# The mediating effect of perceived media characteristics on shyness and text messaging in cell phone relationships

Yutaka Ueda
Seikei University

Miho Nojima
Seikei University

**ABSTRACT**

The present study reveals the effect of shyness on the use of text messaging on cell phone using data collected from 335 Japanese students. Drawing on the theory of social presence, this study also examines the mediating effect of perceived media characteristics on the relationship between shyness and text messaging use. The best structural equation model showed not only a significantly positive effect of shyness on the number of messages and addresses registered, but also that this effect was partially mediated by the perceived social presence of text messaging on cell phones. Some implications for future study are also presented.

Keywords: cell phone, text messaging, shyness, social presence

## INTRODUCTION

Present-day cell phones have multiple functions such as text messaging, digital camera recording, and Internet access that go beyond direct telephoning of others. Among them, text messaging by cell phone (hereinafter abbreviated as TMC) is one of the most common means of communicating, especially for most young people. In fact, it is not appropriate just to define TMC as a secondary medium to regular e-mail by PC; rather, it has established a unique status as a crucial medium for maintaining good relationships with others in society.

Then, how different is TMC from a PC e-mail? One of the main comparative advantages of TMC over PC e-mail is its synchronous communication with others. A cell phone is much smaller and lighter than a small notebook computer, so it is much easier to carry around. Furthermore, it is usually kept on for ready use. When a user sends a message to somebody, s/he can expect a recipient to read instantly and respond to his/her mail as soon as possible. In a rigorous sense, text messaging is not a truly synchronous medium like direct telephoning, but it is conceptually the same kind of medium as a PC e-mail because the message is read at the recipient's convenience. However, it can be said that TMC is the medium by which a sender can expect a recipient to read a message synchronously. In other words, it is the medium that gives the user a feeling of control over the situation, or his/her task closure (Straub & Karahanna, 1998).

TMC is a critically important communication medium, especially for Europeans and Asians (Andersson, Foros, & Steen, 2009; Grinter, Palen, & Eldridge, 2006). Americans preferred voice mail to text messaging until recently, but, as Rosen, Chang, Erwin, Carrier, and Cheever (2010) discussed, TMC is becoming the major activity among Americans, in particular, young Americans.

Because of the importance of TMC, especially in Japanese society, Japanese researchers have investigated the effect of various psychological factors on TMC use thus far. Although those researchers found significant effects of psychological factors on TMC use, most of them focused on the simple relationship between them. On the other hand, organizational researchers have proposed important theories to explain media selection and use in an organization. They explained that media characteristics influenced media use or selection. Further, they also found that media users do not objectively perceive media characteristics, but individual psychological, social, or cultural factors could affect perception of those media characteristics.

Referring to these two findings, this article examined whether or not the perceived characteristics of TMC mediated the relationship between a psychological factor and TMC, using data collected from students at a private university located in Tokyo, Japan.

## ALTERNATIVE EXPLANATIONS OF MEDIA USE

### The Effect of Psychological Factors on Media Use

In the light of the fact that TMC is a communication tool to connect with others, it is natural to consider the effects of psychological factors associated with social interactions using TMC. This study selected shyness as one of the important factors influencing persons' activities when interacting with others in a society.

Shyness was usually defined as social anxiety that inhibits getting along with others (Zimbardo, 1977; Jones and Russel, 1982). Shyness is not a pathological tendency, but a milder form of social anxiety. Shyness has been revealed to be associated with many kinds of negative psychological outcomes such as anxiety, depressive symptoms (Nelson et al. 2008;

Smith & Betz, 2002), loneliness (Fitts, Sebby, & Zlokovich, 2009; Mounts, Valentiner, Anderson, & Boswell, 2006), emotional inexpressiveness and interpersonal incompetence (Bruch, Berko, & Haase, 1998), unrealistic relationship expectations and interpersonal rejection (Koydemir & Demir, 2008), and low regulation along with high negative emotionality (Eisenberg, Fabes, & Murphy, 1995). These psychological outcomes are considered to inhibit the forming of good relationships with others. Very shy individuals have a tendency not only to shrink from forming close relationships but also to evaluate negatively their own relationship with others more than less shy individuals do (Ishida, 1998, 2003; Goto, 2001).

