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Understanding Online Community Participation: A Technology Acceptance Perspective

Hua Wang[1], Jae Eun Chung[2], Namkee Park[3], Margaret L. McLaughlin[4], and Janet Fulk[4]

Abstract

Online community participation has not been well understood from the perspective of technology adoption and use. Using a national sample of 537 online community participants in the United States and structural equation modeling, this study demonstrates that the technology acceptance model (TAM) can provide a useful foundation for theoretical explanation. By empirically testing the original TAM and comparing it with an alternative model, our results confirmed that perceived usefulness (PU) outweighs perceived ease of use (PEOU) in explaining actual use. Our final model further suggested a feedback loop between PU and PEOU, which significantly improved the model fit at both global and local levels. In addition, three exogenous variables (i.e., Internet self-efficacy, community environment, and intrinsic motivation) were proposed and validated. These findings have clear implications for the structure of the TAM as well as for its usefulness for the newly burgeoning practice of online community participation.

Keywords

online community, participation, technology acceptance model

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This study attempts to understand the social psychological processes of an increasingly prevalent phenomenon in communication and technology—participation in online communities. Online communities have been around almost since the dawn of the Internet (Rheingold, 1993; Smith & Kollock, 1999). With the rise of social media in recent years, participating in online communities has become an increasingly popular practice among Internet users. Katz and Aspden's (1997) national survey suggested that Americans are enthusiastic about participating in online communities, with 31% of experienced Internet users and 17% of new users attending activities on multiple sites. In 2001, fully 90 million users in the United States had contacted an online group and 79% of them remained in contact with at least one of them, rendering communities on the Internet as a "virtual third place" for bonding local relationships and bridging global ties (Horrigan, Rainie, & Fox, 2001). From 2004 to 2007, the number of online community members doubled; they reported feeling as strongly about communities online as those in the real world. Many also indicated that they participated in new social causes because of their involvement in online communities (Center for the Digital Future, 2008).

Prior research on online communities has focused on the design and affordances of new technologies as well as the social and cultural dynamics in these spaces, but not the critical decision making of adoption and use of the technosocial systems. Much of the earlier work was devoted to defining online communities and their functionality (e.g., Oldenberg, 1989; Wellman, 2001; Wenger, McDermott, & Snyder, 2002). Discussions were mainly about the social affordances of these new technological platforms (Mynatt, O'Day, Adler, & Ito, 1998; Ruhleder, 2002). Research on online community participation has focused on the design and evaluation perspective (Kim, 2000; Preece, 2001; Shneiderman, 2002), strategies for attracting specific user groups such as newcomers (e.g., Ren, Kraut, & Kiesler, 2007), and particular types of participation such as content contribution as opposed to lurking (e.g., Bishop, 2007; Tedjamulia, Dean, Olsen, & Albrecht, 2005). Many scholars have also been interested in exploring the dynamics related to social capital, social norms, and cultural identities in online communities (Donath, 1998; Ellison, Steinfield, & Lampe, 2007; Galston, 1999; Lessig, 1999; Nardi & Kallinikos, 2009; Resnick, 2001).

However, besides how to build successful online communities and what is happening there, little research has been done to understand why Internet users decide to become a member and participate in online communities. All online communities require a technological infrastructure with tools and applications to enable user interaction and communication. Adoption and use of new technologies are thus an inherent form of participation in these spaces. The technology acceptance model (TAM) is a prominent theoretical model in the field of information systems, but it has received much less attention and appreciation in communication research. In this article, we demonstrate that the TAM can provide a useful theoretical foundation for explaining online community participation. Using a national sample of 537 online community participants in the United States and structural equation modeling, the goal of this article is twofold. First, we sought to evaluate the original TAM in the context of online community participation. Within this realm, we also sought as a subgoal to address an unresolved issue in TAM: the relationship of perceived ease of use (PEOU) relative to perceived usefulness, an issue we describe in more detail in later sections. Second,

we sought to introduce and validate three important exogenous variables that are likely to be particularly relevant to participation in online communities: Internet self-efficacy, community environment, and intrinsic motivation. These exogenous variables help to frame a TAM model that is more tailored to online community participation. To pursue these two goals we proposed a conceptual model and an alternative model, and examined constructive modifications that were suggested by the data and are consistent with the theoretical framework of the TAM in the context of online community participation. The next section lays out the conceptual models, and subsequent sections detail descriptions of analyses, results, model modification, and comparisons. The final section addresses theoretical and methodological considerations.

