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Effect of perceived value and social influences on mobile app stickiness and in-app purchase intention

Chin-Lung Hsu [a], Judy Chuan-Chuan Lin [b,*]

[a] Department of Information Management, National Taipei University of Business, No. 321, Sec. 1, Jinan Rd., Zhongzheng District, Taipei 100, Taiwan, ROC
[b] Department of Computer Science and Information Management, Soochow University, 56 Kueiyang Street, Section 1, Taipei 100, Taiwan, ROC

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ABSTRACT

Recently, there has been a dramatic proliferation of mobile apps, many of which allow for in-app purchases; however, little research has focused on what motivates a user to make such purchases. Based on the Affect–Behavior–Cognition model (ABC model) of attitudes, we developed a model involving perceived value and social influences. The model is then empirically evaluated using survey data collected from 485 users regarding their perception of mobile apps. The findings indicate that stickiness and social identification significantly influence a user's intention to make in-app purchases. Specifically, significant differences were found between users and potential users in terms of antecedents to forming stickiness and making in-app purchases. The results may provide further insights into the development of effective mobile app business models and adoption strategies.

1. Introduction

Global mobile device penetration continues to proliferate at a phenomenal rate, driving the robust growth of mobile commerce applications. According to comScore (Siwicki, 2013), as of June 2013 mobile devices accounted for 55% of total time spent interacting with online retail outlets, with desktop and laptop computers accounting for the remaining 45%. Most mobile interactions take place via mobile apps designed to fulfill specific user demands for shopping, entertainment, information, and social interaction. To achieve viability, the developers and publishers of mobile apps must create suitable business models.

The "freemium" approach has transformed the mobile apps sales market. More than 90% of apps offered in the Apple App Store in 2013 were free (Golden, 2013), prompting initial downloads which paved the way to in-app purchases later. Earlier generation apps depended mostly on advertisements to produce revenue; however more and more publishers are building in-app purchase functions as a primary means of monetizing their work. In-app purchases are defined as the purchase of digital products or services within a specific app via a mobile device. The usual scenario is that consumers download and try out the basic, free version of the app, and then become willing or develop the need to pay for premium access to enhanced features/contents. Such features/content can be categorized as: 1) permanent enhancements to the app usage experience (e.g. removal of advertisements or unlocking more options); 2) expendable updates such as buying extra lives, coins, and food in games; and 3) temporary subscriptions to content or services (MacFarlane, 2015).

Though in theory in-app purchase seems a sensible method to monetize free apps, implementation has proved challenging. Unlike in conventional shopping contexts, in-app purchases require apps to first attract users to download the trial version before subsequent in-app purchase can take place, and only regular (sticky) users are likely to make such purchases (Yaloz, 2015). Therefore, the key element to the success of mobile app is stickiness (Drell, 2013). However, few previous studies have investigated the antecedents and effects of stickiness in the context of mobile apps. Therefore, this study examines factors that influence app user behavior (i.e. stickiness), attitudes, and in-app purchase intention. These are key considerations for app developers given that, in 2013, in-app purchases accounted for more than 70% of US iPhone app revenue and as much as 90% of revenues in Asian markets (Koekkoek, 2013) and is expected to grow steadily (eMarketer, 2015).

Past studies have shown that product value is one of the important factors in promoting app usage and purchases (e.g. Lin and Wang, 2006; Turel et al., 2007a, b; Chang and Tseng, 2013). According to motivation theory, both utilitarian and hedonic values have a strong influence on purchasing behaviors in both conventional and e-commerce shopping settings. In addition, prior studies have confirmed that consumer purchasing decisions may be affected by the opinions of his/her

* Corresponding author.
E-mail addresses: chinlung@ntub.edu.tw (C.-L. Hsu), jclin@csim.scu.edu.tw (J.C.-C. Lin).

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peers (Bearden and Etzel, 1982; Engel et al., 1993; Yang et al., 2007). How this actually influences purchase decisions in the context of in-app consumption is still unknown. Therefore, this study will address the following research questions:

1. To what extent does perceived value affect user's affective responses (i.e. attitude and satisfaction) toward a mobile app?
2. How do social influence and an app user's preference/dependence on a mobile app affect his/her willingness to pay for extra functions?
3. How does purchase experience affect in-app purchasing behaviors in this new mobile market?

To achieve the research goals, this study seeks to examine in-app purchase intention by proposing and empirically testing a behavioral model based on theories of perceived value and social influence. Moreover, given that in-app purchases occur after a user is already familiar with the specific app, the user's prior experiences–attitudes, satisfaction, and likelihood to continue using the app–play an important role in user's willingness to pay for extra functions. Previous studies have verified that the determining factors of information technology and information system (IT/IS) adoption differ between potential users and experienced users (Dwivedi and Irani, 2009; Hsu et al., 2007). Hence, this study also aims to identify factors that influence in-app purchase intention for experienced users (i.e., users who have previously made in-app purchases) and potential users (users who have no prior in-app purchase experience).

This study used a structural equation model (SEM) to assess the empirical strength of the relationships in the proposed model. In-app purchases have proven to be an effective monetization strategy for freemium apps. Examining antecedents and the effects of stickiness on mobile app users' in-app purchase intention from the perspectives of perceived value and social influences will provide valuable insights into in-app purchasing behavior as well as additional implications for theory of stickiness in the mobile app context. In addition, the results of this research can also help app developers devise effective mobile apps to improve their competitiveness.

2. Conceptual model and research hypotheses

Fig. 1 illustrates the research model which is adapted from the ABC model of attitudes. It asserts that user intention to make in-app purchases is determined by attitude, satisfaction, social norms, social identification and stickiness. Furthermore, attitude and satisfaction mediated the impact of beliefs about perceived value (i.e., hedonic and utilitarian values) on stickiness. Perceived value has been identified as a possible measure of experience of mobile technology usage (Turel et al., 2007a,b; Minna, 2005; Kim, 2010; Kuo et al., 2009; Kim and Han, 2009). Different users value mobile apps for different reasons, such as productivity enhancement or entertainment. Therefore, perceived value, including utilitarian value and hedonic value, is proposed as a motivation for app usage. In addition, app users can interact to create online communities and thus enhance their social relationships. For example, social networking apps such as Facebook and the LINE SMS platform (Naver, Inc.) allow users to exchange information through text, images, video and audio via mobile devices. Therefore, social influences, including social norms and social identification, are included as additional beliefs and play a significant role as direct determinants for a user's intention to use apps and make in-app purchases. Fig. 1 shows the network of relationships in the model. The remaining section explains the theoretical foundations and rationale of the proposed links along with definitions of each construct.

