



## Stickiness on a Mobile Instant Messaging Service: Perspective of Consumption Value Theory, Flow, and Social Influence Theory

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### Abstract

Smartphones have become mainstream products, especially for apps that create diverse content and can generate new business models. The mobile instant messaging (MIM) service is one the most frequently used apps. It not only changes communication behavior but also creates new approaches toward business. Therefore, the current study aims to examine the predictors of stickiness of an MIM service among smartphone users. The research framework was based on the theory of consumption value, perceived value, and social influence theory, with the objective to evaluate why people stick to the MIM service. Data collected from 495 valid respondents were analyzed using the structural equation model (SEM). The results indicated that consumption value and social environment both affect the continued usage intention for MIM services. Moreover, this study shows that social influence is the main prompt for continued use as well as stickiness behavior.

*Keywords: Mobile instant messaging (MIM) service, consumption value theory, perceived value, social influence, stickiness*

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# 行動即時通訊服務黏著度：消費價值理論、 沈浸與社會影響理論觀點

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## 摘要

智慧型手機已成為目前手機市場的主流產品，尤其在應用程式（apps）的多元發展趨勢下，產生許多新的商業模式。行動即時通訊（Mobile instant messaging, MIM）服務是近年來蓬勃發展的應用程式之一，它不但改變了人們的溝通行為，同時也為企業帶來新的服務契機。因此，本研究主要在探討智慧型手機使用者在行動即時通訊服務黏著度的影響因素。研究架構是以消費價值理論、沈浸與社會影響理論為基礎，主要目的在於探討人們為何「黏」在某些行動即時通訊服務上。本研究共蒐集了 495 份資料，並以結構方程模式進行資料分析。研究結果顯示消費價值及社會環境都會影響人們持續使用行動即時通訊服務的意圖。此外，本研究亦顯示社會影響是消費者持續「黏」在行動即時通訊服務的主要原因。

關鍵詞：行動即時通訊服務、消費價值理論、知覺價值、社會影響、黏著度

## 1. Introduction

According to a 2014 MIC FINDS survey (MIC FINDS, 2014a), mobile instant messaging (MIM) apps, including Facebook Messenger, LINE, BeeTalk, and Tinder are the most frequently used apps, with 68% of people using social network apps. Among all the MIM services, LINE is the most popular in Taiwan. According to the official blog of LINE, there were over 17 million LINE users in Taiwan and 300 million worldwide as of April 2014; moreover, over 450 million users were using WhatsApp worldwide. WeChat is the most popular social network app in China, with around 600 million users. Therefore, such services are not only changing communication patterns among people but also creating new types of business models.

In Taiwan, a survey conducted by TWNIC indicated that social networking apps were the most downloaded app category (TWNIC Survey, 2014). The top three reasons for



using instant messaging software include (1) satisfying social needs, (2) high interaction between group members, and (3) because friends tend to be using the same app (TWNIC Survey, 2014). Among the respondents who use instant messaging software, the three most popular functions are (1) sending text messages, (2) sending files/photos, and (3) sending group messages. MIM service providers continuously innovate their services to meet their customers' needs and enhance customer satisfaction and loyalty (Deng et al., 2010). Even though these providers make considerable efforts to provide superior MIM service functionality, not all MIM apps are successfully adopted. To have users accept a specific MIM service, it is important to understand the factors affecting MIM technology usage and usage patterns.

To explain IT usage, numerous models that incorporate attitudinal, social, and control factors have been proposed, including the technology acceptance model (TAM) (Davis, 1989; Davis et al., 1989) and two variations of the theory of planned behavior (TPB) (Ajzen, 1991). However, other studies examined IT adoption and usage using a diffusion of innovations perspective (Rogers, 2010; Tornatzky and Klein, 1982). Venkatesh et al. (2003) integrated the three models to formulate a unified model, which was called the Unified Theory of Acceptance and Use of Technology (UTAUT). The model included four core determinants of intention and usage and up to four moderators of key relationships. Although the above theories are well-developed theories of technology acceptance, their fundamental constructs do not fully reflect the variety in user-task environments (Moon and Kim, 2001). Thus, scholars have successively proposed different usage models for various types of technology, for example, web-based stores (Chen et al., 2002; Koufaris, 2002), social technology (Jiang and Deng, 2011; Lu and Hsiao, 2010), and security technology (Lee and Kozar, 2008; Yeh and Chang, 2007).

Mobile instant messenger services involve both mobile and social technologies. Many studies have applied value theory to explore mobile data services and mobile apps (Al-Debei and Al-Lozi, 2014; Gummerus and Pihlström, 2011; Kim, 2010; Kim et al., 2009; Kim and Han, 2009; Kuo et al., 2009; Wang et al., 2013; Yang and Jolly, 2009). For social network sites, many articles exist that discussing usage intention (Al-Debei et al., 2013; Deng et al., 2010; Dickinger et al., 2008; Hsiao, 2011; Lin and Lu, 2011; Lu and Hsiao, 2010; Lu and Lee, 2010; Sledgianowski and Kulviwat, 2009). However, although there has been much discussion of social network and mobile data service usage, post-adoption usage behaviors are seldom discussed. Therefore, the current study aims to examine the predictors of stickiness of MIM services among smartphone users.



## 2. Theoretical Background & Hypotheses

### 2.1 Value and the theory of consumption value

In previous studies, value has been shown as the major determinant affecting users' intention of adoption and purchase. In the present research model, the theory of consumption value is used to evaluate the value of MIM services.

