commitment among group members.
Ilie et al. (2005)	Innovation Diffusion Theory	• Knowledge creation and transfer via highly interactive communication medium can be explained by understanding gender difference. • Knowing how men and women perceive real-time communication gives managers a better understanding of their communication style & what features they are more interested in.	• Suggest IM tech developers focus on critical mass, as in the case of a mass of radioactive material that goes critical, each additional user increases the number of potential network connections exponentially.
Hong et al. (2006)	Integrated Expectation-Confirmation Model (ECT-M) & TAM	• Further out to users' post-adoption behavior by testing the potential utility of models (i.e., ECM-IT and EECMIT) and how they compare to the traditional theory (i.e., TAM) in facilitating such research in the post-adoption context. • IT usage consider influence of contextual aspects (tech w various external factors) • IT adoption researchers underestimate the impact of functional usefulness and ease of use.	• To improve users' perceptions on ease of use, providers may collaborate with mobile device manufacturers to develop devices that fit their services. • Nature of mobile internet with new features and content small screen and input method requires user to make extra effort to access the content (e.g. navigations & extra steps with service menu), PEOU has a larger influence on mobile Internet users's post-adoption behavior.
Van Slyke et al. (2007)	Theory of Reason Action Diffusion of Innovation	• Increasing perceptions of relative advantage may improve attitudes. • The perception of critical mass influences adoption decisions for communication technologies. • Critical mass perception has both direct and indirect impacts on use intentions; expect significant increases in usage intentions as perceptions of critical mass increase.	• Critical mass has been reaching signals to the potential adopter of the utility of the focal technology. • In order to speed diffusion, managers should make early adopters more visible to the majority in order to build the impression of critical mass.

<Appendix B> Literature Review Table (Cont.)

Author	Theory	Theoretical Implication	Practical Implication
Strader et al. (2007)	Incorporate TAM with Network Externality	• Unique characteristics of transactional, communication-oriented, information technologies. • Perceived usefulness of e-mail has a significant association with the intention. • PEOU is significant both email & IM.	• Powerful effect on perceptions of usefulness and intention to use a system. • Marketing & developers new IM should take into account SMIM help communicate w friends, family in their ads.
Rouibah (2008)	Expanded version of TAM	• Software designers and researchers should focus on other hedonic characteristics instead. of the technologies. • Providing more customization and personalization features might enhance perceived enjoyment, as well as satisfy users' curiosity about other people.	• A rich media is a communication channel that provides opportunity for timely feedback, is able to convey multiple cues, supports the tailoring of messages to personal circumstances, and facilitates language variety. • Technology designers should consider these factors, as well as curiosity about other people, as well.
Lu et al. (2009)	TPB TAM Flow Theory	• The perception of enjoyment by users is as important for IM service providers as perceived usefulness. • Users accept IM not only because of extrinsic motivation (perceived usefulness), but also because of intrinsic motivation (perceived enjoyment and concentration).	• Develop not only useful and easy-to-use IM platform, but also want to have fun and enjoy a flow experience. • Offer users a powerful communication and entertainment platform. Efficiencies and reliability are expected in practitioner communication services. Also, IM providers should include entertainment functions.
Mallat et al. (2009)	TAM Diffusion of Innovation theories	• Compatibility with users' general habits and how they use mobile phones can be considered a precondition for service adoption. • The EoU and compatibility factors affected use intention directly. These factors are evaluated by consumers using situation-independent reference points. Compatibility was found to be the most important adoption factor.	• General adoption theories need to be augmented with mobile & situational factors. • Mobile services should build on mobility's benefits. • Mobile services will provide users with timely services that are easily accessed and tailored to the needs of specific users and their location.
Sledgianowski and Kulviwat (2009)	TAM	• PU and PEOU are significant but not the strongest factor. • Perceived playfulness and perceived critical mass are the strongest on Intention.	• PCM is one of the strongest indicators of intention to use social network site, crucial factor influencing intention to adopt emerging technology. • SNS developers is suggested to continue to find ways to enforce users' perception of critical mass.
Deng et al. (2010)	Customer satisfaction & loyalty theorized	• Customer satisfaction is influenced the most by perceived service quality. The high quality of service will have the greatest impact on MIM customer satisfaction. • Trust, satisfaction, and switching cost positively influence customer loyalty of MIM. Customer satisfaction has the greatest effect.	• MIM service providers should be concerned about quality of their service and highlight customer value. • Customer loyalty will develop if formation of trust, switching cost and customers satisfaction is well managed.