2.1. ABC model of attitudes

According to the ABC model of attitudes, attitude is made up of three components: affect, behavior, and cognition. As shown in Fig. 2, cognitive response influences affective response, which in turn shapes behavioral response. Cognitive response refers to the beliefs a person has about performing the target behavior. Affective response is categorized into attitude and satisfaction (Al-Gahtani and King, 1999). Attitude is defined as an individual's positive or negative feelings about performing the target behavior whereas satisfaction is defined as the degree to which a user favorably perceives the overall assessment of performing the target behavior. Behavior is a measure of the strength of one's intention to perform a specified behavior. In the past decades, many theories such as the theory of reasoned action (TRA), the technology acceptance model (TAM) and the theory of planned behavior (TPB) have adapted the cognition–affect–behavior causal chain to predict user behavior (Fishbein and Ajzen, 1975; Davis, 1989; Ajzen, 1991).

The ABC model of attitudes is a general model and does not specify the beliefs that are operative for a particular behavior. Moreover, attitude formation is closely related to the specific characteristics of a particular product and service. Therefore, while researchers have adapted the ABC model of attitudes to explain user behavior, salient beliefs need to be considered in a specific context. For example, in the TAM model, Davis (1989) proposed that user beliefs about perceived usefulness and ease of use had an impact on user attitudes toward IT/IS acceptance behavior within an organization. In the TPB model, the social norms and perceived behavioral control are both types of beliefs which influence user behavior. Prior studies based on these theories also proposed specific beliefs to improve understanding of user behavior for specific contexts, such as WWW, online games, electronic commerce and mobile commerce (Moon and Kim, 2001; Hsu and Lu,

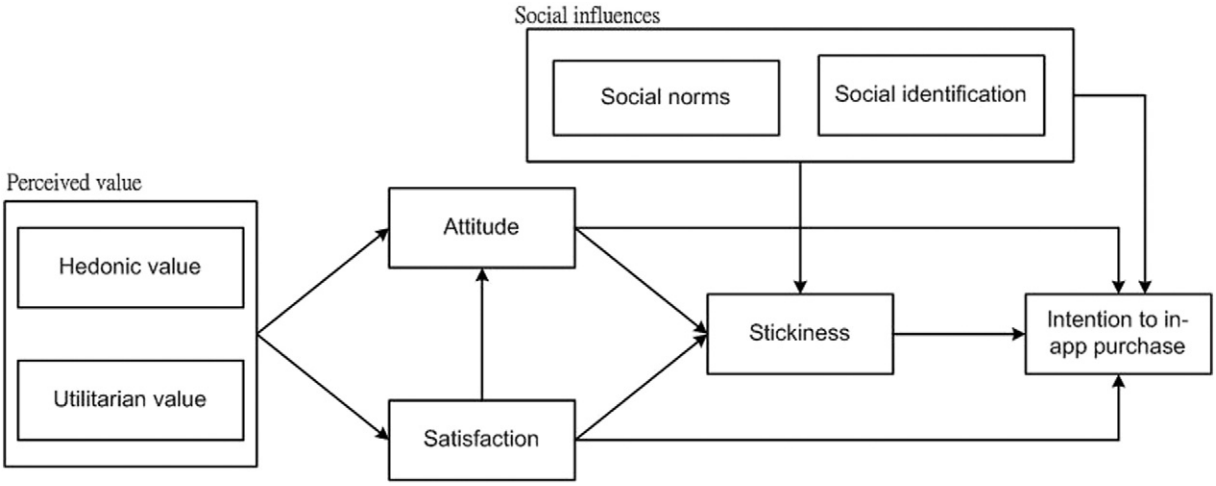

Fig. 1. Research model.

Fig. 2. Basic model (adapted from the ABC model of attitudes).

2004; Lee, 2008; Green and Pearson, 2011; Leong et al., 2013). However, in the context of mobile apps, the present study proposes that belief variables include perceived value and social influences. Findings are expected to shed light on the development of strategies to understand and promote app usages and purchase.

2.2. Hypotheses

2.2.1. Beliefs regarding hedonic value and utilitarian value

A user's utilitarian and hedonic values are seen to influence his/her IT/IS usage behavior. While utilitarian IT/IS focuses on increasing the user's task performance, hedonic values focus on increasing the user's pleasurable experience (van der Heijden, 2004). Studies have empirically verified that both values have an influence on IT/IS perceptions and usage behavior (Kim and Han, 2009; Kim and Hwang, 2012; Chun et al., 2012; Pöyry et al., 2013). According to motivation theory, perceptions of utility represent extrinsic motivation while the perceptions of hedonic value represent intrinsic motivation (Zanna and Rempel, 1988). Extrinsic motivation emphasizes performing a behavior to achieve specific goals/rewards (Vellerand, 1997), while intrinsic motivation refers to the pleasure and satisfaction derived from performing a certain behavior (Deci and Ryan, 1987). Previous research in the IT/IS domain suggests that high extrinsic and intrinsic motivation results in increased intention to adopt a given IT/IS (Davis et al., 1992; Teo et al., 1999; Lin and Lu, 2011; Yoo et al., 2012). The present study assumes that people use apps not only to achieve specific goals or improve task performance and productivity, but also for leisure and entertainment. Therefore, utilitarian value and hedonic value are proposed as factors which impact user's beliefs regarding app usage.

In the current study, we define hedonic value as the degree to which a user derives pleasure from using an app. Utilitarian value is defined as the degree to which a person believes that using an app enhances his or her task performance. Oliver (1993) suggested that perceived value should be conceptualized and measured as a cognitive construct, while customer satisfaction is conceptualized as an affective construct. Lin and Wang (2006) empirically found that perceived value had a significant effect on satisfaction in mobile commerce contexts, while Kuo et al. (2009) showed that the perceived value for mobile value-added services had a positive influence on user satisfaction. In addition, when consumers view a target behavior such as online shopping as being more valuable (e.g. more convenient and cost effective), they will develop a more positive attitude toward that behavior. For example, Overby and Lee (2006) verified that preference (i.e., positive attitude) was influenced by hedonic and utilitarian values in the context of online shopping. Moreover, from the perspective of motivational factors, previous studies have identified positive relationships between utilitarian motivation and attitude as well as between hedonic motivation and attitude (Davis et al., 1992; Childers et al., 2001; Monsuwé et al., 2004). Accordingly, we propose the following hypotheses:

Hypothesis 1a. Hedonic value will positively affect user attitude.

Hypothesis 1b. Hedonic value will positively affect user satisfaction.

Hypothesis 2a. Utilitarian value will positively affect user attitude.

Hypothesis 2b. Utilitarian value will positively affect user satisfaction.

2.2.2. Social influence perspectives

In addition to perceived values, many studies also have found that social influence positively influences an individual's IT usage (Luarn and Lin, 2005; Cheung et al., 2011; Ting et al., 2014). Social influence is the extent to which consumers perceive that their peers (e.g., family and friends) believe that they should use a particular technology (Venkatesh et al., 2012). Reference group theory also emphasizes that a consumer's behavior (e.g. purchasing decision) can be affected by the opinions of his/her peers (Brown and Reingen, 1987; Kotler, 1999). This reference group influence has a similar impact to other social factors and can be regarded as a direct determinant of behavioral intention (Thompson et al., 1991).