Perceived value theory originated from Zeithaml (1988) who defined perceived value as the "consumer's overall assessment of the utility of a product (or service) based on perceptions of what is received and what is given" (Zeithaml, 1988). This means that the customers will weigh the overall perceived benefit of products or services against the price paid in the exchange process. Dodds et al. (1991) defined the perceived sacrifice as non-financial cost, such as search cost or physical or mental pay-off, as well as the monetary cost that customers or users need to pay to get services or products. That is, customers estimate value by including all the benefits and sacrifice factors to make a decision in the market.

Although perceived value provides an overview to understand customers' decision-making behavior, this trade-off structure is too simplified to encompass the multi-dimensionality involved (Hsiao, 2011; Kim et al., 2007). Therefore, (Sheth et al., 1991b) proposed that the following five values affect consumers' choice behavior: functional, social, emotional, epistemic, and conditional value. Table 1 lists the five consumption values and their definitions (Sheth et al., 1991a; Sweeney et al., 1996).

▼ Table 1 Five consumption values and their definitions

Value Types	Definitions
Functional	Perceived utility acquired from an alternative's capacity for functional, utilitarian, or physical performance and thought to be generated by a product's salient attributes (e.g., reliability, durability, and price).
Emotional	Perceived utility acquired from an alternative's capacity to arouse feelings or affective states.
Social	Perceived utility acquired from an alternative's association with one or more specific social groups.
Epistemic	Perceived utility acquired from an alternative's capacity to arouse curiosity, provide novelty, and/or satisfy a desire for knowledge.
Conditional	Perceived utility acquired by an alternative as the result of a specific set of circumstances facing the decision-maker.



Perceived value comes from the comparison of perceived benefits and costs. While not considering the costs, *functional value* in Table 1 is similar to *perceived usefulness* in the technology acceptance model (TAM) and *relative advantage* in the theory of innovation diffusion (IDT). In the IS field, perceived usefulness is widely used in system appraisals or evaluations (Chen et al., 2012; Davis, 1989; Lin and Lu, 2011; Lu et al., 2009; Moon and Kim, 2001). Perceived usefulness also proved to be the most important factor influencing the adoption of MIM in China (Jiang and Deng, 2011). Therefore, this study believes that *functional value* plays an important role in MIM service use and re-use.

Further, with the invention of new technologies and the development of hedonic products or services, prior studies have considered perceived enjoyment as an important construct. For example, Dabholkar and Bagozzi (2002) proposed that perceived enjoyment is probably a critical factor in the TAM. MIM services provide enjoyment for mobile users while they chat and send pictures to each other. In the study of Jiang and Deng (2011), perceived entertainment was found to be a key factor affecting Chinese users to adopt an MIM service. Emotional value is also similar to the concept of perceived enjoyment and entertainment while not considering possible negative costs. Therefore, in this paper, emotional value was considered as another factor that affects MIM usage and re-usage intentions.

However, for the usage purposes, MIM is primarily for communication; therefore, users might seek feelings of belonging to social groups as well as expand their social network. Similar to the concept of perceived presence awareness (PPA) in the study by Hassanein and Head (2007), the social value of an MIM service can help users feel accepted and comfortable in groups, which increases users' perception of usefulness with respect to an MIM service. Consequently, the current study considers social value as one of the value constructs.

Deng et al. (2010) adopted a value structure to evaluate customer satisfaction and loyalty toward MIM services in China that considers functional, emotional, social, and monetary value as the value constructs. The current study adopts the first three (Functional, emotional, and social) as a benefit element of perceived value. For monetary value, most MIM services provide free access, and as a result, the current study does not consider it. Due to the ubiquitous and without time restrict characteristics, the current study does not consider conditional value into the research construct as well. Since the current research discusses the post-adoption and stickiness behavior, the epistemic value construct also is excluded from the research framework.



## 2.2 Consumption value on continued intention to use

In the research model, we adopted the consumption value theory to obtain specific understanding. After a pilot study, we confirmed that MIM services enhanced the social value of smartphone devices.

Previous research regarding mobile devices or mobile services addressed that mobile users not only consider functionality but also seek fun and enjoyment (Dickinger et al., 2008; Kim, 2010; Kim et al., 2009; Kim et al., 2007; Nysveen et al., 2005; Oghuma et al., 2016; Wakefield and Whitten, 2006; Zhang et al., 2017). Lu et al. (2009) pointed out that perceived enjoyment enhances the behavioral intention to use an instant messaging service. Lin and Lu (2011) showed that perceived usefulness and perceived enjoyment are considered as perceived benefits that enhance the continued intention to use a particular service. Kim et al. (2007) proposed that perceived benefit influences perceived value. Zhang et al. (2017) evidenced that social and hedonic values positively affect users' continuance intention to use WeChat. Conversely, function value deprivation positively impact users switching intention to use the service (Peng et al., 2016). Consequently, MIM services not only provide the functionality by way of connection (Extrinsic factor) but also provide enjoyment within reference groups (Intrinsic factor).

Many studies have shown perceived value to influence usage behavior. However, few studies use perceived value to evaluate continued intention. Lin and Lu (2011) proposed that perceived benefit has a positive effect on continued intention to use. However, they did not consider the influence of value in their model. Kim et al. (2007) used a value-based method to evaluate the usage of M-Internet. Their results showed that perceived value mediates customers' beliefs on adoption intention. This confirmed the values' impact on technology adoption. Turel et al. (2010) proposed the value model on hedonic digital artifacts, which shows the influence of consumption value on usage intention. Al-Debei et al. (2013) proved that perceived value has an influence on continued intention to use and continued use behavior. The research also indicated that perceived value might provide a more comprehensive explanation than perceived behavior control. Hsiao (2011) integrated the cost-benefit paradigm value model to demonstrate the intention to pay continuously for a service. The result indicated that value is not only a determinant of usage but also of willingness (or not) to pay.

