An investigation of user communication behavior in computer mediated environments
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The pervasive use of the WWW led to the creation of Computer Mediated Environments (CMEs), which are defined as distributed computer networks used to access and provide hypermedia content. On the Internet, consumers no longer interact with salespeople or have a direct physical experience of a store and its products. Instead, their experience is mediated through the web, using a graphical display without any face-to-face interaction with the e-vendor. Therefore, understanding users’ communication behavior in these emerging Computer Mediated Environments is important. This paper intended to understand users’ communication behavior in Computer Mediated Environments (CMEs), so the study investigate how the information technology (IT) through certain important technology characteristic and extrinsic and intrinsic motivation to influence web users’ attitudes and intentions towards the use of online communication tools (OCTs) in CMEs. These new online communication tools include Instant Messaging (IM), Bulletin Board Discussions (BBS), and Web log (Blog). This study employed Technology Acceptance Model (TAM) to explain the extrinsic motivation and introduces flow theory to investigate intrinsic motivation in determining individual’s acceptance and use of online communication tools. Furthermore, Examination of which are the important technological features affecting web users’ beliefs, attitude and intention towards online communication tools can help the corporation or website administrator to improve their interface design and the approach of online communication with consumers or web users. Therefore, the study observes the influences of online communication tools’ interactivity on users’ external beliefs and internal motivation towards the attitude and use of IT through the perspective of system characteristics. This paper intends to explore the effect of different online communication tools on interaction between users within CMEs. To achieve this purpose, users’ perceptions of interactivity are measured, an integrated model combining the TAM and Flow Theory is proposed, to provide a better understanding of online communication behavior. Within this field, this study further investigates:

- the influence of interactivity characteristics on users’ external attitudes towards the acceptance of online communication tools;
- the influence of interactivity characteristics on users’ internal motivation towards the acceptance of online communication tools;
- the influence of external and internal motivations on users’ attitude and intentions when using online communication tools.
Interactivity is a person-to-person or person-to-technology exchange that effects a change in the knowledge or behavior of at least one person. Person-interactivity is defined as the interactivity between an individual and a website administrator occurring through a medium. Machine interactivity refers to the extent to which users can participate in modifying the form and content of a mediated environment in real time.

Based on the review of existing literature, this study proposed an integrated theoretical framework to examine the influence of “CMEs interactivity” on users’ “behavioral intention” to use the online communication tools, as shown in Fig. 1. Technology-based and psychology-based antecedents should work together to influence an individual’s decision to use a computer-mediated communication tool. Therefore, this framework also examines several intermediate constructs about users’ motives for using online communication tools: perceived ease of use, perceived usefulness, flow of experience, and attitudes towards use. Specific hypotheses are presented below for the examined constructs.

Interactive features such as search engines and online dialogue facilities reduce the time and effort required for users to find what they want from the Web (Kling, 1994). Individuals assume that an information system that is more attractive will be easier to use (van der Heijden, 2003). Cross and Smith (1996) indicate that increased interactivity may lead to time saving. Hence, the hypothesis is presented as follows:

Hypothesis 1: Greater interactivity corresponds to greater perceived ease of use

Interactivity is found to bring about effective delivery of available information through engaging user’s attention, increasing user’s involvement, and enriching user’s experiences (Szuprowicz, 1996; Schaffer and Hannafin, 1986). Chen and Rada’s (1996) meta-analysis indicates that users of hypertext systems tend to have higher effectiveness than users of non-hypertext systems. Hypertext is an example of
machine interactivity. Hence, the hypothesis is presented as follows:

Hypothesis 2: Greater interactivity corresponds to greater perceived usefulness

Theoretically, the Internet is easy to use for searching for information with the minimum time and effort, which encourages the perception that the Internet is effective (Shih, 2004). Since improved performance defines a perceived usefulness that is equivalent to usefulness, perceived ease of use would have a direct, positive effect on perceived usefulness.

Perceived ease of use is a major determinant of attitude toward use in the TAM, and a lot of empirical studies confirm the effect of ease of use on attitudes toward using IT. Extensive research over the past decade provides evidence of the significant effect of perceived ease of use on intention, either directly, or indirectly through its effect on perceived usefulness (Hsu & Lu, 2004; Wu & Chen, 2005; Yu, Ha, Choi, & Rho, 2005). Accordingly, the study proposed the following hypotheses:

H3: Greater perceived ease of use corresponds to greater perceived usefulness
H4: Greater perceived ease of use corresponds to a more positive attitude toward online communication tool use.