Venkatesh et al. (2003) observed that various theories use different constructs to describe social influence. For example, TRA, TPB, and TAM2 propose "subjective norms" as a type of social influence factor. Subjective norms are defined as the individual's perception that his/her peers would approve or disapprove of a particular behavior. In addition, innovation diffusion theory (IDT) uses the term "image" to refer to the degree to which use of an innovation is perceived to enhance one's image or social status. Although different terms have been used to describe social influence, it generally consists of two distinct influences — informational influence and normative influence. Moreover, social influence operates through three distinct mechanisms — internalization, identification, and compliance. First, informational influence is an internalization process which occurs when a user perceives information as enhancing existing knowledge acquired from reference groups. As the number of internet users increases, information influences such as electronic word-of-mouth (eWOM) recommendations play an increasingly important role in shaping customer behavior (Hennig-Thurau and Walsh, 2003). Hsu and Lin (2010) empirically verified that information influence has a significant impact on adoption behavior for In-Car GPS navigation systems. Second, normative influence is a form of identification and compliance. Identification occurs when a user adopts an opinion held by others out of concern with self-definition in relation to the group. Compliance occurs when a user conforms to the expectations of another to receive a reward or avoid rejection and hostility. Social exchange theory supports this perspective in saying that people perform specific behaviors because they expect reciprocal benefits such as enhanced reputation, trust, power, dependence, promise and economic return (Blau, 1964; Emerson, 1981; Donath, 1999; Liang et al., 2008).

In addition to social norms, roles are another common standard for the behavior of group members (Ellis and Fisher, 1994). Roles are "sets of behaviors that are considered appropriate for persons holding particular positions in a group" (Triandis, 1977). People develop a sense of membership and belonging in particular groups. Thus, their perception of social identification increases when they identify with and assume a role in a group through participation in group action. Social identity theory suggests that people classify themselves into social categories. This categorization changes the way people see

themselves in the sense that it activates one's self-concept which is related to the formation of emotions and norms relating to membership in affiliated groups. Furthermore, self-categorization theory also emphasizes that beliefs about appropriate behavior follow directly from one's self-concept as a group member (Turner et al., 1987). Self-concept mostly comprises people social identification, defined as the perception of belonging to a group, team or community. In many instances, social identification has been linked to a number of positive outcomes, such as enhanced behavioral intention, life satisfaction, loyalty and group performance (Alvesson, 2000; Ellemers et al., 2004; Bagozzi and Dholakia, 2006; Hsu and Lin, 2008; Haslam et al., 2009). Therefore, this study uses social norms and social identification as beliefs of social influences to explore the impact on stickiness and intention to make in-app purchases. Social norms are defined as the degree to which a user perceives others as approving of his/her using an particular app. Social identification is defined as the degree to which a user perceives that using a particular app grants him/her membership in a particular community. Accordingly, we propose the following hypotheses:

Hypothesis 3a. Social norms will positively affect user stickiness.

Hypothesis 3b. Social norms will positively affect user intention to make in-app purchases.

Hypothesis 4a. Social identification will positively affect user stickiness.

Hypothesis 4b. Social identification will positively affect user intention to make in-app purchases.

2.2.3. Affective responses regarding satisfaction and attitude

Satisfaction and attitude are conceptualized as an individual's affective reactions toward system usage. User satisfaction is defined as the degree to which a user perceives overall system usage favorably. It is primarily an affective evaluative response. Attitude is defined as an individual's positive or negative feelings (i.e., evaluative affect) about using the system (Davis et al., 1989). Al-Gahtani and King (1999) suggested that satisfaction be used in parallel with the attitude construct to explaining IT/IS usage behavior. Furthermore, satisfaction is conceptually distinct from attitude in that satisfaction is a transient and experience-specific affect, while attitude is relatively more enduring (Oliver, 1980). Therefore, a user may have a positive attitude (with a pleasant experience) but still feel dissatisfied if his/her actual experience does not meet expectations (Bhattacherjee, 2001). In the context of mobile apps, most users adopt try-first-and-purchase-later behavior since many app providers offer free versions for the users to download. Before downloading the apps, a user may develop expectations about app performance. Depending on how well the trial usage compares to expectations, the user gains actual experience from using the trial app and develops perceptions and attitudes regarding the app's value, along with his/her usage satisfaction. Therefore, this study uses attitude and satisfaction as affective factors and examines their impact on usage behavior.

We define attitude as the degree to which the user derives positive feelings from using a given app. Satisfaction was defined as the extent to which the user gives the app an overall favorable assessment. Previous studies have found a significant relationship between these two factors (Hellier et al., 2003; Abdul-Muhmin. 2011). For example, Shih (2004) confirmed that a user's satisfaction with using the Internet played an important role in influencing user's attitude toward using the Internet. In addition, Hung et al. (2003) found that user satisfaction positively influences an individual's attitude toward using Wireless Application Protocol (WAP) services. Accordingly, we propose the following hypothesis:

Hypothesis 5a. Satisfaction will positively affect user attitude.

2.2.4. Behavioral responses regarding stickiness and intention to make in-app purchases

In recent years, the typical digital business strategy for mobile app publishers has been to offer apps on a free or trial basis (Singer-Oestreicher and Zalmanson, 2013), in an attempt to retain and prolong the user's stay. In the context of non-mobile websites, Demers and Lev (2000) proposed the concept of "stickiness" to describe the ability of a site to capture and retain the user's attention. Similarly, app stickiness refers to the user's behavioral intention to re-use and prolong the duration of each usage on an app. By increasing the number of times a user visits an app and the duration of each visit, increased stickiness is seen as increasing the potential for in-app purchases. Both stickiness and in-app purchase intention reflect important dimensions of the app's value and are expected to be positively associated with the app's market value.

We define stickiness as the degree to which a user re-uses a given app and prolongs the duration of each usage. Intention to make in-app purchases was defined as the degree to which a user would like to purchase products and/or services in the future within a given app. The present study proposes that satisfaction had a negative effect on intention to make in-app purchases because users who are satisfied with the functionality of a free or trial version app are less likely to purchase enhanced functionality. In addition, increased stickiness was found to leave users more likely to make in-app purchases. Empirically, Lin (2007) confirmed that a Web user's willingness to stick with a given website is a strong predictor of his/her intention to transact. Accordingly, we propose the following hypotheses:

Hypothesis 5b. Attitude will positively affect user stickiness.

Hypothesis 5c. Attitude will positively affect user intention to make in-app purchases.

Hypothesis 6a. Satisfaction will positively affect user stickiness.

Hypothesis 6b. Satisfaction will negatively affect user intention to make in-app purchases.

Hypothesis 7. Stickiness will positively affect user intention to make in-app purchases.

3. Methodology

3.1. Sample

In recent years, web-based surveys have emerged as an effective means of collecting data for academic research. The empirical data for the present study were collected through an online survey of app users in Taiwan. An announcement of the survey goals was posted for 30 days on heavily-trafficked web sites such as Sogi.com (http://www.sogi.com.tw) and Facebook (http://wwww.facebook.com) as well as online communities such as Mobile01 (http://www.mobile01.com) and campus BBS message boards devoted to issues related to mobile applications. The announcement included a hyperlink to the survey form. Participants who submitted valid questionnaires were entered into a drawing to receive one of twenty NT$200 (US$6) convenience store gift certificates. Duplicate responses were eliminated by filtering for multiple uses of a single IP address or email account. The questionnaire included prompts to ensure that the respondents completed all survey items, thus eliminating invalid responses. The final sample included 485 valid responses.