Hence, the current research employed the value-driven adoption model and proposed the following three hypotheses:



- H1: Functional value (FV) of an MIM service has a positive impact on continued intention to use the service.
- H2: Emotional value (EV) of an MIM service has a positive impact on continued intention to use the service.
- H3: Social value (SV) of an MIM service has a positive impact on continued intention to use the service.

### 2.3 Social influences on continued intention to use

Venkatesh et al. (2003) defined social influence as “the degree to which an individual perceives that important others believe he or she should use the new system.” Social influence is widely used in different frameworks such as TRA, TPB, and IDT theories. Thompson et al. (1991) proved that the social norm is similar to the subject norm in TRA theory. Besides, previous studies have proved that social influence positively affects the usage intention (Venkatesh and Morris, 2000).

In a related research, Hsu and Lu (2004) adopted a social influence factor that uses social norm and critical mass to evaluate the usage intention of online games. Critical mass has been viewed as a crucial factor in the diffusion of mass media (Van Slyke et al., 2007). Lou et al. (2000) indicated that critical mass is highly related to the interaction between peers. Therefore, critical mass is widely used in communication technologies because it cannot be separated from partners’ usage (Markus, 1987).

Li et al. (2005) adopted critical mass to weigh the intention to use an instant messaging service. Li et al. (2005) applied the perceived number of users to evaluate the usage of an instant messaging service. Sledgianowski and Kulviwat (2009) used critical mass, playfulness, and trust to evaluate social network site adoption. Lin and Lu (2011) adopted network externality as a factor to understand whether gender difference has an effect on continuance intention to use.

Social norms have two dimensions: informational influence, which indicates that a user’s adoption will be influenced by other users’ experiences or opinions, and normative influence, whereby people adopt (reject) a new technology based on a positive (negative) outcome (Deutsch and Gerard, 1955).

“Social norm” has been adopted in research on social virtual communities such as online game, social network site, or others (Hamari and Koivisto, 2015; Mouakket, 2015). For example, Hsu and Lu (2004) proposed social norm for online adoption; Dholakia et al. (2004) proposed a model to understand consumer participation in network- and small-





group-based virtual communities; Dickinger et al. (2008) applied perceived enjoyment and social norm to evaluate the usage of media like Push-to-Talk. The results showed perceived enjoyment and social norm to be crucial antecedents for the adoption of technologies that are related to network externalities. Thus, the current study proposed the following hypotheses:

H4a: Critical mass (CM) has a positive impact on continued intention to use an MIM service.

H5a: Social norm (SN) has a positive impact on continued intention to use an MIM service.

#### **2.4 Social influences on stickiness**

Social influence is not only considered as a factor of intention but it also shows its effect on actual behavior. Previous studies have shown that social influence affects actual IT usage behavior (Hsu and Lin, 2016; Karahanna et al., 1999; Lewis et al., 2003; Liker and Sindi, 1997; Lu and Lee, 2010; Venkatesh and Morris, 2000; Venkatesh et al., 2003). Furthermore, Hsu and Lu (2007) showed that social influence is associated with loyalty in that users have the willingness to revisit the online game community. MIM emphasizes on the function to communicate with friends ubiquitously and without the time limitation. Therefore, the current study believes that social influence not only affects intention but also actual behavior. When peers spend more time or use it more frequently, the user will check the app more often or prolong their usage time. Thus, the current study proposed that social influence positively affects stickiness to an MIM system by positing the following hypotheses:

H4b: Critical mass (CM) has a positive impact on the stickiness to MIM systems.

H5b: Social norm (SN) has a positive impact on the stickiness to MIM systems.

#### **2.5 Flow**

Csikszentmihalyi (2000) defined flow experience as “the holistic sensation that people feel when they act with total involvement.” When people in the low statement, they will total absorb themselves into the activities; fully concentrated on the activity; the self-consciousness disappears, and fall in the control sense of environment (Csikszentmihalyi, 2000).

Earlier studies have shown that flow experience is related to perceived enjoyment and intrinsic interest (Donna and Novak, 1997; Ghani and Deshpande, 1994; Ghani et al., 1991; Hoffman and Novak, 1996; Koufaris, 2002; Moon and Kim, 2001; Novak et al., 2000).





Hoffman and Novak (1996) applied flow experience to online browsing behavior. Flow experience is also applied in the technology acceptance context (Koufaris, 2002), while Hsu and Lu (2004) proposed flow experience in online game usage.

MIM services not only provide perceived usefulness but also enjoyment when people are chatting or sharing photos. The enjoyment when conversing with a friend and telepresence while using a service will create the flow status. Moreover, flow experience is also shown in virtual communities and instant messaging systems (Lin and Lu, 2011; Lu et al., 2009). Therefore, we proposed that flow experience positively affects the continued intention to use and posited the following hypothesis:

H6a: Flow experience has a positive impact on the continued intention to use an MIM service.

Qi and Fu (2011) indicated that flow will influence social networking sites' (SNS) e-loyalty (defined as online stickiness) and referral loyalty. Moreover, the results indicated that flow experience prompts users' willingness to return and prolongs the time spent on SNS. Based on previous studies and the similarities between MIM and SNS, we proposed that flow experience positively influences stickiness behavior and posit the following hypothesis:

H6b: Flow experience has a positive impact on the stickiness to an MIM system.

## 2.6 Continued intention to use and stickiness

The second objective of the current study is to understand post-adoption usage intention and behavior. Therefore, the authors employ continuance usage and stickiness as the dependent variables to understand post-adoption usage behavior. Al-Debei et al. (2013) used social norm and behavior prospect to understand why people keep coming back to use Facebook. Kim (2010) utilized continuance intention in exploring mobile data services.