Perceived usefulness in the TAM model originally referred to job related productivity, performance, and effectiveness (Davis, 1989). This is also an important belief identified as providing diagnostic insight into how user attitude toward using and intention to use are influenced - perceived usefulness has a direct effect on intentions to use over and above its influence via attitude (Davis, Bagozzi and Warshaw, 1989; Davis, 1993; Lu, Yu, Liu and Yao, 2003; Hsu and Lu, 2004; Wu and Chen, 2005; Yu, Ha, Choi and Rho, 2005). Accordingly, the hypothesis is presented as follows:

H5: Greater perceived usefulness corresponds to a more positive attitude toward online communication tool use.
H6: Greater perceived usefulness corresponds to greater behavioral intention to use online communication tool.

Attitude has long been identified as a cause of intention. Attitude toward using in the TAM model is defined as the mediating affective response between usefulness and ease of use and behavioral intention to use a target system. In other words, a prospective user’s overall attitude toward using a given system is an antecedent to intention to adopt (Davis, 1989; Moon and Kim, 2001; Hsu and Lu, 2004; Wu and Chen, 2005; Yu, Ha, Choi and Rho, 2005). Accordingly, the hypothesis is presented as follows:

H7: A more positive attitude corresponds to a greater behavioral intention to use online communication tool.

Light and Wakeman (2001) attested Hoffman and Novak’s (1996) theory that relationships between Web users and the Web may change when the level of interactivity changes. Ghose and Dou (1998) also noted that the higher the interactivity level of a webpage, the more attractive it is. Moon and Kim (2001) considered ITs which are difficult to use less likely to be considered enjoyable, and ITs that are easier to use will be less threatening to individual. Accordingly, the hypothesis is presented as follows:

H8: Greater interactivity corresponds to greater flow experience
H9: Greater perceived ease of use corresponds to greater flow experience
Research has shown that perceived enjoyment not only has a positive effect on usefulness (Agarwal & Karahanna, 2000) but also correlates with perceived ease of use (Csikszentmihalyi, 1975). Users in a flow state focus their attention on a limited stimulus field, filtering out irrelevant thoughts and perceptions. Therefore, experiencing flow will affect the performance of IT users positively (Sánchez-Franco & Roldán, 2005). Accordingly, the hypothesis is presented as follows:

**H10:** Increased flow experience corresponds to greater perceived usefulness.

Flow experience is an example of intrinsic motive, whereas perceived usefulness is an example of an extrinsic motive. Standelands et al. (1983) found that attitudinal outcomes such as positive affect, pleasure, and satisfaction result from the experience of playfulness. Additionally, flow experience seems to prolong Internet and Web site usage (Rettie, 2001). Webster, Trevino and Ryan (1993) also noted that flow experience was associated with positive subjective experience and exploratory behavior. Accordingly, the hypothesis is presented as follows:

**H11:** Greater flow experience corresponds to a more positive attitude toward online communication tool use.

**H12:** Greater flow experience corresponds to a greater behavioral intention to use online communication tool.

Empirical data were collected by conducting a field survey of users experienced in online communication. The scale items for these variables were developed from many studies, which have been validated repeatedly. The scales were slightly modified to suit the contexts of blogs, BBS, and IM. The Internet survey was hosted by www.my3q.com telecommunication laboratories, and yielded 426 usable responses.

The measurement model was tested against four models and find that the first-order factor (correlated) model is the most applicable. The indices for the measurement model indicate a good fit, with $\chi^2/df$ (511.7/303 = 1.688), Goodness of Fit Index (GFI: 0.93), Adjusted Goodness of Fit Index (AGFI: 0.90), Comparative-fit index (CFI: 0.98), and Root mean square error of approximation (RMSEA: 0.040). Comparison of other fit indices with their corresponding recommended values provided evidence of a good fit (GFI = 0.914, AGFI = 0.882, CFI = 0.968, Normed fit index (NFI) = 0.943, Non-normed fit index (NNFI) = 0.97, Standardized root mean square residual (SRMR) = 0.043, RMSEA = 0.053).

Therefore, this study could proceed to examine the path coefficient of the structural model.