Among the respondents, 56% were male, 63% were under the age of 25, 61% had a bachelor's degree and 53% had experience making in-app purchases. Table 1 summarizes the demographics of the respondents. The demographic profile showed that users are relatively young and generally well educated. This trend is somewhat similar to results reported by FIND (2014). Generally, younger users are more accepting

Table 1
Demographic profile.

Measure	Items	Frequency	Percent
Gender	Male	271	56
	Female	214	44
Age	Under 20	76	16
	21–25	228	47
	26–30	93	19
	Over 30	88	18
Education	High school or less	30	6
	Some college	18	4
	Bachelor's degree	298	61
	Graduate degree	139	29
Experience in making in-app purchases	Yes	255	53
	No	230	47
Price range of in- apps purchases	Under NT50	84	18
	NT$30–NT$150	125	26
	NT$51–NT$300	28	6
	OVER$300	18	4
	None	230	47
Monthly expenditure for in-app purchases	Under NT$50	71	15
	NT$51–NT$100	75	16
	NT$101–NT$500	72	15
	NT$501–NT$1000	21	4
	Over NT$1000	16	3
	None	230	47
Number of in-app purchases in the past year	Under 6	173	35
	7–12	63	13
	Over 12	19	4
	None	230	47
Credit card	Yes	280	58
	No	205	42
Preferred means of payment for in-app purchases	Credit card payment	144	30
	Telecommunication bill	106	22
	Convenience store	166	34
	Stored value card	57	12
	Other	12	3

of innovations, and are likely become the most active apps users and the most influential consumers in the mobile apps field in the future. Realizing the preferences and behavior of these future opinion leaders would be of great value to mobile app publishers.

3.2. Measurement development

The questionnaire included demographic information and construct items. In addition, measures were adapted from previous studies (Lin, 2007; Hsu and Lin, 2008; Davis et al., 1989; Kim et al., 2007; Bhattacherjee, 2001) to develop scales for measuring constructs such as perceived value (i.e., utilitarian value and hedonic value), attitude, satisfaction, social norms and social identification, stickiness and intention in the context of mobile apps (see Appendix for the complete questionnaire). Each item was measured on a five-point Likert scale, ranging from "strongly disagree" (1) to "strongly agree" (5). Each item was translated into Chinese following Brislin's (1980) translation — back translation method. In the survey, respondents were asked to specify an app that he/she uses most frequently, and subsequently answered the rest of questionnaire with respect to the usage behaviors of that app.

Before conducting the main survey, the instrument was validated using both a pre-test and pilot. The pre-test involved 10 respondents who were experienced smartphone app users. The respondents were asked to comment on a list of items related to the constructs, including the wording of the scales, the length of the instrument, and the questionnaire format. Finally, to reduce possible ambiguity, a pilot test was administered to 50 respondents selected from a population of app users. The results of the pilot test showed acceptable reliability and validity.

Table 2
Descriptive statistics (means and S.D.).

n = 485	Means	S.D.
Hedonic value	4.10	0.55
Utilitarian value	3.83	0.70
Social norms	3.71	0.69
Social identification	3.57	0.61
Attitude	4.05	0.54
Satisfaction	3.96	0.52
Stickiness	3.73	0.65
Intention to make in-app purchases	3.14	0.88

4. Results

4.1. Descriptive statistics

Table 2 lists the means and standard deviations of the constructs. On average, the participants responded positively to the research constructs (the averages all being greater than 3). However, on average, the surveyed participants seemed to be slightly less concerned with intention to make in-app purchases, suggesting that users may have a reduced tendency to purchase in-app products and services.

4.2. Analytical strategy for model assessment

To test the proposed hypotheses, data were collected and analyzed using structural equation modeling (SEM), a second-generation multivariate technique for analyzing causal models by estimating the measurement and structural models using AMOS 21.0. We also tested the univariate normality of the collected data by skewness and kurtosis tests. The results showed that absolute skew and kurtosis values for most of variables are less than 2 (see Table 3), indicating that the data in our study are close to the univariate normality (Kline, 2005). We also assessed multivariate normality by using Mardia's method (Mardia, 1970). According to Bollen (1989), if the Mardia's coefficient is lower than $p(p+2)$ (where p is the number of observed variables), then the sample exhibits multivariate normality. In this study, the Mardia's coefficient was 191.406, which was lower than 675 (the

Table 3
Item reliability, composite reliability and average variance extracted (AVE).

Item	Skewness	Kurtosis	Item reliability	Composite reliability	AVE
HV1	−0.59	2.92	0.86	0.89	0.72
HV2	−0.44	1.66	0.84		
HV3	−0.32	0.94	0.85		
UV1	−0.52	0.45	0.84	0.88	0.71
UV2	−0.44	0.15	0.86		
UV4	−0.38	0.10	0.83		
SN1	−0.39	0.57	0.74	0.86	0.68
SN2	−0.11	−0.46	0.88		
SN3	−0.15	0.04	0.85		
SI1	−0.31	0.20	0.79	0.75	0.50
SI2	0.10	−0.19	0.74		
SI3	−0.40	0.31	0.57		
AT1	−0.42	1.59	0.76	0.87	0.70
AT2	−0.31	1.10	0.87		
AT3	−0.63	2.59	0.87		
SA1	−0.54	2.00	0.81	0.90	0.68
SA2	−0.33	1.77	0.85		
SA3	−0.16	0.43	0.79		
SA4	−0.36	1.11	0.85		
ST2	0.03	0.11	0.72	0.84	0.64
ST3	−0.23	0.02	0.86		
ST4	−0.36	0.08	0.82		
IN1	−0.26	−0.50	0.89	0.90	0.74
IN2	−0.16	−0.38	0.82		
IN4	−0.30	−0.15	0.87		

HV: Hedonic value; UV: Utilitarian value; SN: Social norms; SI: Social identification; AT: Attitude; SA: Satisfaction; ST: Stickiness; IN: Intention to make in-app purchases.

value of p(p + 2), where p = 25). Therefore, the data in our study are assumed to exhibit multivariate normality. After accounting for sample size, data normality and the characteristics of evaluation methods (Olsson et al., 2000), we then adopted the method of maximum likelihood estimation (MLE) for the analysis.

4.3. Measurement model

A confirmatory factor analysis using AMOS was conducted to test the measurement model. The initial assessment indicated that items with a factor loading less than 0.5 should be removed (Hair et al., 1992). The final instrument included 25 items, as shown in Table 3. The data indicate that the reliability of the individual items ranged from 0.57 to 0.89, exceeding the minimum acceptable value of 0.50 (Hair et al., 1992). The internal consistency of the measurement model was assessed by computing the composite reliability. Consistent with the recommendations of Fornell (1982), composite reliability of all items exceeded the benchmark of 0.60. The average variance extracted for all constructs exceeded the threshold value of 0.5 recommended by Fornell and Larcker (1981). Since the three reliability values were all above the recommended thresholds (Table 3), the scales for evaluating these constructs were deemed to exhibit adequate convergence reliability.