TAM as a Theoretical Foundation

Davis (1986) proposed the TAM to understand the psychological processes of information technology adoption and acceptance based on the theory of reasoned action (Fishbein & Ajzen, 1975) and the theory of planned behavior (Ajzen, 1991; Ajzen & Fishbein, 1980). The development of this model was largely situated in the context of diffusion of information systems in organizations (Bagozzi, 2007; Davis, Bagozzi, & Warshaw, 1989). Over the last two decades, the TAM has established a theoretical paradigm of its own (Bagozzi, 2007; Lee, Kozar, & Larsen, 2003; Ma & Liu, 2004; Yousafzai et al., 2007a), undergone multiple waves of modification (e.g., Brown & Venkatesh, 2005; Venkatesh, 2000; Venkatesh & Bala, 2008; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003), and been extensively tested in areas about the adoption and use of new technologies such as personal computers and software applications (e.g., Venkatesh & Brown, 2001) and increasingly web-based applications such as e-commerce (e.g., Lallmahamood, 2007), e-banking (e.g., Rigopoulos & Askounis, 2007), e-learning (e.g., Park, Lee, & Cheong, 2007), e-health (e.g., Lanseng & Andreassen, 2007), and e-government (e.g., Wangpipatwong, Chutimaskul, & Papasratorn, 2008). Overall, the TAM has been proved a parsimonious and robust theoretical framework that has withstood testing across individuals, settings, and cultures, as well as time periods (Bagozzi, 2007; Lee et al., 2003; Yousafzai et al., 2007a) and outperformed its theoretical antecedents in explaining and predicting technology acceptance (e.g., Davis et al., 1989; Venkatesh et al., 2003).

Model Specification

Testing the Original TAM

The TAM takes a social psychological approach to understanding technology acceptance by end users through two internal belief determinants: *Perceived usefulness* (PU) is defined as the degree to which a user perceives that the use of a technological platform helps accomplish his/her personal goals; and *PEOU* is defined as the degree to which a user perceives that the use of a new technology is free of effort (Davis, 1986; Venkatesh & Davis, 2000). Over the years, researchers have proposed more than 70 exogenous variables for PU and

PEOU (Lee et al., 2003; Yousafzai et al., 2007a). Venkatesh et al. (2003) attempted to synthesize eight technology adoption-related theories and developed an integrated model in the unified theory of acceptance and use of technology (UTAUT). In TAM3, Venkatesh and Bala (2008) recategorized 12 exogenous variables but returned to the core of the original TAM with PU and PEOU predicting technology acceptance. Although both models are comprehensive with added explanatory power through predictors from other theories, critics say that these models have left researchers with more than 40 exogenous variables, some of which are conceptually similar (Bagozzi, 2007); the moderators introduced to these models are largely demographic which creates challenges to theoretical insight and interpretation of interaction effects (Park, 2010). In addition, most of the exogenous variables are derived from the business and organizational context and may not be applicable to other settings (Yousafzai et al., 2007a). Therefore, to keep the theoretical parsimony and adaptability and in keeping with nonbusiness context, this study tested the original TAM and proposed to validate three exogenous variables that are likely to be most pertinent to online community participation.

In the original model, PU and PEOU, both determined by exogenous variables that can be specified by study contexts, positively predict people's attitude toward using a new technology; this attitude then predicts their behavioral intention, which in turn predicts their actual use of the technology (Davis, 1986). An initial testing of the TAM found that PU, together with PEOU, accounted for about half of the variance in end-user intentions of using a new computer program in a longitudinal study, although attitude had limited mediating effects (Davis et al., 1989). Davis (1989) also reported that both PU and PEOU were significantly correlated with the actual technology use. However, PU demonstrated much greater predictive power than PEOU in both studies, leading the authors to postulate the possibility of PEOU as a causal antecedent of PU rather than a parallel, direct determinant of actual use (Davis, 1989; Davis et al., 1989). Therefore, the only validated links were from PEOU to PU and from PU to technology acceptance. In subsequent years, studies using different versions of the model, sampling strategies, and research methods have yielded inconsistent findings (Lee et al., 2003).

Meta-analyses suggest that since the validation of the links among PU, PEOU, and technology acceptance in Davis et al. (1989), the empirical testing of the TAM has mainly focused on the relative weight of PU and PEOU in affecting technology acceptance and the effects of specific exogenous variables on these endogenous variables (Yousafzai et al., 2007a). Technology acceptance is either tested in the form of behavioral intention or actual use; attitude as a mediator is largely omitted given its lack of validation early on (Ma & Liu, 2004; Yousafzai et al., 2007a, 2007b). Overall, empirical evidence from the TAM research tends to privilege the importance of PU over PEOU and supports the postulate that PU is a full mediator between PEOU and technology acceptance (Yousafzai et al., 2007a) although this dispute remains uncertain in the context of online community participation. Therefore, the following research hypotheses are proposed to test the originally validated TAM in a conceptual model (Figure 1):

Hypothesis 1: PEOU will be positively associated with perceived usefulness among online community participants.

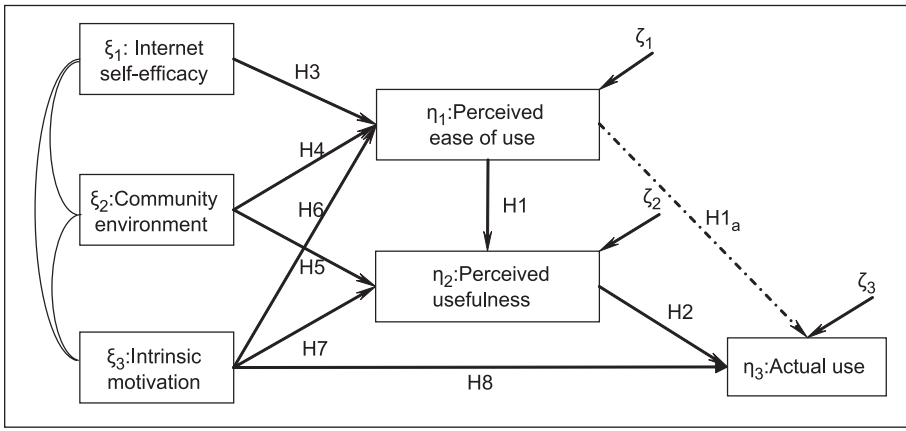

Figure 1. The conceptual and alternative model: TAM of online community participation introducing and testing exogenous variables

Hypothesis 2: Perceived usefulness will be positively associated with the actual use/participation among online community participants.