Perceived ease of use in this research is only affected by interactivity ($\beta = 0.561$, standard path coefficient), which explains 31.5% of the total variance of perceived ease of use ($R^2 = 0.315$, coefficient of determination). Interactivity ($\beta = 0.471$), perceived ease of use ($\beta = 0.202$), and flow experience ($\beta = 0.275$) all significantly influence perceived usefulness, jointly explaining 73.0% of the variance in perceived usefulness ($R^2 = 0.730$). Flow experience is predicted by interactivity ($\beta = 0.675$) and perceived ease of use ($\beta = 0.265$), jointly explaining 72.7% of the total variance ($R^2 = 0.727$). Among these relationships, interactivity and perceived ease of use are the major influences on an individual’s flow experience when using online communication tools. Attitude towards use is jointly predicted by perceived ease of use ($\beta = 0.137$), perceived usefulness ($\beta = 0.130$), and flow experience ($\beta = 0.704$), with 82.3% of the total variance explained ($R^2 = 0.823$). The effect of flow experience on attitude is thus greater than that of perceived ease of use and perceived usefulness. This implies an important point for
researchers: that the traditional TAM may not completely explain users’ attitudes toward the acceptance of online communication tools. Finally, behavioral intention is influenced by perceived usefulness ($\beta = 0.108$), flow experience ($\beta = 0.262$), and attitude towards use ($\beta = 0.568$), and these jointly explain 80.8% of the total variance in behavioral intention ($R^2 = 0.808$).

As a result, all these hypotheses are supported by the results, which are shown in Fig. 2. In general, important relationships are indicated between interactivity and flow experience, and the two antecedents in TAM. Perceived ease of use had almost the same significant effect on individual’s attitude as perceived usefulness. Besides, flow experience had a more significant effect on individuals’ attitudes than perceived ease of use and perceived usefulness. This means that the intrinsic motivational factors have more powerful effect than extrinsic factors to build positive attitudes. As the result, for academic researchers, this study contributes to a theoretical understanding of factors that promote not only task-oriented but also entertainment-oriented. Entertainment-oriented IT differs from task-oriented IT in terms of reason to use. Task-oriented IT usage is concerned with improving organization productivity. Therefore, TAM emphasizes the importance of perceived usefulness and perceived ease of use as key determinants. However, concerning of entertainment-oriented IT, this study demonstrated the importance of individual intentions tended to need other variable, such as flow experience. Furthermore, this dominance was strong, and explained most of the variance in technology usage.

![Fig. 2 Hypotheses Testing Results: Structural Equation Model](image)

The theoretical implications of the study describe as follows: (1) Beliefs of perceived ease of use, and perceived usefulness were adopted commonly in the previous study of users’ attitude and use intention; however, internal affection such as enjoyment was adopted rarely. (2) Past research that adopted the TAM, or combined TAM and flow theory, has mostly investigated online shopping behavior, online communication behavior between users in the online environment has rarely been investigated. In order to completely explain and have the better understanding of the communication behavior between users in Computer Mediated Environments, this study combined the perceived ease of use, perceived usefulness from TAM and the flow experience from flow theory to investigate the users’ attitude and use
intention toward information technology. (3) This study further investigated how the system characteristic influences the individuals’ extrinsic and intrinsic motivation by increasing the efficiency and effectiveness. (4) Technology-based and psychology-based antecedents are investigate how they work together to influence an individual’s decision to use a computer-mediated communication tool. This result shows that the perceived ease of use had almost as significant an effect on the individual’s attitude as perceived usefulness and this result challenged the basic tenets of TAM which emphasize the importance of perceived usefulness as the key determinant of user acceptance of IT. (5) Flow experience had a more significant effect on individuals’ attitudes than either perceived ease of use or perceived usefulness. This means that intrinsic motivational factors neglected in the past have a more powerful effect than extrinsic factors in positive attitudes and use intention toward online communication tools.

The practical implication, this study provided support for research about the positive effects of interactivity on the acceptance of online communication tools in Computer Mediated Environments. Therefore the online communication tools designers need to be aware of the highly dynamic interaction between social and technological factors and how it influences technology acceptance. The results also show that interactivity is not only mediated by task-oriented (external) motivation but also entertainment-oriented (internal) motivation to absorbing users. The results suggest that developers of online communication tools should endeavor to emphasize intrinsic motivation rather than extrinsic motivation. According to the results, the online communication tools possess the features of high interactivities which can improve the perceived ease of use, perceived usefulness, and playfulness of users will increase users’ positive attitudes and use intention toward online communication tools. Therefore, the interface designer of online communication tools must build highly user-machine interactivities, and not only focus on developing task-oriented factors but also improving entertainment-oriented factors of the online communication tools.