Table 4 indicates that the variances extracted for each construct were greater than any squared correlation among the constructs, thereby implying that the constructs are empirically distinct (Fornell and Larcker, 1981). In summary, measurement model testing, including convergent and discriminant validity measures, showed satisfactory results. In addition, as shown in Table 5, the fitness measures for the measurement models are all acceptable. Consequently, all measures taken in this study show that the model provides a good fit to the data.

To test for potential common method bias, we adopted Harman's one-factor test (Podsakoff et al., 2003) and ran an unrotated principle component factor analysis for all constructs. The results generated six factors (with an eigenvalue greater than one) with one factor accounting for 39% of covariance among the measures. The other five contributed 32% of the remaining variance, each accounting for 3%–9%. Thus, we detect no apparent common method bias.

In addition, variance inflation factors (VIFs) was used to assess the degree of multicollinearity. We conducted a regression analysis by modeling intention to purchase as the dependent variable and the other nine variables as independent variables. The VIF ranges from 1.453 to 2.891, which is below the suggested threshold of 3.3 (Diamantopoulos and Siguaw, 2006). Therefore, no significant multicollinearity problem exists with regard to our data.

4.4. Structural model

We analyzed the structural model by testing the hypothesized relationships among the various constructs. As illustrated in Fig. 3, hedonic and utilitarian values, along with satisfaction significantly influence attitude ($\beta = 0.19$, $p < 0.01$; $\beta = 0.15$, $p < 0.001$; $\beta = 0.60$, $p < 0.001$, respectively), thus supporting H1a, H2a and H5a. Together, these three paths explain 71% of the observed variance in attitude. Hedonic and utilitarian value also affect satisfaction ($\beta = 0.74$, $p < 0.001$; $\beta = 0.18$, $p < 0.001$, respectively), providing support for H1b and H2b. The model accounted for 68% of the variance in satisfaction. Attitude ($\beta = 0.29$, $p < 0.01$), satisfaction ($\beta = 0.22$, $p < 0.05$) and social identification ($\beta = 0.33$, $p < 0.001$) had significant effects on stickiness, accounting for 49% of the variance. Therefore, H4a, H5b and H6a were supported. Finally, social identification and stickiness had a significantly positive effect on intention to make in-app purchases ($\beta = 0.34$, $p < 0.001$; $\beta = 0.34$, $p < 0.001$), while satisfaction had significantly negative effect ($\beta = -0.23$, $p < 0.05$), accounting for 32% of the variance. Therefore, H4b, H6b and H7 were supported. Contrary to expectations, social norms had no significant effect on stickiness or intention to make in-app purchases. Hence, H3a and H3b were not supported. Furthermore, attitude had no direct influence on user intention to make in-app purchases, thus H5c was not supported.

To compare the effects of prior experience making in-app purchases on intention to make further in-app purchases, the sample was further categorized into potential users and actual users. Among the 485 respondents, 256 had prior experience making in-app purchases. Table 6 lists descriptive statistics and t-test test results for potential and actual users. On average, both groups responded positively to perceived attributes such as hedonic value, utilitarian value, social norms and social identification as well as attitude, satisfaction, stickiness and intention to make in-app purchases. Meanwhile, the difference between the two groups is statistically significant for all items except hedonic value, attitude and satisfaction. The average ratings for utilitarian value, social norms, social identification, stickiness and intention were significantly higher among actual users than for potential users.

Two separate structural modeling analyses were also conducted for the two groups. As shown in Fig. 4, for potential users, hedonic value, utilitarian value and satisfaction were found to influence attitude ($\beta = 0.26$, $p < 0.05$; $\beta = 0.19$, $p < 0.001$; $\beta = 0.54$, $p < 0.001$, respectively). The model accounted for 74% of the variance in attitude. Moreover, hedonic value and utilitarian value directly influenced on satisfaction ($\beta = 0.80$, $p < 0.001$; $\beta = 0.10$, $p < 0.05$, respectively). Together, these two paths accounted for 71% of the variance in satisfaction. The results show that an app's stickiness for potential users is related to the user's satisfaction ($\beta = 0.36$, $p < 0.01$) and social identification ($\beta = 0.29$, $p < 0.01$), accounting for 48% of the variance. Surprisingly, no significant path was found from positive attitude and social norms to stickiness. Finally, stickiness had a significant effect on intention to make in-app purchases ($\beta = 0.30$, $p < 0.01$), accounting for 17% of the variance. Unexpectedly, attitude, satisfaction, social norms and social identification had no direct effect on intention to make in-app purchases.

Results for actual users (Fig. 5) indicate that hedonic value and satisfaction influence attitude ($\beta = 0.18$, $p < 0.05$; $\beta = 0.66$, $p < 0.001$, respectively). The model accounted for 71% of the variance in attitude. However, utilitarian value had no direct influence on attitude. Moreover, hedonic value and utilitarian value directly influenced satisfaction ($\beta = 0.64$, $p < 0.001$; $\beta = 0.29$, $p < 0.001$; respectively). Together, these two paths accounted for 65% of the variance in satisfaction. The results

Table 5
Fit indices for the structural model.

Measures	Recommended criteria	Results	References
X^2/d.f. (p-value)	<3	2.12 (0.000)[a]	Bentler and Bonnet (1980), Hair et al. (2006), Schumacker and Lomax (2004), Seyal et al. (2002), Scott (1994), Ullman (2006)
GFI	>0.9	0.92	
AGFI	>0.9	0.89	
CFI	>0.9	0.96	
NFI	>0.8	0.93	
RMSEA	<0.08	0.04	

[a] For a larger sample size, significant p-values are expected (Hair et al. 2006).

Table 4
Discriminant validity of users.

	HV	UV	SN	SI	AT	SA	ST	IN
HV	***0.72***							
UV	0.11	***0.71***						
SN	0.11	0.23	***0.68***					
SI	0.20	0.19	0.26	***0.50***				
AT	0.39	0.18	0.20	0.24	***0.70***			
SA	0.48	0.16	0.19	0.29	0.53	***0.68***		
ST	0.26	0.09	0.11	0.24	0.31	0.31	***0.64***	
IN	0.04	0.08	0.08	0.15	0.11	0.09	0.18	***0.74***

Diagonals (in bolds and italic) represent the average variance extracted (AVE), while the other matrix entries represent the shared variance (the squared correlations).