<Appendix B> Literature Review Table (Cont.)

Author	Theory	Theoretical Implication	Practical Implication
Gan and Li (2015)	TAM UTAUT ECT	• PQC has weak effect on resistance to change (RTC). • RTC has the strongest effect on Continuance Intention (CI). • Expands the research scope on the post-adoption behavior of users of mobile services with reference to both motivators and inhibitors.	• Mobile service providers should optimize service quality and increase their user base in order to retain users, while also minimizing switching behavior among mobile service users. • Provide a good interface design for easy usage and an interactive design for frequent interactions to facilitate CI.
Glass and Li (2010)	TAM on IM Adoption	• PU has average significant on IM adoption. • PEOU has strong effect on IM adoption. • Social Influence (Critical Mass and Subj Norm) has strongest effect on adoption. • The new communication technology involves direct communication with individuals.	• Critical mass & subjective norm loaded on the same factor, suggest better distinguish between these two constructs. • Social influences are critical factors in getting employees to adopt new IM. • Managers assign importance to gain a critical mass of users to assure new IM is disseminated in the org.
Li et al. (2010)	Motivational Model	• Motivational model was integrated perceived usefulness and perceived enjoyment to provide complementary perspective for future CMC. • Relationship commitment and perceived critical mass show a unified “self” and “other” for users of CMC.	• The use of IM and CMC technologies facilitates socializing at work. Workers who value interpersonal relationships may find it difficult to resist such communication. • Relationship-oriented employees may find CMC useful and enjoyable. Therefore, they make good candidates for introducing CMC. If a critical mass is perceived, late adopters may be influenced.
Pinho and Soares (2011)	TAM	• Reinforces the role of PEU and PU beliefs as determinants of a positive attitude towards SN adoption.	• PU and PEU are relevant beliefs for using these instruments constitutes a novel contribution to our understanding of why consumers engage into SNS
Sheer (2011)	Media Richness Theory & Communication Control	• Extends the applicability of media richness, a concept previously restricted in organizational task situations in which managers choose media for maximum delivery efficiency, to media use in online social interaction.	• Users choose and use an IM’s various multimedia features to build relations. • A teenager’s ability to communicate in depth via messaging is likely to be necessary if he or she intends to develop close friendships through rich features.
Shen et al. (2011)	Belief-Desire-Intention model & Social influence theory	• Two social influence processes, internalization and identification, were found to be especially important for the development of desire and we-intention to use IM.	• IM in team collaboration as a social behavior and examined the changing roles of social influence processes in the formation of usage intention. • Different influence patterns among different experience groups remind managers to employ different strategies in facilitating the use of instant messaging in team collaboration.

<Appendix B> Literature Review Table (Cont.)