Researchers have also found that shyness had a significant effect on cell phone use. For example, Kitani (2003) also empirically confirmed that sociability and shyness significantly influence TMC, whereas interpersonal anxiety had no effect on it. Concretely, he found shyness had significantly negative effects on the frequency of TMC, the frequency of sending e-mails, the frequency of receiving emails, and the number of persons an individual person talks with on the cell phone. Kagawa (2006) also investigated the effect of shyness on TMC use. She found less shy individuals send and receive more e-mails than very shy individuals. These results were also intuitively expected. Very shy individuals find more difficulty than their less shy counterparts in expressing their opinions to others and, therefore, tend to avoid communicating with others unless they really have to.

However, it is not clear that very shy individuals prefer text messaging to direct calling on a cell phone if they really have to communicate with others. Although Hirata (2007) found very shy individuals preferred TMC to direct telephoning on a cell phone, Kazama (2009) did not find significantly different preferences between direct telephoning and TMC depending on shyness.

Although these findings were helpful in understanding the causes of TMC, their approach might be somewhat simplistic. Many of these researchers were interested in to whom or how often people used text messaging, but they did not care about how subjects perceived TMC as a medium appropriate to communicating with others and whether individual factors affected these subjects' perception of TMC. In other words, researchers have tried to investigate the direct causal relationship between individual factors and TMC, at least implicitly assuming TMC has inherent characteristics that are similarly recognized by every user. However, organizational researchers have considered that a medium's characteristics have an impact on its use.

**Organization Theory on Media Use**

Organization researchers have also been interested in the media use of managers and other employees in an organization. Short, Williams, and Christie (1976) proposed the social presence theory that holds that individuals choose a medium having a similar degree of psychological presence as a communication partner suited to the task does. Daft and Lengel (1986) suggested information rich theory (IRT), which defined information richness as "the ability of information to change understanding within a time interval", to explain media selections in an organization (Daft & Lengel, 1986, p. 560).

Initially, social presence theory and IRT assumed that objective media characteristics should meet the information requirement that will permit a media user to make an informed decision. However, Markus (1994) pointed out the limitation of Daft and Lengel's (1986) original IRT by proposing critical mass theory and social definition theory as alternative frameworks to explain managerial media choices. In her words, "(w)hereas information richness theorists implicitly assume that richness lies in the medium (as perceived by

individuals), these alternative perspectives conceptualize richness as an outcome of social behavior, rather than its cause" (p. 507).

Furthermore, Lee (1994) found that richness is not an inherent property of a medium, but an emergent property of the interaction of e-mail with its organizational context. He argued, "(a)fter all, the same medium with the same features could readily support rich communication among some users in some organizational contexts, but only lean communication among other users in other organizational contexts" (Lee, 1994, p.154-155).

Empirical studies showed that the perceived media characteristics differed from person to person. For example, Gefen and Straub (1997) indicated that women and men differed in their perception of social presence/information richness, usefulness of e-mails, and ease of use of e-mails, but not in their actual use of e-mail. Carlson and Davis (1998) focused on the media selection of directors (executives) and managers. Directors who were more self-oriented in their media choice selected their media based on access/ease of use criteria. On the other hand, managers who were more other-oriented chose their media based on media richness/social presence criteria. Straub and Karahanna (1998) described how users' feelings about task closure by media communication depend not only on media characteristics but also on their psychological factors, which influence perception of a communication situation. Furthermore, Trevino, Webster, and Stein (2000) revealed that perceived media richness most constantly influenced general attitude toward different media. Yoo and Alavi (2001) confirmed that not only media conditions but also group cohesion influenced social presence in an established group.