Stickiness is considered the most important factor of a successful system. Lin (2007) defined online stickiness as the user's willingness to stay longer on a website and continue visiting the website. The current study defined stickiness as actual behavior. This is consistent with the concept used in Lu and Lee (2010) research, which considers stickiness as an actual behavior. Previous studies classified stickiness behavior into two elements: duration and retention (Lu and Lee, 2010; Thorbjørnsen and Supphellen, 2004).

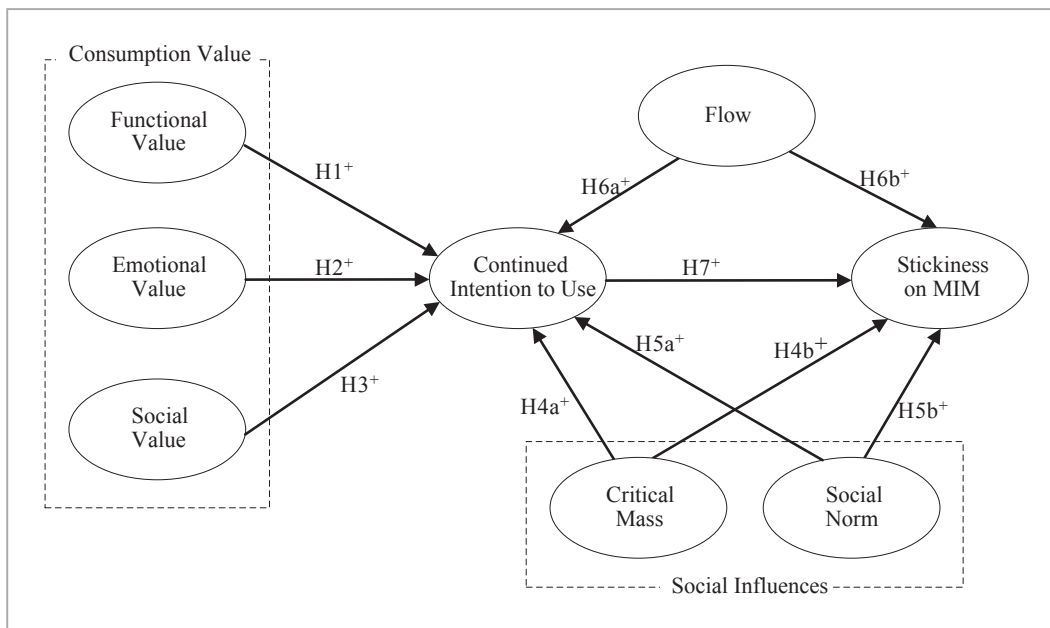
In the theory of planned behavior, intention is the primary determinant of actual behavior (Ajzen, 1991). Moreover, the relationship between intention and behavior



has been proven by previous studies (Ajzen, 1991; Lu et al., 2009; Sledgianowski and Kulviwat, 2009; Taylor and Todd, 1995). The current study proposed that positive continued intention enhances the frequency of MIM system usage and usage time. Studies on similar topics also suggest that continued intention to use affects stickiness usage behavior (Al-Debei et al., 2013; Wu et al., 2010). Consequently, the following hypothesis was proposed:

H7: Continued intention to use an MIM service has a positive impact on stickiness to the MIM system.

After reviewing the extant literature, the authors proposed the research framework presented as Figure 1, which diagrams the relationships among the constructs.



▲ Figure 1 Research framework

### 3. Research Methodology

#### 3.1 Pre-test

Before the questionnaire was distributed, a small-scale pretest was conducted to ensure the validity and reliability of the measurements. Fifteen participants were recruited to complete the questionnaire and provide feedback on the measurements. One of the items (Flow Experience 5: “I enjoyed my experience when I used an MIM service”) was deleted



due to difficulty in comprehension. Moreover, the questionnaire was rearranged to improve understanding and facilitate responses.

### 3.2 Data collection

The current study integrated the theory of consumption value and social influence to develop a model for understanding why people tend to stick to the MIM service. In the present study, the participants were users who use MIM apps that provide a message function, graph sending, and free talking functions. People who have the experience of using MIM services were invited to participate in the survey. Data was mainly collected through an online survey over a period of three months (October-December 2013). The participants self-selected by responding to messages placed on popular websites with huge traffic, including Facebook (<http://zh-tw.facebook.com/>) and Taiwan's most popular bulletin board system (BBS) ([telnet://ptt.cc](http://ptt.cc)). The online data collection method enabled the study to recruit participants from the younger generation.

Responses were received from 504 respondents. After removing those with incomplete data, 495 valid questionnaires remained. Table 2 shows the demographics for all valid responses. The sample comprised 57.6% female and 42.4% male respondents. The largest age groups were 20-29 and 30-39 years (Accounting for 72.1% in total). Most respondents had at least a bachelor's degree (95.3%) and more than one year's experience in MIM usage (64.7%). Compared with the MIC survey results (female, 53.6% and 70.4% 20-39 years old) (MIC FINDS, 2014b), the gender and ages factors of our sample were similar. This means that the study sample can be used to explain characteristics regarding the population of MIM users in Taiwan.