To test the dispute regarding the role of PEOU relative to PU, a direct link from PEOU to actual use is added in an alternative model (Figure 1):

Hypothesis 1a: PEOU will be positively associated with the actual use/participation among online community participants.

The original TAM posits that other variables pertinent to the specific kind of technology acceptance can affect actual use either directly or indirectly through the mediation of PEOU and PU. A larger number of variables have been proposed in TAM research and some are tested more often than others (Lee et al., 2003; Yousafzai et al., 2007a). Given that the model was developed and most frequently tested in organizational settings, some exogenous variables such as job relevance and output quality may not apply to online community participation. Three important exogenous variables were identified in the current study based on their theoretical foundation, contextual relevance, and empirical support: Internet self-efficacy, community environment, and intrinsic motivation.

Internet self-efficacy. Social cognitive theory (Bandura, 1977, 2001) adopts an agentic view of human action and is one of the most commonly used theories in social psychology and communication behavior. Its core concept is self-efficacy, an individual's perceived ability to carry out a certain action (Bandura, 2001). Presumably, the higher the self-efficacy, the more likely an individual is to perceive a task as effortless. All online communities operate through computer software and web-based applications. Although some TAM scholars use computer self-efficacy as one of the determinants of PEOU (e.g., Venkatesh et al., 2003), Internet self-efficacy (Eastin & LaRose, 2000) is more appropriate for this study as most online

community members are already computer savvy (Center for the Digital Future, 2008) and their participation involves web-based applications and mediated human interactions. In this study, Internet self-efficacy is defined as an online community member's perception of his or her ability to use the Internet and web-based tools to participate in various community activities. Previous studies have found Internet self-efficacy to be a significant predictor of PEOU in the context of e-learning (Roca, Chiu, & Martínez, 2006) and VoIP phone service (Park, 2010). Therefore, the following research hypothesis is proposed:

Hypothesis 3: Internet self-efficacy will positively predict PEOU among online community participants.

Community environment. Successful online communities often have a large number of members who have shared goals and their activities are supported by computer software and governed by established protocols (Preece, 2001). Therefore, an online community is essentially an information technology-enabled social and communicative space. It is a vivid example of the "new social operating system" constituted by intertwining technological and social networks (Rainie & Wellman, in press). Community environment is defined in this study as the information and technology systems as well as their users in the context of online community. Good technological infrastructure and services increase the likelihood of adoption and usage and enhance user experiences with a technology (DeLone & McLean, 1992). Perceived quality of system characteristics, services, and shared information has been proved to be a significant predictor of PU and PEOU (Lee et al., 2003; Park, 2010; Venkatesh et al., 2003; Yousafzai et al., 2007a). Furthermore, an online community not only involves the technology and human interface, but other users and the social climate they collectively create as well. The more friendly an individual perceives the community environment is, the more likely he or she will be to perceive being part of the online community as easy and useful (Galston, 1999; Kim, 2000). Therefore, the following hypotheses are proposed:

Hypothesis 4: Community environment will positively predict PEOU among online community participants.

Hypothesis 5: Community environment will positively predict perceived usefulness among online community participants.

Intrinsic motivation. A new technology cannot be simply taken as a given. An individual's adoption process is largely a goal-driven activity (e.g., Bagozzi, 2007; Park, 2010). The theory of uses and gratifications posits that individual media users make deliberate selection and consumption choices to accomplish their personal goals (Blumler & Katz, 1974; Palmgreen, 1984; Rubin, 1986). In this study, intrinsic motivation is defined as the motivation that is internal to online community members rather than that provided by external reward. Although both intrinsic and extrinsic motivation have been proposed and tested in TAM research

(e.g., Venkatsh & Bala, 2008; Venkatesh et al., 2003), intrinsic motivation is more pertinent to the context of online community participation as individual users' behavior is largely voluntary and without external incentives. Research has shown that community members choose to get involved for reasons such as information acquisition and exchange, relational development and maintenance, social and emotional support, and entertainment (Grace-Farfaglia, Dekkers, Sundararajan, Peters, & Park, 2006; Ishii, 2008; Ridings & Gefen, 2004; Sangwan, 2005; Wang & Fesenmaier, 2003; Wasko & Faraj, 2000). Therefore, the higher the intrinsic motivation, the more likely an individual is to perceive being part of an online community as free of effort and goal fulfilling and to actually spend time there. Including intrinsic motivation in the TAM should significantly improve the theoretical model (Park, 2010). Empirical support has appeared in both early TAM research (Davis et al., 1992; Vankatesh, Speier, & Morris, 2002) as well as more recent communication studies (Kim, Na, & Ryu, 2007; Park, 2010; Park et al., 2007). Therefore, the following hypotheses are proposed:

Hypothesis 6: Intrinsic motivation will positively predict PEOU among online community participants.