Here, the important question about the effect of shyness on TMC derives from the above discussion. As described previously, past researches about TMC revealed that psychological factors actually affected use of text messaging. However, the discussion about media selection and use in organizational theory shows that the effect of psychological factors on a subject's media use explains, at least partially, his/her perception of the characteristics of the media.

As far as we know, no empirical study has dealt with the influence of affiliation motive on text messaging. However, as Markus (1994), Lee (1994), and other researchers have implied, if people's psychological factors like shyness influence the range and quality of human relationships with others, then those psychological factors also affect their perception of media characteristics. In other words, we argue that the past researches' findings of the significant relationships between people's psychological factors and their TMC can be explained, at least partially, by their perception of TMC.

## HYPOTHESES

From the above discussion, we proposed Figure 1 as the basic framework to examine the relationships among psychological factors, perceived characteristics of TMC, and TMC use. This framework assumed that the effect of psychological factors such as shyness on TMC use would be partially mediated by perceived media characteristics. See Figure 1 in the Appendix.

We proposed three hypotheses based on this framework. First, as shown in the previous section, past research has shown that less shy students will more positively use TMC to make contact with others than would high shy students. TMC is a casual communicating device, and most Japanese young people are familiar with operating a cell phone to send and receive e-mails. However, as shown in previous studies, high shy students are poor at building close relationships with others and do not positively use text messaging unless they really have to. In contrast, less shy students positively use TMC whenever they want to. Therefore, the following Hypothesis I was proposed.

Hypothesis I: Shyness will negatively influence actual TMC use.

Next, shyness was considered to influence the perceived characteristics of TMC as well. Less shy students positively widen their human relationships with others by TMC, and this active communication of diverse contents with various friends, in turn, affects their perception of the social presence of TMC. Therefore, we provided the following Hypothesis II.

Hypothesis II: Shyness will negatively influence the perceived social presence of TMC use.

Finally, perceived media characteristics are considered to influence text messaging use. Daft and Lengel (1986) did not consider media use was proportionate to the degree of media richness. Rather, they proposed a contingent relationship between the organizational situation and media richness. However, proponents of media naturalness theory (Kock, 2004; DeRosa, Hantula, Kock, & D'Arcy, 2004) argue that perceived cognitive effort, or "perceived level of using a medium for communication" to perform a collaborative task (Kock, 2004, p. 334), should be used as the dependent variable, instead of media use. It is generally considered that, ceteris paribus, the more users perceive cognitive effort to be a requirement for use of a medium, the less they tend to use that medium. If students perceive TMC's social presence/media richness as low, they do not want to use TMC except when they have to because they perceive it as unnatural compared with oral communication. In contrast, when students perceive the naturalness of TMC to be close to that of oral communication, they use it positively with little or no reluctance. Hence, the following Hypothesis III was presented.

Hypothesis III: Perceived social presence of TMC will positively influence actual TMC use.

## RESEARCH METHOD

### Sample

Data were collected from a sample consisting of Japanese students at a private university that is located in Tokyo, Japan. The ages of the students were inferred to be between 18 and 22 because most of them entered the university soon after their graduation from high school. This university provides all the students with a syllabus on the Web, and requires them to register for all classes electronically. Many classes utilize an Internet-based instruction support system that enables a professor to distribute the necessary materials for his/her class, and students to upload their reports to a professor. This provision can facilitate almost all the students in becoming familiar with electronic communication at this university.

The questionnaire was distributed to the students by the authors during classes and the students were asked to fill out the questionnaire and return it to the authors after the class. Because several classes received the questionnaire, students were also asked to return the questionnaire without filling it out if they had already answered it in a different class. Some data were omitted because respondents obviously answered the questionnaire in jest. Final sample size was 335.

## Measures

The self-report questionnaire was used to collect data of all dependent and independent variables.