Table 2 Demographics of respondents (N = 495)

	Freq.	Percentage		Freq.	Percentage
Gender			Level of Education		
Male	210	42.4%	High school or below	23	4.6%
Female	285	57.6%	Bachelor	302	61.0%
			Master or above	170	34.3%
Age (years)					
Under 20	87	17.6%	Experience of MIM Usage		
20-29	268	54.1%	Under 1 year	175	35.3%
30-39	89	18.0%	1-3 years	240	48.5%
Over 40	51	10.3%	Over 3 years	80	16.2%



### 3.3 Measurement

The questionnaire was developed from previous studies. Referring to Sheth et al. (1991b), this study defined consumption value as users' perceived value regarding a specific MIM service. Such value comes from users' perceptions of usefulness, enjoyment, and feelings about belonging to a group. With regard to the measurement of consumption value, we used functional, emotional, and social values adapted from Sweeney and Soutar (2001) and Deng et al. (2010). Eleven items were used to measure the consumption value of MIM service as shown in Table 3.

Social influence, which contains social norm was adapted from Taylor and Todd (1995) and Al-Debei et al. (2013) while critical mass was adapted from Hsu and Lu (2004). In this study, social norm was defined as "one's perception that significant referents desire him/her to continuously use or not use a particular MIM service." Critical mass was defined as "one's perception that most people in his/her group use frequently a particular MIM service." In Table 3, five items were used to measure social influence; the first two items were for social norm, the others for critical mass.

Flow experience has been well discussed, and as a result, the current study uses studies by Novak et al. (2000), Hsu and Lu (2004) and Ku (2011) to develop the questionnaire. This study defined flow experience as "the holistic experience that one feels when he/she use a particular MIM service with total involvement." Four items were used to measure flow experience regarding MIM service as shown in Table 3.

As the dependent variable, the continued intention to use (CIU) was adapted from Kim et al. (2008), Lin and Lu (2011), Al-Debei et al. (2013), and Bhattacharjee and Premkumar (2004). This study borrowed the construct of stickiness on MIM from Lu and Lee (2010) and defined it as "one's behavior of the time spends in a particular MIM service and retention to the MIM service." Three and six questionnaire items, respectively, were used to measure the continued intention to use MIM service and the stickiness on MIM service as shown in Table 3. All items were measured on a five-point Likert scale, ranging from "strongly disagree" (1) to "strongly agree" (5).



Table 3 Summary of measurement scales			
Construct	Items	References	
<i>Consumption value</i>	Functional value	FV1: MIM is reliable.	Sweeney and Soutar (2001), Deng et al. (2010)
		FV2: MIM has good functions.	
		FV3: MIM fulfills my needs well.	
	Emotional value	EV1: I feel good when I use MIM.	Sweeney and Soutar (2001)
		EV2: Using MIM is enjoyable.	
		EV3: MIM gives me pleasure.	
		EV4: Using MIM is interesting.	
	Social value	SV1: MIM helps me feel acceptable.	Sweeney and Soutar (2001)
		SV2: MIM makes a good impression on other people.	
		SV3: Using MIM gives me a sense of belonging with other users.	
		SV4: MIM improves the way I am perceived.	
	<i>Social influences</i>	Social norm	SN1: People who influence my behavior think I should continue using MIM.
SN2: People who are important to me would think that I should continue using MIM.			
Critical mass		CM1: Most people in my group use MIM service frequently.	Hsu and Lu (2004)
		CM2: Most people in my community use MIM service frequently.	
		CM3: Most people in my class/office use MIM service frequently.	
<i>Flow experiences</i>	FE1: My attention was completely focused on the content when I used MIM service.	Novak et al. (2000), Hsu and Lu (2004), Ku (2011)	
	FE2: I was able to express my ideas without hesitation when I used MIM service.		
	FE3: I had the feeling of having experienced a personal situation when I used MIM service (total involvement).		
	FE4: I enjoyed my experience when I used MIM service.		
<i>Continued intention to use</i>	CIU1: I intend to continue using MIM to chat with my friends, family, or co-workers in the future.	Kim et al. (2008), Lin and Lu (2011), Al-Debei et al. (2013), Bhattacharjee and Premkumar (2004)	
	CIU2: I intend to recommend my friends to use MIM in the future.		
	CIU3: I will regularly use MIM in the future.		
<i>Stickiness</i>	Visit duration	VD1: I stay for a long time while using MIM service.	Lu and Lee (2010)
		VD2: I usually spend a lot of time chatting on MIM service.	
		VD3: I continue to prolong my stays on MIM service.	
	User retention	UR1: I use MIM service almost every day.	
		UR2: I am in the habit of looking for new messages on MIM service while accessing the internet.	
		UR3: I will use MIM service frequently.	



## 4. Data Analysis

### 4.1 Measurement model

The measurement model was assessed using partial least squares (PLS) and analyzed using SmartPLS software. Following the two-step approach recommended by Anderson and Gerbing (1988), the measurement model was first examined for reliability and validity. The structural model was then examined for the research hypotheses and model fitness.

As shown in Table 4, the results indicated that the composite reliability for all exceed 0.7, which suggests acceptable reliability. Convergent validity was tested by examining average variance extracted (AVE) and indicator loadings. Discriminant validity was evaluated by comparison of the AVEs and the squared correlation for each construct. As shown in Table 4, all AVEs met this criterion, thus establishing acceptable discriminant validity. Moreover, all alpha values were larger than 0.7, suggesting good reliability (Nunnally and Bernstein, 1978).