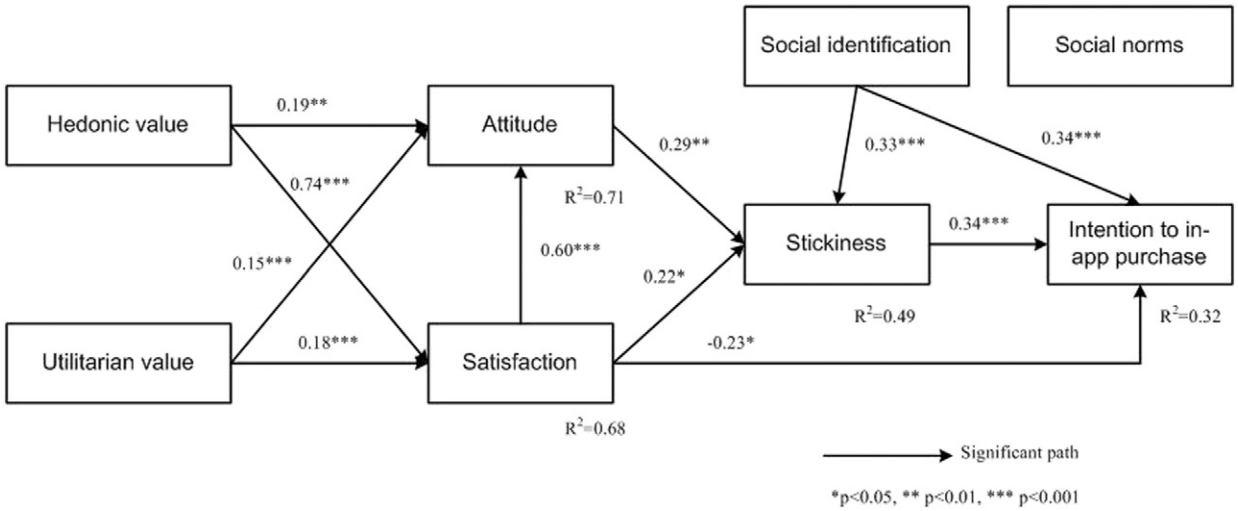

Fig. 3. Results of structural modeling analysis (n = 485).

show that attitude and social identification had a significant effect on stickiness ($\beta = 0.45$, $p < 0.001$; $\beta = 0.24$, $p < 0.05$, respectively), accounting for 54% of the variance. However, social norms and satisfaction had no direct influence on stickiness. Finally, stickiness and social identification had a significant effect on the intention to in-app purchase ($\beta = 0.22$, $p < 0.05$; $\beta = 0.28$, $p < 0.01$), accounting for 42% of the variance. However, the paths from attitude, satisfaction and social norms to intention to make in-app purchases were insignificant.

Our study also adopted the approach proposed by Keil et al. (2000) to test the significance of the coefficient differences. Table 7 lists the comparison results, which show significant differences in most path coefficients between potential and actual groups.

5. Discussion and conclusion

In-app purchases are one of the effective monetization strategies for freemium apps, and the commercial success of an app depends largely on its "stickiness" (Yaloz, 2015). This study examines the antecedents and effects of stickiness in the context of mobile in-app purchases. Findings and implications are discussed as follows.

5.1. Discussion

First, the proposed model is found to accurately predict user intention to make in-app purchases. Stickiness is found to significantly and positively influence intention, thus emphasizing that apps users are unlikely to make in-app purchases for apps which they don't find engaging. This shows that stickiness is not only important in web-based environments (Zott et al. 2000; Lin, 2007), but also is the key to increasing online transactions in the context of mobile apps. Another plausible finding is that users are willing to make purchases due to concern for social identification, which also directly impacts stickiness. Use of social- and communication-oriented apps may provide users with a sense of belonging. This perception will impact the app's perceived stickiness and the user's intention to make in-app purchases. Surprisingly, social norms are found to have no significant effect on stickiness and intention. This finding differs from theories such as TRA, TPB and TAM2 (Fishbein and Ajzen, 1975; Ajzen, 1991; Venkatesh and Davis, 2000). However, it is consistent with previous studies (Chau and Hu, 2002; Lewis et al., 2003; Hsu and Lin, 2008; Tsai and Bagozzi, 2014), which found that social norms have no significant effect on user's behavioral intention. Indeed, users may develop values and standards for their intention to use by referring to normative practices of a group or other users. However, such normative effects mostly occur in compulsory usage situations. Generally, users do not consider the approval of others when choosing to adopt an app since they generally download apps on a voluntary basis to fulfill their private needs, thus limiting the impact of social norms. In addition, users regard apps installed on their smartphones as a type of privately consumed necessity and, according to Bearden and Etzel (1982), the reference group influence for such a product and brand is relatively weak. In-app purchase behavior is largely dominated by app attributes (i.e., hedonic value and utilitarian value) rather than by the influences of others.

Though attitude has no significant influence on intention to make in-app purchases, satisfaction has a significant and negative effect on intention, apparently because users who are satisfied with a free or trial app have limited incentive to pay to upgrade. However, attitude and satisfaction appear to have significant and positive effects on stickiness. In addition, satisfaction positively impacts attitude. In summary, the model provides a conceptual depiction of the critical role played by affective factors in determining stickiness and thus increase intention to make in-app purchases.

Second, both utilitarian value and hedonic value turn out to have a significant influence on affective factors, though the hedonic value is a stronger predictor than utilitarian value ($\beta = 0.74$ and $\beta = 0.19$). This reveals that utilitarian and hedonic value dimensions play important roles in predicting affective outcomes such as satisfaction and attitude. Moreover, this study emphasizes entertainment and leisure-oriented apps, as opposed to productivity apps. While using such apps, the hedonic value is the primary driver of user affect, thus significantly decreasing the relative impact of utilitarian value.

Finally, the findings reveal that determinants influencing intention to make in-app purchases differ substantially between potential and experienced users. As depicted in Figs. 4 and 5, the potential user's

Table 6
Descriptive statistics and ANOVA.

Scale items	Potential users (n = 229)	Users (n = 256)	p-Value
Hedonic value	4.06	4.14	0.14
Utilitarian value	3.76	3.89	0.03*
Social norms	3.64	3.76	0.05*
Social identification	3.48	3.65	0.00***
Satisfaction	3.95	3.97	0.79
Attitude	4.00	4.08	0.10
Stickiness	3.59	3.84	0.00***
Intention to make in-app purchases	2.60	3.62	0.00***