Shyness. Shyness was measured with 7 items that were developed by Sakurai and Sakurai (1991). They created Japanese 21-item shyness scales to collect data from a Japanese sample based on Jones and Russell (1982). After a factor analysis, they supposed three factors that were composed of these 21 items, and our study chose only 7 items that had a higher loading on the first factor with 5.89 as an eigenvalue in their study. This first factor was associated with anxiety regarding others' evaluation of oneself and perceived maladjustment to interpersonal situations; we chose this factor only because, as Sakurai and Sakurai (1991) admitted, "it is considered to constitute a core of shyness" (p. 238). The items had 5-point Likert-type response formats with anchoring values of 1 (strongly inapplicable) and 5 (strongly applicable).

Perceived social presence of TMC: Perceived characteristics of TMC were measured with a Japanese version of the 7-item adjective scale developed by Chidambaram and Jones (1993). They created a 20-item scale to measure social presence, communication effectiveness, and communication interface, but only the 7-item scale associated with social presence was used in this study. Students were asked to rate bipolar adjectives on a semantic differential scale from 1 to 7.

Use of TMC. Use of TMC was measured with three items. The first two were about the actual frequency of TMC use. We asked students to rate the average number of messages they individually sent or received by cell phone. "Individually" meant that the number of direct e-mail advertisements should not be included. We prepared a 9-point scale from "(1) less than once a day" to "(9) over forty a day." We preliminarily collected data about the number of messages sent and received by cell phone from 84 students, and learnt that the average number of messages was about 15.55 (sent) and 15.97 (received). Therefore, we created a 9-point scale that had "(5) about 15 a day" at the center of the scale. The third item was the number of addresses registered in a cell phone. Most students prefer to register the addresses of friends with whom they are in frequent contact. These data were collected using an 8-point scale from "(1) 0" to "(8) over 101."

## RESULT

### Basic Statistics

The basic statistics of each variable and inter-correlations between two variables were shown in Table 1. The values of Cronbach's alphas of shyness and perceived social presence variables were 0.822 and 0.810, respectively, which shows these variables have relatively high reliabilities. Although the correlation between the number of sent messages and the number of received messages was fairly high ($\gamma = 0.912$, $p < 0.01$), the correlations of the number of addresses registered with them was not comparatively high ($\gamma = 0.247$ or 0.347, $p < 0.01$). Considering the possibility that many messages were given to or received from registered addresses, this result might mean the frequency of communicating with people whose address was registered varied from person to person. Shyness had significantly negative correlations with the number of sent messages ($\gamma = -0.247$, $p < 0.01$), the number of received messages ($\gamma = -0.261$, $p < 0.01$), and the number of registered addresses ($\gamma = -0.279$, $p < 0.01$). These negative correlations mean the higher the level of shyness was, the less the likelihood of communicating with others by TMC, and vice versa. Correlation of shyness with perceived social presence was also significantly negative ($\gamma = -0.161$, $p <$

0.01), which was as expected. Perceived social presence had significantly positive correlations with the number of sent messages ($\gamma = 0.194$, $p < 0.01$), the number of received messages ($\gamma = 0.196$, $p < 0.01$), and the number of registered addresses ($\gamma = 0.193$, $p < 0.01$). This meant that the more the social presence of TMC was perceived, the more the number of messages given and received, and the more the number of addresses registered, and vice versa. See Table 1 in the Appendix.

**Structural Equation Modeling**

Next, we adopted structural equation modeling (SEM) to examine whether or not the hypothetical causal relationships would be valid. Although we assumed a partial mediation effect on the relationship between perceived characteristics of TMC and TMC use, alternative relationships should be considered. According to Figure 2, compared to our hypothetical model (2-A), 2-B dealt with the full mediation effect of the perceived characteristics of TMC, and 2-C assumed the independent effects of psychological factors and perceived characteristics of TMC on TMC use. If perceived characteristics of TMC had no effect on TMC use, 2-D might be the best model. See Figure 2 in the Appendix.

We constructed eight different structural equation models with or without the paths from one variable to another (2 by 2 by 2) and compared them according to the values of the goodness-of-fit of those alternative models. We dealt with each TMC use variable separately because we considered three variables of TMC might be subject to different influences from each other, and a composite variable might conceal these important findings despite the correlation. For example, as with the number of sent messages, Table 2 shows all the values of the goodness-of-fit of eight models, and, finally, model 2-A (our hypothetical model) was the best of all models. See Table 2 in the Appendix. See Table 3 in the Appendix.