Table 4 Original Cronbach's alpha and composite reliability of eight constructs, revised correlation coefficient matrix and square roots of the AVEs

	Cronbach's Alpha	Composite Reliability	CIU	CM	EV	FV	Flow	SN	SV	Stickiness
CIU	0.8713	0.9209	<b>0.8917</b>							
CM	0.8754	0.9237	0.5833	<b>0.8954</b>						
EV	0.9288	0.9495	0.6560	0.4496	<b>0.9081</b>					
FV	0.7696	0.8642	0.5650	0.4010	0.6296	<b>0.8252</b>				
Flow	0.7825	0.8594	0.6450	0.4009	0.6809	0.6038	<b>0.7780</b>			
SN	0.8931	0.9493	0.5162	0.3988	0.5924	0.5149	0.5623	<b>0.9505</b>		
SV	0.9154	0.9402	0.4544	0.3150	0.6992	0.5887	0.6357	0.6309	<b>0.8928</b>	
Stickiness	0.8624	0.8973	0.6870	0.5102	0.5691	0.4884	0.6094	0.4921	0.4807	<b>0.7717</b>

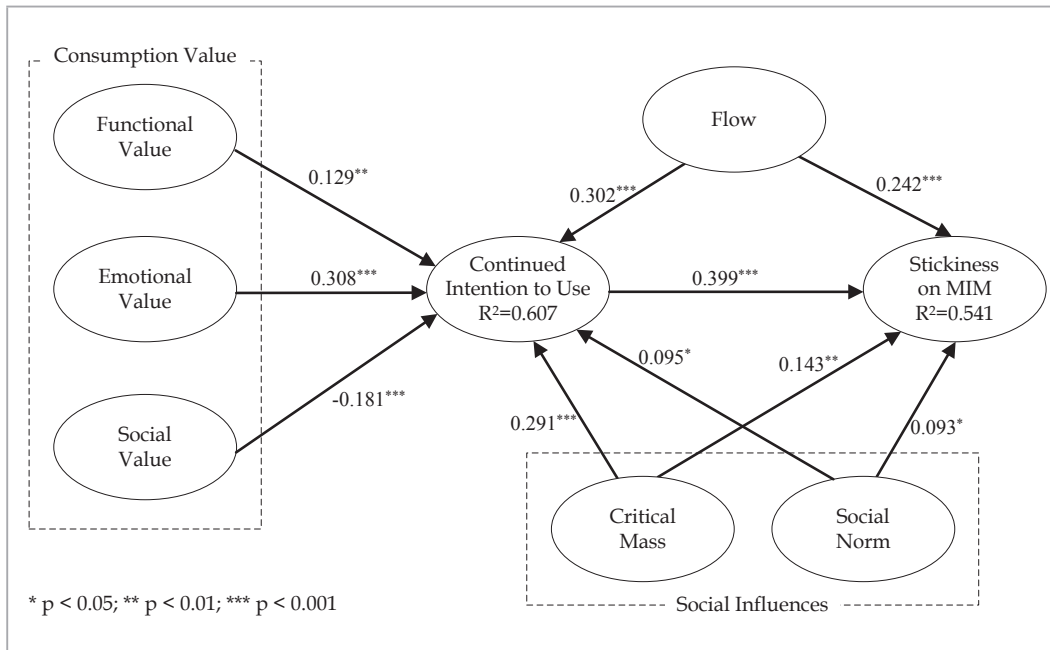
Note: EV (emotional value); SV (social value); CIU (continued intention to use); CM (critical mass); CV (consumption value); SN (social norm). Diagonal elements (bold) are the square root of average variance extracted (AVE) between the constructs and their measures. Off-diagonal elements are correlations between constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements. All correlations are significant at  $p < 0.01$ .

### 4.2 Structural model

After examining the measurement model, its relationship in the research model was examined. The model was estimated using the structural equation model (SEM) and analyzed using SmartPLS software.



The results of the analysis using SmartPLS are presented in Figure 2. The result in the current research framework is highly correlated; however, the path coefficient in the structural model is negative. The correlation coefficient between social value and continued intention to use is 0.45; however, the path coefficient is negative ( $\beta = 0.181$ ;  $p < 0.001$ ).



▲ Figure 2 Model testing results

After double-checking the research model and statistical scheme, a multicollinearity phenomenon appears in the current research model. From the correlation matrix, it was found that emotional value and social value is highly correlated (The correlation coefficient is nearly 0.7; therefore, the researchers combined the functional, emotional, and social values into a single consumption value). Table 5 displays the revised Cronbach's alpha, composite reliability, correlation coefficient matrix and square roots of the AVEs.





Table 5 Cronbach's alpha and composite reliability of six constructs, revised correlation coefficient matrix and square roots of the AVEs

	Cronbach's Alpha	Composite Reliability	CIU	CM	CV	Flow	SN	Stickiness
CIU	0.8713	0.9209	<b>0.8917</b>					
CM	0.8754	0.9237	0.5831	<b>0.8954</b>				
CV	0.9319	0.9417	0.6508	0.4508	<b>0.7730</b>			
Flow	0.7825	0.8594	0.6452	0.4009	0.7366	<b>0.7780</b>		
SN	0.8931	0.9493	0.5163	0.3988	0.6648	0.5623	<b>0.9505</b>	
Stickiness	0.8624	0.8973	0.6871	0.5102	0.5938	0.6094	0.4922	<b>0.7717</b>

Note: CIU (continued intention to use); CM (critical mass); CV (consumption value); SN (social norm). Diagonal elements (bold) are the square root of average variance extracted (AVE) between the constructs and their measures. Off-diagonal elements are correlations between constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements. All correlations are significant at  $p < 0.01$ .

Figure 3 shows the results of the revised model testing. We found that consumption value has a positive impact on continued intention to use MIM services ( $\beta = 0.243$ ;  $p < 0.001$ ).