Hypothesis 7: Intrinsic motivation will positively predict perceived usefulness among online community participants.

Hypothesis 8: Intrinsic motivation will positively predict actual use/participation among online community participants.

Method

Participants

Participants in this study were recruited through an online panel administered by the Media Research Lab at the University of Texas at Austin. The panel is an opt-in, privacy-protected participant pool, using a random selection sampling strategy for web-based academic research (T. Daugherty, personal communication, March 27, 2008; Daugherty, Lee, Kim, & Outhavong, 2005). A total of 989 Internet users across the United States took part in the study via an online survey, including 537 online community participants who constituted the final sample in this article.[1] Sample characteristics were as follows: 37.7% male and 62.3% female; 81.4% White, 3.4% African American, 7.0% Hispanic or Latino, 5.3% Asian and Pacific Islander, 0.9% Native American, and 1.9% Other. With respect to education, 61.8% held a 4-year college degree, graduate studies or above; 24.6% had some college, 12.7% were high school graduates or with training at vocational or trade school, and 0.9% had less than a high school education. Household incomes were variable, with 15.2% reporting their combined household annual income as less than US$29,999, 19.0% between US$30,000 and US$49,999, 36.2% between US$50,000 and US$99,999, and 29.6% earned US$100,000 or more. Respondents' ages ranged from 19 to 82 with an average age of 42.42

(*SD* = 12.78). The respondents in our sample were somewhat more likely to be women, older, better educated, wealthier, and more ethnically diverse than online community members identified in a U.S. national survey around the same time (*n* = 237; Center for the Digital Future, 2009).

Procedure

Data for this study were collected through an online survey in June and July of 2008. A web-based questionnaire was administered via Qualtrics.com. Panelists of the Media Research Lab were notified about the study in an email announcement with a hyperlink to directly access the survey and participate online. All participants were offered an incentive of eligibility for a US$500 cash prize drawing. To ensure the anonymity of survey respondents, the drawing was administered by the Media Research Lab as an independent third-party in this research project.

Measurement

As many established TAM measures were developed for organizational settings, a series of scales were customized for this study. The concepts were adapted to the online community context and items were developed, reviewed, and revised by the authors for relevance to each variable's conceptual domain (DeVellis, 2003). After several rounds of discussion and revision, the items were pilot-tested in April, 2008 with a sample of undergraduate students enrolled in a communication course at a major West coast university. Some items were revised after the reliability check in the pilot sample. The final measures of the constructs are reported in Table 1 with factor loadings and Cronbach's α, two of the most frequently used tests for checking construct validity and reliability (Straub, 1989). Although a few item loadings were marginal, they all met the commonly used .40 minimum level and the Cronbach's α were all well above the .70 threshold (Gefen, Straub, & Boudreau, 2000; Nunnally, 1978).

Perceived ease of use (PEOU). A 5-point Likert-type scale was used to measure PEOU and all respondents were asked to indicate how much they would agree or disagree with three statements: "It is easy to participate in an online community," "Finding my way around online community sites is not difficult," and "It is simple to navigate online community websites" (*M* = 4.34, *SD* = .72).

Perceived usefulness (PU). A 5-point Likert-type scale was also used to measure PU and all respondents were asked to indicate how much they would agree or disagree with six statements: Online communities are useful for "information acquisition," "information exchange," "relationship development," "relationship maintenance," "social and emotional support," and "entertainment" (*M* = 3.92, *SD* = .65).

Actual use. This construct was measured through self-reported time spent in online communities: "Approximately how many hours of your time do you spend in the online

Table 1. Factor Loadings and Reliabilities

Constructs	Items	Loadings	Cronbach's α	Constructs	Items	Loadings	Cronbach's α
Perceived ease of use (PEOU)	PEOU1	.75	.90	Community environment (EVN)	EVN1	.71	.88
	PEOU2	.80			EVN2	.64	
	PEOU3	.84			EVN3	.70	
Perceived usefulness (PU)	PU1	.41	.77		EVN4	.68	
	PU2	.45			EVN5	.66	
	PU3	.66			EVN6	.71	
	PU4	.58		Intrinsic motivation (MOT)	MOT2	.72	.91
	PU5	.63			MOT3	.70	
	PU6	.40			MOT4	.73	
Internet self-efficacy (NetEff)	NetEff2	.65	.86		MOT5	.72	
	NetEff4	.67			MOT6	.65	
	NetEff6	.59			MOT7	.76	
	NetEff7	.60			MOT8	.56	
	NetEff8	.73			MOY9	.70	
	NetEff9	.59			MOT10	.64	
	NetEff10	.66			MOT11	.62	

community site or sites in a typical week?" The responses ranged from 0.40 to 40.0 hours per week ($M = 6.57$, $SD = 8.06$).[2]

Internet self-efficacy. This construct was measured using an established scale from Hsu and Chiu (2003) which also applies to online community participation. Survey respondents were asked to use a 5-point Likert-type scale to indicate how much they would agree or disagree with a set of statements such as: I feel confident "posting messages in a Web bulletin board," and "chatting on the World Wide Web" ($M = 4.45$, $SD = .70$).