Table 3 shows the best models for each of three TMC use variables. It described the partial mediating model (the hypothetical model) as having the best values of the goodness-of-fit for all three TMC use variables. All three models have reasonably high values for the goodness-of-fit (TLI > 0.90, CFI > 0.90), although the values of RMSEA were a little bit higher than the criterion (RMSEA = 0.057 $\sim$ 0.059 > 0.05). All the estimates of the paths between two variables in all three models are significant at $p < 0.01$ level.

According to these models, the estimates of the path from shyness to perceived social presence were significantly negative (−0.22), which shows very shy students perceived less of a social presence of TMC than did their less shy counterparts. This result supports Hypothesis I. The paths from shyness to TMC are estimated to be −0.23 to −0.28. This means the higher the students' shyness is, the less they use TMC. This also supports Hypothesis II. The best models also show that the effect of shyness on TMC is partially mediated by the perceived social presence of TMC. All the paths from perceived social presence to TMC are significantly positive (0.15 to 0.17). This result supports Hypothesis III.

**DISCUSSION AND CONCLUSION**

Past research focusing on the effect of shyness on TMC did not answer the question as to why very shy people were less positive in using TMC than their less shy counterparts. This study found the perceived social presence of TMC partially mediated the relationship between shyness and TMC. Very shy people are considered to be more sensitive to media that communicate with others than are their less shy counterparts because they are socially more anxious and inhibited about getting along with others. They might think TMC is an unreliable and undependable medium for maintaining stable relationships, so that they are less dependent on TMC than are less shy people.

The findings of this study hold some implications for both researchers who are interested in media use and cell phone producers. Although Markus (1994) and Lee (1994) focused on the traditional PC e-mail system when they emphasized the importance of paying attention to perceived media characteristics, this study demonstrated their argument still holds true for TMC that could be considered different from PC e-mail. Researchers should examine whether various factors influence the perceived characteristics of TMC, and in turn, the actual use of TMC. Cell phone producers who are interested in customers' evaluation of a cell phone should recognize the fact that not only a cell phone's objective properties but also the users' psychological factors might influence their evaluation of a cell phone. This might imply that some data regarding customers' lifestyle or their psychological factors should also be collected when those producers want to survey user satisfaction regarding a cell phone.

Although the findings of this study are important, some limitations should be resolved through future study. First, this study used only one composite shyness variable. Although Sakurai and Sakurai (1991) argued that this variable can be seen as the variable appropriate to representing the concept of shyness, they also considered the multidimensionality of shyness. Future study is expected to include different aspects of shyness that explain TMC. Second, the variables of the perceived social presence of TMC might also have been too simplistic. Although the argument about the social presence of media is somewhat abstract, we might be able to use other related items like those of perceived media richness by Carlson and Zmud (1999). We also might be able to use the argument and the framework of the perceived naturalness of media (Kock, 2004; DeRosa, Hantula, Kock & D'Arcy, 2004).

As discussed in the first section, we initially assumed that the current position of TMC as the medium to communicate with others is different in Japan from in other countries. However, we also hear of the problem of TMC addiction in other countries. Therefore, we hope researchers in other countries would investigate the same or different factors that influence TMC using data collected from their countries.

**REFERENCES**

Andersson, K., Foros, Ø., & Steen, F. (2009). Text and voice: Complements, substitutes or both? *Industrial and Corporate Change*, 18(6), 1231-1247.

Bruch, M. A., Berko, E. H., & Haase, R. F. (1998). Shyness, masculine ideology, physical attractiveness, and emotional inexpressiveness: Testing a mediational model of men's interpersonal competence. *Journal of Counseling Psychology*, 45(1), 84-97.