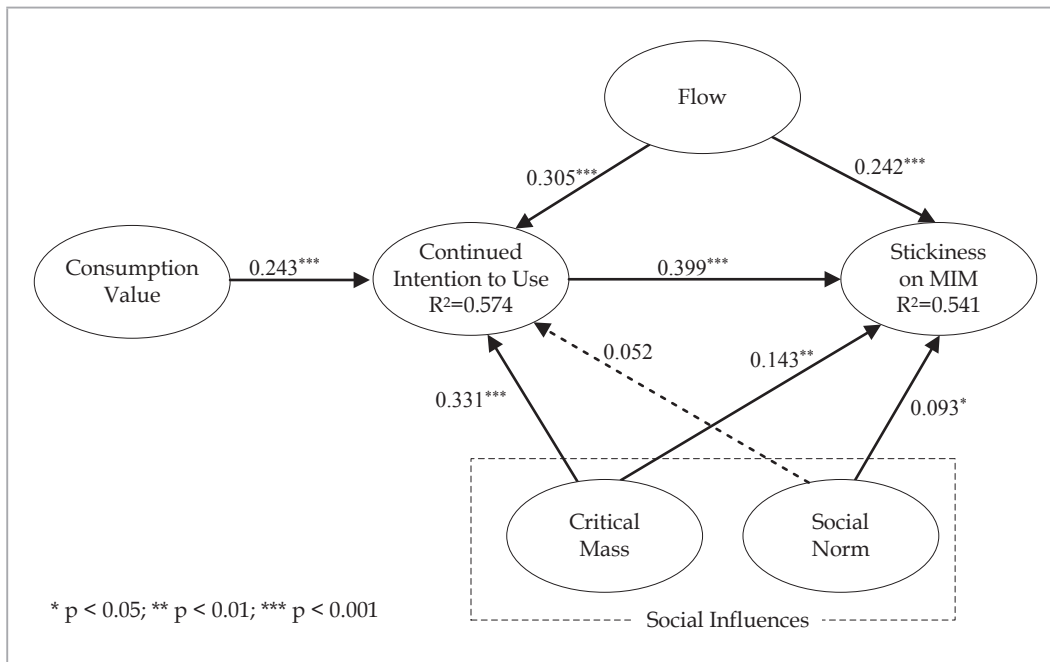
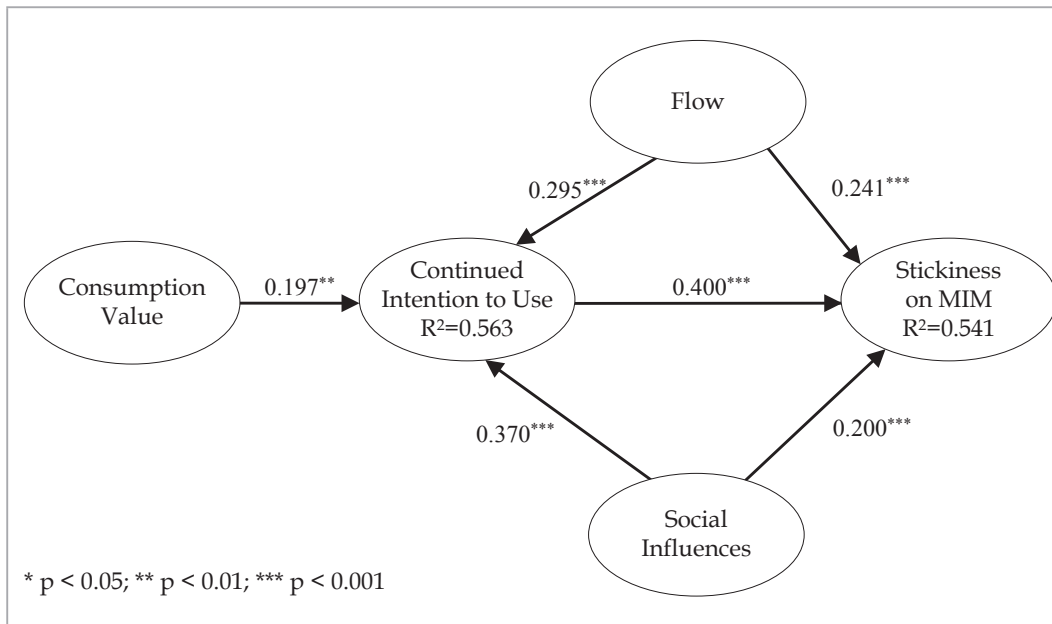


Figure 3 Revised model testing results



Furthermore, both critical mass ( $\beta = 0.331$ ;  $p < 0.001$ ) and flow ( $\beta = 0.305$ ;  $p < 0.001$ ) positively influence the intention of continuance to use MIM services; therefore, hypotheses 4a and 6a are supported. The R-square shows that the variables account for 57.4% of the variance in the intention to continue to use. The social norm, however, does not support hypothesis H5a ( $\beta = 0.052$ ;  $p > 0.05$ ), but the correlation coefficient of 0.5163 means that there might be a multicollinearity phenomenon in the current framework. Therefore, this study considered social norm and critical mass into social influences.

Figure 4 represents the result after combination of the two social constructs. It indicates that social influences significantly affect the continuance intention to use MIM service ( $\beta = 0.370$ ;  $p < 0.001$ ) and stickiness ( $\beta = 0.200$ ;  $p < 0.001$ ). Finally, continuance intention to use ( $\beta = 0.400$ ;  $p < 0.001$ ) and flow ( $\beta = 0.241$ ;  $p < 0.001$ ) both positively affect the stickiness on MIM services. The R-squares also indicate that 54.1% of the variance accounted for by the constructs in the stickiness on MIM services.