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

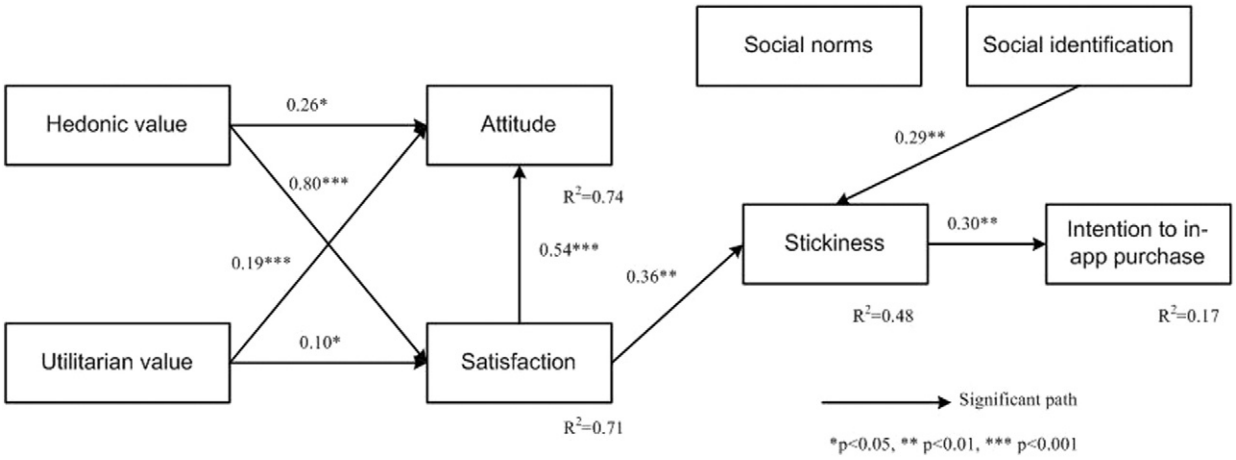

Fig. 4. Results of structural modeling analysis for potential users (n = 229).

intention is determined by stickiness alone while that of the experienced user is determined by both stickiness and social identification. Stickiness is an important factor in motivating the majority of current and potential users to make in-app purchases. We also found that social identification plays a key role in stickiness for both groups. Social identification results in a significant difference between these two groups in terms of intention to make in-app purchases (17% and 42% for potential users and experienced users, respectively).

Interestingly, the effects of affective factors on stickiness for both groups yield different results. For potential users, satisfaction directly impacts stickiness, while attitude has no significant effect on stickiness but significantly influences satisfaction. This underscores the importance of satisfaction for potential users. Satisfaction is a positive emotional state related to expectation performance discrepancy (confirmation). For potential users, the expectation is typically based on others' opinions or information disseminated through mass media. When potential users feel satisfaction (i.e. app performance exceeds expectations), they will use the apps more frequently and for longer durations, thus enhancing their intention to make in-app purchases. For experienced users, satisfaction influences attitude, but no significant relationship was found between satisfaction and stickiness. One possible explanation is that experienced users tend to have a greater subjective expectation for making future in-app purchase because of their past experience in making such in-app purchases. However, to make in-app purchases, such users may require an app to provide enduring positive feelings (i.e. improved attitude) which meet or exceed their expectations, rather than a transient emotional reaction (i.e. satisfaction). Therefore, for the experienced user, stickiness is directly influenced by positive attitude. Satisfaction influences attitude, and thus indirectly influences stickiness. For both groups, hedonic value and utilitarian value seem to play an influential role in shaping user affect. Notably, utilitarian value is found to not directly impact attitude in experienced users, but it does directly affect satisfaction. Intuitively, users have positive attitudes toward apps they found to be useful. However, the analytical results indicate that utilitarian value does not appear to drive user attitude. Instead, utilitarian value forms satisfaction, which in turn shapes user attitudes. This implies that users will have a positive attitude toward apps they perceive as providing utilitarian value.

5.2. Implications for researchers

As smartphones and mobile apps become more indispensable in our daily lives, researchers working in the fields of marketing and technology adoption need a deeper understanding of consumer behaviors in mobile platforms. The results of this study provide a better theoretical understanding of mobile app user behavior in regard to in-app purchases. Several implications are as follows: First, this study expands our comprehension of the theory of stickiness and provides empirical evidence that stickiness is a significant driver for purchase intention, even in the context of mobile app commerce. This study further

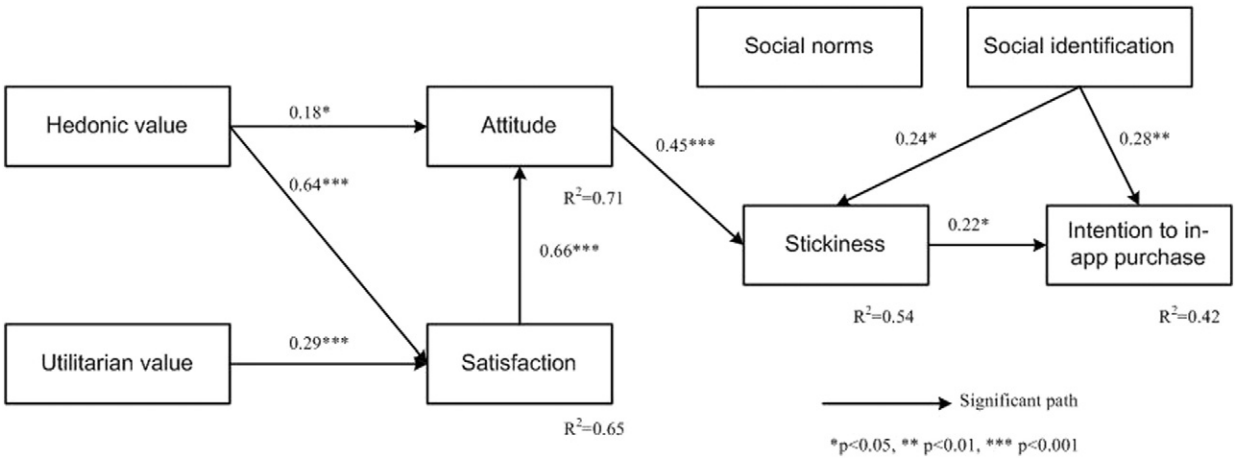

Fig. 5. Results of structural modeling analysis for actual users (n = 256).

Table 7
Coefficient differences between groups.

Path coefficients			
Hypothesis	Potential users	Actual users	Difference
H1a	0.26*	0.18*	0.08***
H1b	0.80***	0.64***	0.16***
H2a	0.19***	0.07	0.12***
H2b	0.10*	0.29***	−0.09***
H3a	−0.14	0.04	0.18***
H3b	0.08	0.10	−0.02
H4a	0.29**	0.24*	0.05***
H4b	0.18	0.28**	−0.10***
H5a	0.54***	0.66***	−0.12***
H5b	0.21	0.45***	−0.24***
H5c	0.02	0.04	−0.02
H6a	0.36**	0.14	0.22***
H6b	−0.11	0.16	−0.27***
H7	0.30**	0.22*	0.08***

* Significant at the $p < 0.05$ level.
** Significant at the $p < 0.01$ level.
*** Significant at the $p < 0.001$ level.

examines the effects of attitude and satisfaction toward stickiness and results indicate that both attitudes and satisfaction positively enhance app user's intention to continue to use a particular app.

Second, while studies on extrinsic motivation such as utilitarian value for IT/IS use have received more attention in the IS literature, our model implies that intrinsic motivation, such as hedonic value, can be an influential factor in affective response of app use. Third, given the multi-purpose characteristics (e.g. entertainment, social and sharing) of apps, social identification is also verified to be another important factor in driving in-app purchase intention. Social norms, on the other hand, do not have a significant effect on either stickiness or in-app purchase intention. This finding is in line with prior related studies which indicated that social norms have a very limited impact on voluntary-use application.