Community environment. A 5-point Likert-type scale was used to measure perceived quality of both online community web sites and their users. All respondents were asked to indicate how much they would agree or disagree with six statements: "online community sites generally function well," "online community sites are well-designed," "the overall quality of online community sites is high," "people on online community sites are usually very nice," "I meet nice people through online community sites," and "I usually like the people I meet through online community sites." Exploratory factor analysis and the scree plot suggested a unidimensional scale ($M = 3.74$, $SD = .69$).

Intrinsic motivation. The measurement of this construct was developed based on previous research on motivations in online communities (Ardichvili, Page, & Wentling, 2003; Ridings & Gefen, 2004; Sangwan, 2005; Wang & Fesenmaier, 2003). A set of 12 statements was developed based on previous research (see Table 2). Exploratory factor analysis

Table 2. Measurement of Intrinsic Motivation for Online Community Participation

Using a 5-point scale where 1 means not true at all and 5 means very much true, please indicate how you would rate the following statements about various reasons why you participate in online communities.
I visit an online community site or sites because . . .
1. I can get information I need.
2. I can share my knowledge with others.
3. I can exchange ideas with other people.
4. I can talk with people with similar interests and values.
5. I can find others like me.
6. I can keep up with friends and families.
7. People there are very supportive of each other.
8. People there are willing to share their personal experiences with others who are dealing with a similar problem.
9. I can express my emotions and feelings.
10. It makes me feel relaxed.
11. It is fun.
12. It helps kill time.

suggested items related to entertainment may have higher loadings on a second factor but the scree plot indicated a predominantly single-factor scale. To accomplish higher reliability of measurement, a unidimensional scale of 10 items (removing the first and the last item) was used to measure intrinsic motivation in our final analysis ($M = 3.85$, $SD = .78$).

Data Analysis

The data were analyzed using structural equation modeling (SEM) in LISREL 8.80 (Bollen, 1989; Byrne, 1998; Jöreskog & Sörbom, 1996; Wheaton, Muthen, Alwin, & Summers, 1977). SEM allows researchers to simultaneously test a set of interrelated hypotheses by estimating the relationships between multiple independent and dependent variables in a structural model, rather than analyzing the linkage only at one level at a time (Byrne, 1998; Gefen et al., 2000). There are two approaches to SEM: Partial-least-squares-based SEM (i.e., PLS) employs principle component estimation method to maximize variance explained and is better suited for predictive applications and theory building while covariance-based SEM (e.g., LISREL, AMOS, and EQS) employs maximum likelihood estimation method to test the a priori-specified model against population parameters derived from the sample and is better suited for confirmatory research and model comparison (Gefen et al., 2000; Ping, 2009). Both PLS and LISREL have been used in TAM publications in the field of information systems and there is no substantial difference between the two methods in the results (Gefen et al., 2000). Given that LISREL is more commonly used for theory testing in communication research that fits our objectives, it was chosen to be the confirmatory analytical technique in this study.

Table 3. Zero-Order Bivariate Correlations ($N = 537$)

Variable	1	2	3	4	5	6
1. Perceived ease of use	—					
2. Perceived usefulness	.34**	—				
3. Actual use	.18**	.27**	—			
4. Internet self-efficacy	.37**	.24**	.05	—		
5. Community environment	.46**	.60**	.21**	.17**	—	
6. Intrinsic motivation	.46**	.62**	.30**	.28**	.70**	—

Note: **$p < .01$, two-tailed.

The proposed conceptual models and hypotheses were tested through four methods: (a) At the global level, overall goodness of fit tests were conducted and assessed with a nonsignificant χ^2 goodness-of-fit statistic, χ^2/df ratios of less than 5, root mean square error of approximation (RMSEA) less than .05, and adjusted goodness of fit index (AGFI) close to 1, and expected cross-validation index (ECVI) ideally lower than the ECVI for both the saturated model and independence model; (b) At the local level, the statistical significance of each link was assessed based on t values. The critical values of t are ±1.96 at the .05 alpha level and ±2.58 at the .01 alpha level, 2-tailed test; (c) The model was modified by adding paths based on their modification indices and theoretical reasoning (Byrne, 1998); and (d) Comparative tests were conducted between the originally proposed conceptual model and the alternative model, and between the originally proposed conceptual model and modified model using chi-square difference tests.

Results

Preliminary Analysis

The bivariate correlations[3] between the variables ranged from .05 to .62 (Table 3). All correlations were significant at the .01 level except for the correlation between Internet self-efficacy and actual use.

Model Testing

The chi-square test was close to nonsignificant ($\chi^2 = 9.73$, $p = .045$); the χ^2/df ratio was 2.43 (9.73/4), which was much lower than the standard criterion of 5 or less; RMSEA was 0.05; AGFI was 0.97—all indicating an overall good model fit. The ECVI was 0.082, much lower than the independent model (2.34), but very close to the saturated model (0.079), suggesting that the proposed conceptual model is significantly better than the null model, but still has room for further improvement. The goodness of fit statistics are included in Table 4 for model comparisons.