▲ Figure 4 Revised model testing results

Table 6 shows final Cronbach's alpha and composite reliability of the five constructs after model revision as well as the final correlation coefficient matrix and square roots of the AVEs. Cronbach's alpha of all constructs is close to or more than 0.8, indicating that the items in each construct are of high internal consistency and that each construct has a good



level of reliability (DeVellis, 2012). Moreover, all items in each construct are developed and extracted from previous studies; this means that these items have high content validity. Further, all composite reliability values in Table 6 are more than 0.7 and all AVEs are more than 0.5, indicating that the questionnaire maintained convergent validity (Fornell, 1982; Fornell and Larcker, 1981). Finally, for discriminant validity, all diagonal elements were larger than off-diagonal elements. However, high pairwise correlations among explanatory variables possibly represents a little multicollinearity existing even though all correlation coefficients in Table 6 are less than the criterion ( $<0.9$ ) suggested by researchers (Hair et al., 2010). It should be considered further when interpreting the results.

▼ Table 6 Final Cronbach's alpha and composite reliability of five construct, correlation coefficient matrix, and square roots of the AVEs

	Cronbach's Alpha	Composite Reliability	CIU	CV	Flow	SI	Stickiness
CIU	0.8713	0.9209	<b>0.8917</b>				
CV	0.9319	0.9417	0.6509	<b>0.7730</b>			
Flow	0.7825	0.8594	0.6454	0.7365	<b>0.7780</b>		
SI	0.8301	0.8810	0.6598	0.6392	0.5544	<b>0.7733</b>	
Stickiness	0.8624	0.8973	0.6870	0.5938	0.6095	0.5969	<b>0.7717</b>

Note: CIU (Continued intention to use); CV (Consumption value); SI (Social influences). Diagonal elements (Bold) are the square root of average variance extracted (AVE) between the constructs and their measures. Off-diagonal elements are correlations between constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements. All correlations are significant at  $p < 0.01$ .

## 5. Discussions and Conclusions

### 5.1 Key findings

This study considered the impacts of three key independent variables (Perceived consumption value of MIM services, social influence, and flow experience) on MIM usage intention and the stickiness on MIM services. The results showed that all three variables positively affect users' intentions to use the MIM services continuously, which in turn influences the stickiness on MIM. Further, we also found that social factors, flow experience, and MIM usage intention have significant positive effects on the stickiness on MIM service.

The result of the relationship between consumption value and continuance intention



to use is in line with the research proposed by Al-Debei et al. (2013), which pointed out that value influences the continuance intention to use for social networking sites. Results from this study specifically address the functional, emotional, and social value of the MIM service. Among all the perceived values, emotional value played the most important role in influencing the continued intention to use MIM services. Thus, the pleasure and enjoyment of using MIM services should be considered in its design.

Further, social factors such as critical mass and social norm also affect users' continuance participation intention. In particular, critical mass is more influential than social norm in predicting both the continued intention to use and stickiness of MIM services. Accordingly, the current study suggests that the number of adoption is especially critical in predicting the successfulness of an MIM service. This finding explains why most MIM apps offer free-of-charge services as this allows rapid market expansion to achieve a critical mass quickly.

Finally, flow experience plays another important role in this study. This result is consistent with the prospect proposed by Kim (2010), which addresses the relationship of social norm and continuance usage behavior and examines flow and social factors in the online game environment (Hsu and Lu, 2004). Continuance intention to use, flow, social norm, and critical mass all positively affect the stickiness of MIM. This result points out that social factor is the most important determinant of stickiness. This is consistent with Lu and Lee (2010) research result on blogs that identifies social influence as a significant factor toward actual behavior.

The results of the current study show that the user's social environment weighs more heavily than consumption value (i.e., functional, emotional, and social value). It represents that the functions or enjoyment for using MIM services predict MIM usage behavior. In general, the consumption value of MIM service might be the basic factor for initial adopters; however, social environment creates continuance usage intention and stickiness behavior.

Overall, the results show social factors to be the main reason in prompting the stickiness behavior in MIM services. Therefore, social factors are more important for usage research, especially in the online game and social networking environment. Users will continuously use MIM services because of the social need. Finally, the influence of flow on continued intention to use MIM services is more significant than the influence of consumption value. This result indicates that keeping users immersed in the context of MIM services is important for encouraging the continuous use of MIM. Thus, service



providers of MIM apps are suggested to keep innovating in the development of more powerful functionalities that connect people through technologies in ways that promote stickiness.

## **5.2 Theoretical contributions**

For the theoretical contributions, this study views the consumption value proposed by Sheth et al. (1991b) as perceived value and utilizes the three decomposed values—functional, emotional, and social—to evaluate the perceived value regarding MIM usage. Furthermore, this study extended research on the connection between intention and actual behavior, which was ignored by most prior studies. Thus, this study provides an in-depth understanding of the key determinants affecting MIM continuance intention as well as stickiness behavior.

This study also explained how social factors affect stickiness behavior. The results reveal that social influence not only directly affects continuance usage intention but also affects actual behavior. In particular, the results suggest that critical mass is more important than social norm in predicting MIM adoption. Therefore, offering a free version of an MIM app to the public to download and use is the first step in successfully reaching a critical mass. Further, the significant influence of flow experience on continued intention and stickiness on MIM was revealed in this study.

## **5.3 Practical implications**

The implications derived from the significant influence of consumption value, social influence, and flow can be described as three-fold.

First, designers and developers should recognize the importance of perceived value in predicting the adoption and continued usage of MIM services, with a specific focus on delivering value through enjoyment and pleasure in use. Second, quick adoption by the public to reach a critical mass should be an important marketing strategy to achieve social influence. Therefore, providing MIM services at low-cost or free of charge is one of the most popular strategies in distributing the software. Finally, the creation of flow should be one of the main concerns in shaping the positive experience of MIM usage to promote continuous adoption. Accordingly, it is important for designers and developers to provide MIM services capable of creating user engagement, participation, and ultimately, customer loyalty.



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