Carlson, P. J., & Davis, G. B. (1998). An investigation of media selection among directors and managers: From "self" to "other" orientation. *MIS Quarterly*, 22, 335-362.

Carlson, J. R., & Zmud, R. W. (1999). Channel expansion theory and the experiential nature of media richness perceptions. *Academy of Management Journal*, 42, 153-170.

Chidambaram, L., & Jones, B. (1993). Impact of communication medium and computer support on group perceptions and performance: A comparison of face-to-face and dispersed meetings. *MIS Quarterly*, 17, 465-491.

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness and structural design. *Management Science*, 32, 554-571.

Daft, R. L., Lengel, R. H., & Trevino, L. K. (1987). Message Equivocality, Media Selection, and Manager Performance: Implications for Information Systems, *MIS Quarterly*, 11, 355-366.

DeRosa, D. M., Hantula, D. A., Kock, N., & D'Arcy, J. (2004). Trust and leadership in virtual teamwork: A media naturalness perspective. *Human Resource Management*, 43, 219-232.

Eisenberg, N., Fabes, R. A., & Murphy, B. C. (1995). Relations of shyness and low sociability to regulation and emotionality. *Journal of Personality and Social Psychology*, 68, 505-517.

Fitts, S. D., Sebby, R. A., & Zlokovich, M. S. (2009). Humor styles as mediators of the shyness-loneliness relationship. *North American Journal of Psychology*, 11, 257-272.

Gefen, D., & Straub, D. W. (1997). Gender differences in the perception and use of e-mail: An extension to the technology acceptance model. *MIS Quarterly*, 21, 389-400.

Grinter, R. E., Palen, L., & Eldridge, M. (2006). Chatting with teenagers: Considering the place of chat technologies in teen life. *ACM Transactions on Computer-Human Interaction*, 13, 423–447.

Goto, M. (2001). Shyness ni-kansuru syakai shinrigaku-teki kenkyu to sono tenbou [Social psychological studies on shyness]. *Japanese Journal of Interpersonal and Social Psychology*, 1, 81-92.

Hirata, S. (2007). Daigakusei no keitai denwa tool no tsukaiwake ni-oite shyness・social skill ga ataeru eikyou [The effect of shyness and social skill on university students' different uses of cell phone tools]. *Journal of Clinical and Educational Psychology*, 33, 18.

Ishida, Y. (1998), Yujin kankei no shinmitu-ka ni oyobosu shyness no eikyou to kodokukan [The effect of shyness on friendship development and loneliness]. *Japanese Journal of Social Psychology*, 14, 43-52.

Ishida, Y. (2003). Yujin-kankei no keisei katei ni-okeru shyness no eikyo: Daigaku shinnyusei no judan-teki kenkyu [The effect of shyness on friendship development: A longitudinal study of college freshmen]. *Japanese Journal of Interpersonal and Social Psychology*, 3, 15-22.

Jones, W. H., & Russell, D. (1982). The social reticence scale: An objective instrument to measure shyness. *Journal of Personality Assessment*, 46, 629-631.

Kagawa, A. (2006). Shakai-teki skill, shyness ga kodoku-kan, keitai mail no riyou ni oyobosu eikyo [The influence of social skills and shyness on loneliness and mobile phone mail] (http://www2.ipcku.kansai-u.ac.jp/~tsuchida/thesis06/kagawa.pdf)

Kazama, M. (2009). Daigakusei ni-okeru communication syudan no senkou to shyness to-no kankei [The relationship between the preferred channel of communication and shyness in Japanese university students]. *Human Welfare Studies*, 12, 51-60.

Kitani, Y. (2003). Daigakusei no keitai mail no riyo taido ni-kansuru kenkyu: Hiroshima shinai no daigakusei wo taisho to-shite [A study on the attitude of college students using mobile mail]. *Hiroshima Shudo University Academic Journals*, 44, 341-371.

Kock, N. (2004). The psychological model: Toward a new theory of computer-mediated communication based on Darwinian evolution. *Organizational Science*, 15, 3, 327-348.