Author	Theory	Theoretical Implication	Practical Implication
Xu et al. (2011)	Copresence Theory	• There are novel and distinct factors describing interpersonal relations between users. Perceived critical mass and relationship commitment had similar levels of effects. • Copresence and presence are determinants that complement existing knowledge.	• Our focus on the role of interpersonal relationships, especially the factors describing the social interactions between the users, is novel and distinct. • Adding features that promote a sense of copresence to an online communication service such as a virtual community may increase usage.
Zhou and Lu (2011)	Network Externality Flow Experience	• Knowledge of network externalities advances with flow experience and network externalities. • User loyalty is further influenced by referent network size and perceived complementarity.	• Provide users with ancillary functions to enhance perceived complementarity. • Mobile service providers need to improve their interface design and bring an engaging usage experience to users.
Chung et al. (2012)	Social capital theory	• A social capital consists of resources gained through relationships among people, which provide access to and use of social networking resources. • Common identity- and bond-attachment how they are formulated through social capitals: cognitive capital, structural capital, relational capital, and individual characteristics.	• A large network may not contribute significantly if group members aren't actively interacting with each other. • Social relations, confidence in knowledge, and kindness are significantly affected by the mediators' common identity and bond attachments; however, network externality has no effect.
Wang et al. (2012a)	Motivation Theory and Media Capacity Theories	• The goal of IM is to maintain and build interpersonal relationships in real time. Users' perceptions of hedonic utility directly influence their PU.. • Social presence theory and media choice theory provide additional insights into PU and PE.	• IM service providers must continuously explore design methods to improve the entertainment aspects of IM use. • IM designers should further develop IM technology while keeping its media capabilities in mind, especially the features related to social presence.
Wang et al. (2012b)	Five-factor model personality Motivation Theory Continuance	• Social communication provided by IM to maintain interpersonal relationships, not to enhance users' work performance. • Highlight the role of individual differences and personality in technology continuance behavior.	• Organizations could benefit from knowing the types of people who have positive beliefs towards technology. • Given IM's features importance to user satisfaction, these interactive features should be strengthened and frequently updated.
Choi (2013)	IS Continuance model & TRA	• Satisfied users are crucial to SNS continuane intention. • User satisfaction is determined by confirmation, perceived usefulness, and perceived enjoyment.	• This study could offer an explanation of how each value is associated with user satisfaction and SNS continuance intention.

<Appendix B> Literature Review Table (Cont.)

Author	Theory	Theoretical Implication	Practical Implication
Han et al. (2013)	Value-based Adoption Model	• Structured relationship between benefit (quality, usefulness, playfulness) and sacrifice (technicality, cost, security risk) of smart phone users, perceived value, and continuous intention to use. • Provides theoretical contribution to the development, design, and marketing of smart phones.	• Smartphone developers need to improve task efficiency and performance, including rate systems of smart phones. • Marketing managers should pay more attention to identifying not only customers' benefit and sacrifice components, but also their lifetime value of adopting smart phones.
Jang et al. (2013)	Prosocial behavior theory	• Online friendship desire is increased by three factors of SNS interactivity (connectivity, enjoyment, and synchronicity).	• Studying online friendship desire in relation to online citizenship behavior and identifying its antecedents. In addition to providing guidance on how to manage online society, this study helps promote SNS effectiveness.
Ku et al. (2013)	Uses & Gratifications Theory	• Users prefer entertainment and relationship maintenance, information, sociability. Relationship maintenance was the primary gratification. • Incorporated interpersonal influences and the negative effects of privacy concerns.	• SNS providers may enhance the search function on sites to help members easily obtain information or the communication interface on their sites to improve members' ability to socialize and maintain relationships.
Jung and Hong (2014)	Extended TAM	• Validated and extended TAM partially, also developed the construct of metaphor in smartphone settings.	• Users can perceive that the app is useful and easy to use by using metaphors used in its user interface, which in turn makes them want to use it.
Ogara et al. (2014)	Media Richness Theory	• Using visual cues & symbols to convey meaning and personalization in communication is what makes MIM rich. • Full capabilities of the features present in these technologies thereby increasing their knowledge base and level of interactivity.	• MIM application designers consider certain variables that lower the learning curve while at the same time enhancing social presence in these applications. • Design of current MIM environments with presence capabilities promotes an atmosphere for users to communicate, interact and socialize.
Yoon et al. (2015)	TAM Flow theory Theory of Social Influence	• Technical characteristics play an important role in users' mobile IM. • Developed an extended TAM for new information technologies that includes hedonic and interpersonal features.	• Convenience is critical for increasing the usability and the • Use of mobile IM brings users pleasure. MIM services developers should design and develop a high availability system to offer this convenience.
Liu and Guo (2015)	Self-regulation framework	• Examine factors leading to user behavioral intentions and should be adopted in studies in the field. • Sense of belonging had partially mediated the effect of service quality and fully mediated the effect of trust on loyalty.	• Enhance the sense of belonging through their websites and communities. Providing high quality of service to and building trust among members. • Retailers should strive to manage their sites, including social features such as online forums, to build sense of belonging among users.