Table 4. Model Comparison and Chi-Square Difference Tests

	Conceptual model	Alternative model	Final model
χ^2(*p*-value)	9.73 ($p = .045$)	8.87 ($p = .03$)	4.22 ($p = .24$)
χ^2/df	2.43 (9.73/4)	2.96 (8.87/3)	1.41 (4.22/3)
RMSEA	0.05	0.06	0.03
AGFI	0.97	0.96	0.98
ECVI	0.082	0.084	0.075
ECVI (saturated)	0.079	0.079	0.079
ECVI (independent)	2.340	2.340	2.340

	χ^2	*df*		χ^2	*df*
Conceptual	9.73	4	Conceptual	9.73	4
Alternative	8.87	3	Final	4.22	3
	$\chi_d^2 = 0.86$	$df_d = 1$		$\chi_d^2 = 5.51$	$df_d = 1$

Decision rule: $\chi_1^2(\alpha = .05) \geq 3.84$

Hypothesis Testing

Hypothesis 1 was not supported: PEOU did not significantly predict PU ($\beta = .01$, $t = 0.30$). However, the rest of the hypotheses were all supported by statistically significant results. As postulated in Hypothesis 2, PU positively predicted actual use ($\beta = .14$, $t = 2.70$). As postulated in Hypothesis 3, Internet self-efficacy positively predicted PEOU ($\gamma = .28$, $t = 7.41$). As postulated in Hypothesis 4 and Hypothesis 5, perceived community environment positively predicted both PEOU ($\gamma = .29$, $t = 5.87$) and PU ($\gamma = .32$, $t = 7.03$). As postulated in Hypothesis 6 through Hypothesis 8, intrinsic motivation positively predicted PEOU ($\gamma = .17$, $t = 3.36$), PU ($\gamma = .39$, $t = 8.48$), and actual use ($\gamma = .21$, $t = 3.96$; Figure 2).

Model Modification

The LISREL modification indices suggested that adding a feedback loop from PU to PEOU would improve the model fit. To date, TAM studies have not investigated feedback effects between these two variables. The modification index suggested that the feedback link would have a negative sign. This feedback loop makes sense theoretically under the assumption that the contrasting signs represent an equilibrating effect between the two variables. Given the mixed results for whether there is a mediating effect, the feedback link suggests an interesting alternative to the recursive specifications of prior models.

The chi-square test for the modified model was nonsignificant ($\chi^2 = 4.22$, $p = .24$); the χ^2/df ratio was 1.41 (4.22/3) which was even lower than 2.43; RMSEA was 0.03; AGFI was 0.98; the ECVI was 0.075, not only much lower than the independent model (2.34), but also lower than the saturated model (0.079) this time, suggesting a great improvement of overall model fit for the conceptual model at the global level. The goodness of fit

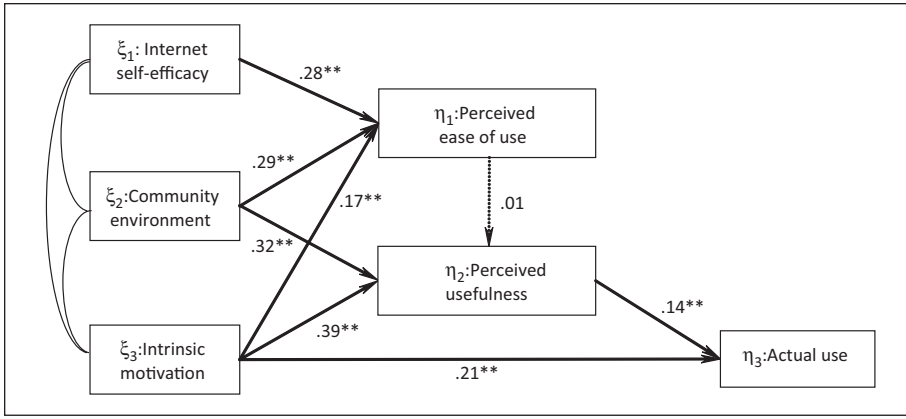

Figure 2. Results of hypotheses testing for the conceptual model

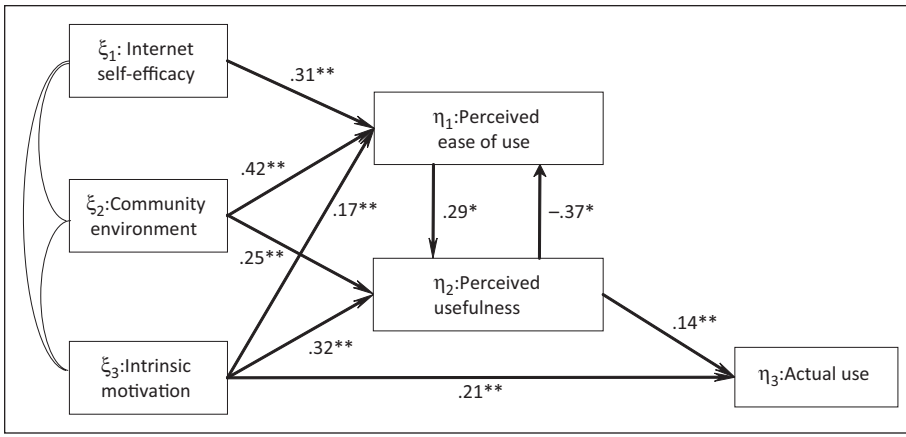

Figure 3. Results for the final conceptual model

statistics are included in Table 4 for model comparisons. The stability index was 0.159, which was much lower than the threshold value of 1, indicating the non-recursive feedback loop within the structural equation model was quite stable.