Koydemir, S., & Demir, A. (2008). Shyness and cognitions: An examination of Turkish university students. *Journal of Psychology*, 142(6), 633-644.

Lee, A. S. (1994). Electronic mail as a medium for rich communication: An empirical investigation using hermeneutic interpretation. *MIS Quarterly*, 18, 143-157.

Markus, M. L. (1994). Electronic mail as the medium of managerial choice. *Organizational Sciences*, 5, 502-527.

Mounts, N. S., Valentiner, D. P., Anderson, K. L., & Boswell, M. K. (2006). Shyness, sociability, and parental support for the college transition: Relation to adolescents' adjustment. *Journal of Youth and Adolescence*, 35, 71-80.

Nelson, L. J., Padilla-Walker, L. M., Badger, S., Barry, C. M., Carroll, J. S., & Madsen, D. D. (2008). Associations between shyness and internalizing behaviors, externalizing behaviors, and relationships during emerging adulthood. *Journal of Youth Adolescence*, 37, 605-615.

Rosen, L. D., Chang, J., Erwin, L., Carrier, L. M., & Cheever, N. A. (2010). The relationship between "textisms" and formal and informal writing among young adults. *Communication Research*, 37, 420-440.

Sakurai, S., & Sakurai, T. (1991). Daigakusei-you shyness syakudo no nihongo-ban no sakusei to datousei no kentou [Construction of Japanese version of shyness scale for college students]. *Bulletin of Nara University Education*, 40(1), 235-243.

Short, J., Williams, E., & Christie, B. (1976). *The Social Psychology of Telecommunications*. London, England: Wiley.

Straub, D., & Karahanna, E. (1998). Knowledge worker communications and recipient availability: Toward a task closure explanation of media choice. *Organizational Science*, 9, 160-175.Smith, H. M. & Betz, N. E. (2002). An examination of efficacy and esteem pathways to depression in young adulthood. *Journal of Counseling Psychology*, 49, 438-448.

Trevino, J. K., Webster, J., & Stein, E. W. (2000). Making connections: Complementary influences on communication media choices, attitude, and use. *Organizational Science*, 11(2), 163-182.

Yoo, Y., & Alavi, M. (2001). Media and group cohesion: Relative influences on social presence, task participation, and group consensus. *MIS Quarterly*, 25, 371-390.

Zimbardo, P. G. (1977). *Shyness: What it is, what to do about it.* Reading, MA: Perseus Press.

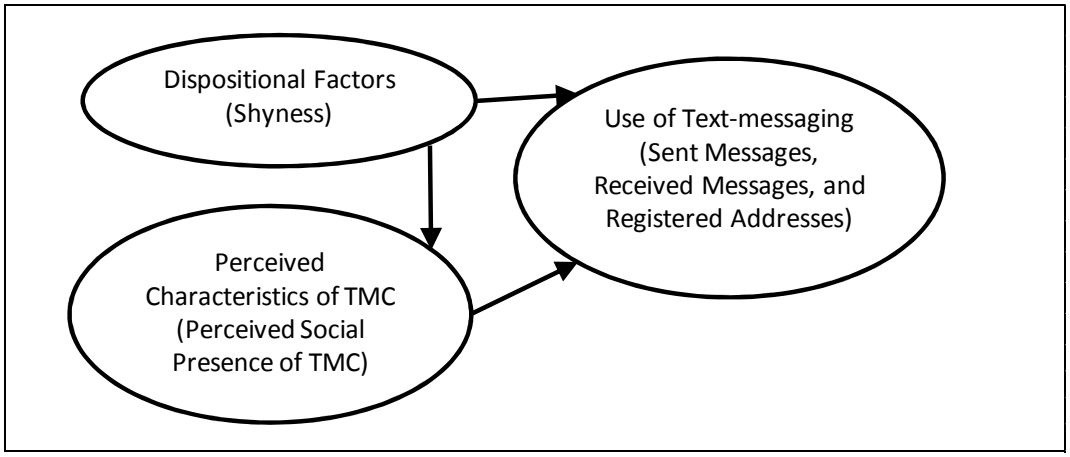


Figure 1 Basic Framework: Partial Mediating Effect of Perceived Characteristics of TMC