<Appendix B> Literature Review Table (Cont.)

Author	Theory	Theoretical Implication	Practical Implication
Jun et al. (2016)	TAM Theory	• It is communication, user context, and network accessibility speed that determine perceived usefulness, ease-of-use, and behavioral intentions to use MCS.	• Mobile commerce service providers need to improve access costs, mobile apps, network capacity, and bandwidth. • Service providers should provide users with value-added information specific to their circumstances.
Oghuma et al. (2016)	Expectation-confirmation theory	• Developed an extension of ECM involves the influence of perceived service quality on confirmation and satisfaction. • Extended ECM with PU (utilitarian), enjoyment (hedonic), perceived usability (features interfaces) and perceived security	• MIM providers must spend more time understanding how users perceive enjoyment from MIM. • Confirmation and satisfaction influence MIM users' intentions to continue using. • Creating an attractive and user-friendly interface. Some of the emoticons are even culturally focused.
Peng et al. (2016)	Migration theory from social network perspective	• IT switching phenomena, especially the online communication tools like MIMs, are collective-based. • Relative deprivation has a tight relationship with social networks. Relative deprivation from functional and monetary dimensions based on the specific feature of WeChat.	• Users may switch more if they see people in their networks using a new IT that gives them a sense of deprivation. • Add more creative and valuable features and functions to retain their users to reduce the impact of relative deprivations.
Kim (2017)	Dedication-constraint model	• Positive emotions had a significantly positive effect on user loyalty. • Affective commitment was significantly associated with positive emotions and user loyalty, but not with negative emotions. • Perceived usefulness, perceived enjoyment, and trust had a significant effect on affective commitment.	• Affective and calculative commitment were stronger determinants of post-adoption behaviors. • When users perceive MMAs to be useful, enjoyable, and trustworthy, they develop affective commitment, which, in turn, triggers positive emotions and ultimately increases their loyalty.
Lee et al. (2017)	Theory of network externality	• A user's emotions and dedication-constraint mechanisms play a crucial role in user loyalty. • MMA user loyalty is fully captured by the ambivalent view of emotions. • Trust, social norms, and perceived usefulness as enablers of affective and calculative commitments.	• Positive emotions are evoked when users perceive the usefulness, enjoyment, and trustworthiness of MMAs, and this ultimately contributes to the loyalty of MMA users. • Staying with current service providers has utilitarian and hedonic benefits.
Sun et al. (2017)	Push-pull-mooring	• Integrated the status quo bias (SQB) theory and PPM framework by proposing inertia as a key factor capturing the mooring effects of inertia. • Providing a comprehensive picture of inertia formulation through affective commitment and habit.	• Encourage habitual usage of MIM by increasing affective commitment and switching costs. • In addition to providing users with a more controllable environment, service providers can prevent users from being too fatigued with incumbent services.

<Appendix B> Literature Review Table (Cont.)