At the local level, estimation of all individual paths became significant, including the link from PEOU to PU as well as from PU back to PEOU (Figure 3). More specifically, PEOU positively predicted PU ($\beta = .29$, $t = 2.23$), but PU negatively predicted PEOU ($\beta = -.37$, $t = -2.25$). In addition, other links still held significant: PU positively predicted actual use ($\beta = .14$, $t = 2.70$); Internet self-efficacy positively predicted PEOU ($\gamma = .31$, $t = 7.41$); community environment positively predicted both PEOU ($\gamma = .42$, $t = 5.49$) and PU ($\gamma = .25$, $t = 4.22$); intrinsic motivation positively predicted PEOU ($\gamma = .31$, $t = 3.81$), PU ($\gamma = .32$, $t = 5.49$), and actual use ($\gamma = .21$, $t = 3.96$).

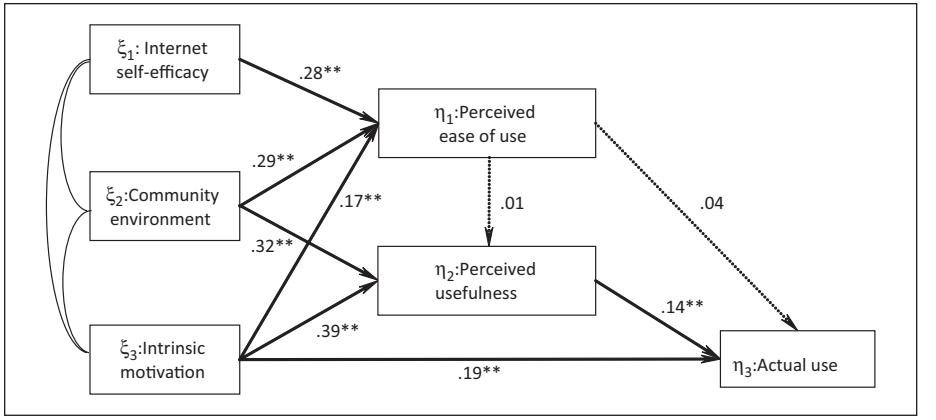

Figure 4. Results for the alternative model

Model Comparisons

The first comparative analysis was conducted between the conceptual model and the alternative model with an additional link from PEOU to actual use. The fit statistics for the alternative model were as follows: The chi-square test was significant ($\chi^2 = 8.87$, $p = .03$); the χ^2/df ratio was 2.96 (8.87/3) which was slightly higher than 2.43; RMSEA was 0.06; AGFI was 0.96—all indicating a decline in overall model fit. The ECVI was 0.084, still much lower than the independent model (2.34), but higher than the saturated model (0.079), suggesting that the alternative model is significantly better than the null model, but not better than the saturated model. The goodness of fit statistics are included in Table 4 for model comparisons.

Estimation of the alternative model yielded two non-significant results. PEOU did not significantly predict PU ($\beta = .01$, $t = 0.30$) and PEOU did not significantly predict actual use ($\beta = .04$, $t = 0.92$). Nonetheless, other links still held significant: PU positively predicted actual use ($\beta = .14$, $t = 2.62$); Internet self-efficacy positively predicted PEOU ($\gamma = .28$, $t = 7.41$); community environment positively predicted both PEOU ($\gamma = .29$, $t = 5.87$) and PU ($\gamma = .32$, $t = 7.03$); intrinsic motivation positively predicted PEOU ($\gamma = .17$, $t = 3.36$), PU ($\gamma = .39$, $t = 8.48$), and actual use ($\gamma = .19$, $t = 3.43$; see Figure 4).

Results of a chi-square difference test suggested that there was no statistical difference between the conceptual model and the alternative model, yet the conceptual model rendered better than the alternative model in terms of the goodness of fit statistics. However, the chi-square difference test between the conceptual model and the modified model indicated that adding a feedback loop from PU to PEOU significantly improved the model (see Table 4).

Taken together, the modified model turned out to be the best fit with observed data at both the global and local levels among all the three models. Table 5 presents the direct, indirect, and total effects of the modified model. Among the total effects of exogenous variables on endogenous variables, intrinsic motivation had the highest total effects on PU,

Table 5. Direct, Indirect, and Total Effects

	Effects on								
	Perceived ease of use			Perceived usefulness			Actual use		
Variables	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
Internet self-efficacy	0.28	—	0.28	—	0.08	0.08	—	0.01	0.01
Community environment	0.41	–0.12	0.29	0.25	0.08	0.33	—	0.05	0.05
Intrinsic motivation	0.31	–0.14	0.17	0.32	0.05	0.37	0.21	0.05	0.26
Perceived ease of use	—	—	—	0.29	–0.03	0.26	—	0.04	0.04
Perceived usefulness	–0.38	0.04	–0.34	—	—	—	0.14	–0.01	0.13
Actual use	—	—	—	—	—	—	—	—	—

followed by community environment on PU, and Internet self-efficacy on PEOU. Effects of endogenous variables on other endogenous variables were relatively low given the feedback loop.