Finally, the results of this study demonstrate that past adoption experiences have different effects on mobile app usage behaviors. The findings are consistent with prior studies in various contexts (e.g. Karahanna et al., 1999; Teo and Ranganathan, 2004; Crabbe et al., 2009). Therefore, this study extends the understanding of IS adoption in the mobile context and future studies should seek to further expand our knowledge in this fast growing field.

5.3. Implications for practice

Our results appear to have important implications for app developers and publishers seeking to promote their in-app products and services. First, stickiness and social identification had been empirically confirmed to have a significant influence on users' intention to make in-app purchases. Therefore, app developers should put more emphasis on encouraging reuse and increasing the amount of time users spend on each session. Developers should also incorporate functions which allow and encourage users to share their social lives through text, pictures, images and video. This sharing behavior will attract increased feedback from peers, allowing the user to develop a strong sense of social identification through group action. This will, in turn, enhance app stickiness and intention to make in-app purchases. According to Find (2014), five of the ten most popular apps in Taiwan are social and communication apps (e.g., LINE, Facebook, WhatsApp and WeChat). Such apps help users enhance their social relationships and their self-concept within a community. This reflects the importance of social identification in increasing stickiness.

Second, this study also provides some guidelines to enhance app stickiness. Users were found to perceive utilitarian value and hedonic value to be important in their attitude toward and satisfaction with a given app. In addition, hedonic value had a more significant impact on affection than did utilitarian value. Therefore, app developers should seek to maximize hedonic motivation such as enjoyment, fun and pleasure.

Finally, potential users and actual users should be targeted using different marketing strategies. Marking to potential users should focus on stickiness, satisfaction and social identification. For current users, marketing should focus on attitude, social identification and stickiness. Perception of social identification has significant effects for both groups. This finding shows that users stick with apps because of social identification. Thus, app providers should incorporate community and forum functions to encourage users to share their social lives and opinions, and thus prompt them to use the app more frequently and for longer periods. This will, in turn, increase their intention to make in-app purchases. In addition, the results present the following implications for app developers and publishers.

1. For potential users, app developers should be aware of the importance of satisfaction. Given the abundance of similar (and similarly free) apps, satisfaction can increase stickiness and thus the user's intention to make in-app purchases. As a result, app developers should invest more effort in managing user expectations, which can be increased through mass advertisement and electronic word-of-mouth (eWOM). When a user's initial actual experience with an app (i.e., perceived hedonic value and utilitarian value) meets such increased expectations, the user will feel satisfied. Therefore, app developers should seek to drive increased expectations through early adopters and opinion leaders.
2. App developers should seek to improve the attitudes of current users to increase stickiness for that demographic. Though satisfaction was not found to have a significant effect on stickiness, satisfaction was found to have a significant effect on attitude. For users who had previously made in-app purchases, satisfaction was found to have an impact on attitude, but not stickiness. Hence, app developers should seek to improve user attitude, and thereby increase stickiness and intention to make in-app purchases.

5.4. Limitations and future research

The results of the present study need to be interpreted with caution for several reasons. First, statistical analysis provides only numerical relationships, and the results are interpreted subject to the author's subjective appraisal. However, the presented results are consistent with established theories and other studies, thus enhancing confidence in the findings. Second, respondents were current mobile app users, thus introducing potential self-selection bias. Third, the level of analysis is a limiting factor. Since this study was based on the ABC Model of attitudes, using perceived value and social influences as additional antecedents of the behavioral intention to make in-app purchases, it is impossible to generalize the findings to other IT/IS purchase behavior. Conceivably, intention to make in-app purchases may be subject to additional factors such as personality and price. Moreover, the subjects were app users in Taiwan and many of them were young and well-educated mobile users. Culture and lifestyles may differ among countries. Future research may investigate the influence of these additional variables to produce a better understanding of in-app purchase behavior.

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Appendix A. List of items by construct

A.1. Hedonic value

1. Using the app is fun for me.*
2. Using the app gives me pleasure*
3. I enjoy using the app.*

A.2. Utilitarian value

1. Using the app enables me to accomplish work, learning, communication and transactions more quickly.*
2. Using the app enables me to accomplish work, learning, communication and transactions more effectively.*
3. Using the app enhances my effectiveness in work, learning, communication and transactions.
4. Using the app improves the quality my work, learning, communication and transactions.*

A.3. Social norms

1. People who are important to me would approve of me using the app.*
2. People who are important to me think that I should use the app.*
3. People who influence my behavior encourage me to use the app.*

A.4. Social identification

1. Using the app would enhance my chance to meet people with whom I share common interests.*
2. I am proud to be a member of this app community.*
3. Using the app gives me a strong feeling of belonging to a group.*
4. This app is a communication channel, allowing users to maintain close ties and share information.

A.5. Attitude

1. My attitude toward using the app is favorable.*
2. I like using the app.*
3. I feel good about using the app.*

A.6. Satisfaction

1. Using the app makes me feel very satisfied.*
2. Using the app gives me a sense of enjoyment.*
3. Using the app makes me feel very contented.*
4. Using the app makes me feel very delighted.*

A.7. Stickiness

1. I would stay longer on this app than other apps.
2. I intend to spend more time on this app.*
3. I use this app as often as I can.*
4. I use this app every time I am online.*

A.8. Intention to make in-app purchases

1. I intend to continue purchasing in-app products and services.*
2. I strongly recommend others to purchase in-app products and services.*
3. I find purchasing in-app products and services to be worthwhile.
4. I will frequently purchase in-app products and services in the future.*

* Denotes items retained for data analysis.

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Chin-Lung Hsu is an associate professor of Information Management at National Taipei University of Business, Taipei, Taiwan. He received MBA and Ph.D. degrees from National Taiwan University of Science and Technology, Taipei, Taiwan, in 1999 and 2004, respectively. Dr. Hsu's articles have appeared in *Computers in Human Behavior*, *Information & Management*, *Omega*, *Internet Research*, *Electronic Commerce Research and Applications*, *Information Systems and e-Business Management*, *International Journal of Mobile Communications*, *International Journal of Computer Application in Technology*, *International Journal of Technology and Human Interaction*, *International Journal of Mobile Human Computer Interaction*, and *Information Management & Computer Security*. His research interests include electronic commerce and Internet marketing.

Judy Chuan-Chuan Lin is a professor of Computer Science and Information Management at Soochow University, Taipei Taiwan. She received the BSEE from Columbia University, New York; the MS from Polytechnic School of Engineering at New York University, New York; the PhD in MIS from National Taiwan University of Science and Technology. Her papers have appeared in *Information and Management*, *International Journal of Information Management*,

Behaviour and Information Technology, *Electronic Commerce Research and Applications*, *Information Systems and e-Business Management*, *Online Information Review*, *Journal of Information Science*, *Internet Research*, *International Journal of Mobile Communications*, *International Journal of Mobile Human Computer Interaction*, *International Journal of Technology and Human Interaction*, and various international conference proceedings and journals. Her research interests include internet marketing as well as electronic commerce and innovation adoption.