Author	Theory	Theoretical Implication	Practical Implication
Tseng et al. (2017)	Media Richness Theory	• Customer perceived values, from the perspective of the media richness of MIM, we introduce the antecedents to customer perceived values of MIM. • The four dimensions of media richness are also studied, but their impacts on user loyalty differ. Multicues influence user loyalty via functional value, immediate feedback impacts user loyalty via social value, and personal focus impacts user loyalty via self-expressive value.	• Providing indexing or searching tools can help users to identify the desired symbols to use in various contexts. Users should be more loyal to the product as a result of these features. • Provide multiple communication cues. Besides texting, multimedia, and smartphones, MIM providers can also enable customers to access MIM services using wearable devices for coordination and collaboration.
Wu et al. (2017)	Attachment Theory	• Mobility is another important functional attribute of MIM applications and refers to the ability to use MIM applications seamlessly and ubiquitously. • Consumers will use MIM applications for routine tasks when they perceive the mobility.	• Mobile MIM applications facilitate seamless communication with friends. In addition, it simplifies routine tasks for consumers. • MIM applications need to differ from each other based on mobility, which enhances consumers' functional dependence and emotional attachment.
Bere (2018)	Task-tech fit	• Provide students with simple-to-use platforms and encourage them to participate. • To support effective teaching and learning, lecturers need to continue working with students to identify popular emerging technologies.	• MIM creates new opportunities for mobile learning. • MIM developers should incorporate important functionalities such as assessment facilities to improve its potential in learning.
Cho (2020)	Attraction-Selection-Attrition (ASA) Model	• Messages are not the only function of MIMs today; they are also used for file sharing, file editing, and group chat. • The informational, relational, and affective aspects of MIMs overloaded use in organizational contexts help to understand the less explored aspects.	• Overload use of MIM aids in the organizational context • Quality of information exchanged & overload influence organizational attractiveness and intention to stay at current organization.
Gong et al. (2020)	Expectation-confirmation model	• Both satisfaction and perceived critical mass directly contribute to continuance intention of SMIM users, and perceived critical mass has a stronger impact. • Confirmation of self-expression is the most important driver of satisfaction.	• Enhancing interpersonal connectivity can increase user satisfaction and retention. • SMIM service providers can reward group members for helping each other or implement rating mechanisms, offering privileges for newcomers or additional free services.
Mouakket (2018)	Uses & Gratifications	• Social interaction influences self-disclosure of information via MIM apps, whereas social influence does not. • Analyzed three-dimensional gratifications (intrinsic, social, and extrinsic) in relation to information self-disclosure within MIM.	• Users' disclosure of personal information via MIM applications is influenced by intrinsic, social, and extrinsic factors. • Incorporate intrinsic features into MIM conversations to motivate customers to reveal depth and breadth of information about themselves.

<Appendix B> Literature Review Table (Cont.)

Author	Theory	Theoretical Implication	Practical Implication
Tam et al. (2020)	Expectation Confirmation and Extended UTAUT2	• Perf. Expectancy (PU) is significant on Continuance Intention. • New constructs, namely effort expectancy and habit added to model, increasing the predictive power in explaining continuance intention.	• Companies and developers should create/update mobile apps to make them easy and intuitive to use. • Mobile apps offer benefits that could positively influence customers' sense of satisfaction and their willingness to continue using a service.
Pal et al. (2020)	TAM & Valence framework	• Instead of perceived usefulness or perceived ease of use, user trust is the greatest predictor of the adoption intention. Suggested that trust plays an important factor that second-generation mobile instant messaging (SMIM) that developers should give proper attention to ensure the success of the service.	• Incorporating all this information from within the application will reduce users' efforts in finding the relevant information from multiple sources and increase their trust and dependency. • Vendors must have an explicit privacy policy, which they should share with users before they start using the apps.
Huang and Miao (2021)	Domestication theory	• Theoretically, this study extended previous studies of households to a broader context of social, political, economic, and industrial realities. • linked the periodic non-use of moments with the re-domestication of WeChat.	• Demonstrating their individual agency to re-establish boundaries and avoid the risks of alienation and intrusion of mobile communication technologies into the fabric of everyday life.
Chen et al. (2022)	Hofstede's cultural theory	• These two MIM usage purposes were closely examined in terms of cultural dimensions. Friendship development and relationship maintenance are influenced by cultural dimensions in different ways. • High collectivist cultures are more likely to use MIM apps. Users with high masculinity, uncertain avoidance, and power distance are less likely to adopt MIM apps. High uncertainty avoidance and high power distance motivate users to use MIM apps.	• China's highly collectivist culture makes WeChat the most popular MIM. With WeChat's Red Packets feature, users can send money in virtual credits to friends in a group chat along with photos. • The MIM app could improve emoticons and Group Talk features. • The focus of marketing managers should be on WhatsApp voice/video, and document sharing. These features allow users to deliver clear, direct messages to their friends in high-masculinity cultures.

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