Discussion

This study had two purposes. The first was to illustrate the applicability of the TAM model to the communication field and in particular to the burgeoning trend of participation in online communities. Within this goal was the subgoal to further investigate the relationship of PEOU to PU in the TAM application to online communities. The second goal was to develop context-specific exogenous predictors of key TAM variables that were pertinent to online communities. In pursuit of these goals, we proposed and empirically tested a technology acceptance model of online community participation benefiting from a national sample of Internet users who participated in online communities. Findings of this study make several contributions to theoretical development and practical applications.

First, the originally validated TAM was empirically tested as part of the proposed conceptual model, and the weight between PEOU and PU on actual use was evaluated by comparing the conceptual model with an alternative model. Results suggested that the two models were not statistically different from each other, but the overall goodness of fit of the conceptual model was better than the alternative, and the path from PEOU to PU was not statistically significant in either of the two models. The added path from PEOU to actual use in the alternative model was not significant either. This finding is consistent with the conclusions from the TAM meta-analyses reviewed earlier that PU plays a more important role than PEOU. The results also validated the original TAM in the context of online community participation.

Furthermore, when the conceptual model was modified according to reasonable recommendations in the modification indices by adding a feedback loop from PU to PEOU, the overall goodness of fit of the modified model led to significant improvements both at the

global and the local levels. All of the fit statistics approached an ideal standard, and all of the individual paths became statistically significant. The stability index was much lower than the threshold, suggesting that the influences between PEOU and PU dampen out quickly and the model is quite stable. The feedback loop also suggests that PEOU positively affects PU, which in turn negatively affects PEOU. This means that when Internet users perceive online community participation as an easy social practice, they would also be likely to perceive it as a useful act. Once they realize the value of participating in online communities, they may not see it as an effortless behavior. This dynamic loop suggests an interesting theoretical alternative to the mediating effect that was evident in the recursive models. Given that the nonrecursive model offered the best fit statistics, future research on other technologies may also want to examine the possibility of feedback loops between these two variables.

In addition, this study identified and validated three influential factors of online community participation: Internet self-efficacy, perceived community environment, and intrinsic motivation. All of the hypothesized links from these three exogenous variables to the endogenous variables from the original TAM were significant across all the three models tested. Therefore, based on the results of the present study, Internet self-efficacy positively predicts PEOU; perceived community environment positively predicts both PEOU and PU; and intrinsic motivation positively predicts PEOU, PU as well as actual use. Obviously, this shows that intrinsic motivation plays a critical role in the entire model of technology acceptance, and should be incorporated in future TAM-based models as well.

In summary, this study provides additional empirical evidence of the robustness and value of using the TAM to understand social phenomena related to new technologies. It also extends the generic TAM to the realm of online community participation with specific exogenous variables that significantly influence people's perceptions and actual behavior patterns, as well as incorporating a feedback loop between PEOU and PU.

The present study has some limits, however, in that it focused on psychological factors related to individual users rather than social contextual factors such as social norms. By using a sample of Internet users who already participate in online communities, our analysis was limited to variables that help explain people's actual technology adoption and acceptance rather than predicting future behavioral tendencies of nonusers. Also, although our newly adapted scales turned out to be reasonably reliable, additional testing and validation are needed to improve the measurement of key constructs such as community environment and intrinsic motivation on multiple dimensions.

In conclusion, this study shows the robustness of TAM in explaining technology-related attitudes and behaviors outside of the work setting. The study also illustrates the application of technology specific exogenous factors to demonstrate the applicability to the TAM to technologies that did not even exist when the original model was formed. Also, interesting questions are raised about alternatives to the mediating effect of PEOU that has occasionally been found.

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Notes

1. For our analysis and findings of data on nonusers, see Chung, Park, Wang, Fulk, & McLaughlin (2010).
2. As it is not uncommon in data on use of the Internet, the distribution of the actual use was skewed toward a few high users, with many users reporting much lower use. This distribution suggested the advantage of applying a log transformation to the actual use variable and repeating the SEM tests using the transformed variable. The results of this analysis were quite similar to those for the untransformed variable. Given the similarity of results, we report the untransformed variable for the ease of interpretation. Results of analyses using transformed variable are available from the first author.
3. Perceptual data obtained from the same source at the same point in time are at risk from inflated correlations due to common method variance. To assess the likelihood that correlations with self-reported actual use were subject to common method variance, we employed the procedures outlined in Lindell and Whitney (2001), using the .05 correlation between Internet efficacy and actual use as the marker variable. None of the adjusted correlations became nonsignificant, and the confidence intervals for the adjusted correlations did not include zero. These results suggested that common method variance is unlikely to be an explanation of the findings.

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