Table 1 Means, Standard Deviations (std dev), Reliabilities, and Correlations

| | variables | means | std dev | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|
| 1 | no. of sent messages | 4.08 | 1.775 | — | | | | |
| 2 | no. of received messages | 4.13 | 1.777 | .912** | — | | | |
| 3 | no. of addresses registered | 7.44 | 1.177 | .247** | .347** | — | | |
| 4 | shyness | 2.7395 | 0.80472 | — .247** | — .261** | −.279** | (0.822) | |
| 5 | perceived characteristics | 2.9928 | 0.61345 | .194** | .196** | .193** | −.161** | (0.810) |

n = 329-335, *: $p < 0.05$, **: $p < 0.01$, Reliabilities in parentheses.

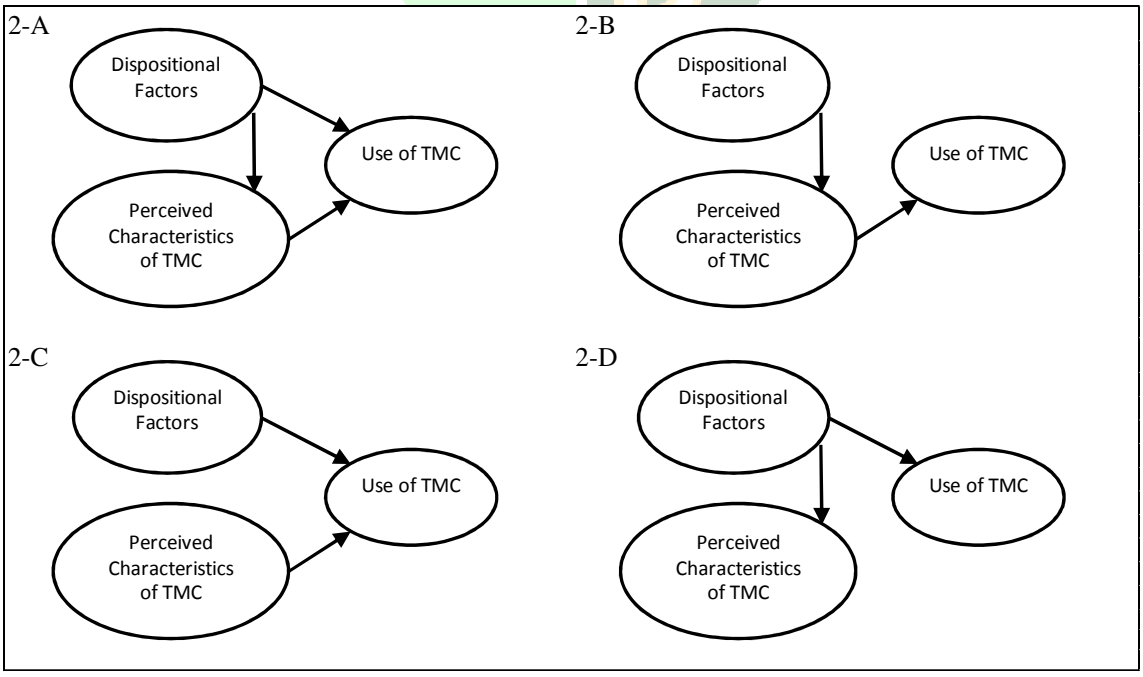


Figure 2 Alternative Hypothetical Relationships among Three Factors

Table 2 Comparison of Alternative Models (the Number of Sent Messages)

| Paths | 1(2-A) | 5(2-B) | 2(2-C) | 3(2-D) |
|---|---|---|---|---|
| Shyness ⇒ Perceived Social Presence | —0.22 | —0.23 | | —0.23 |
| Perceived Social Presence ⇒ Use of TMC | 0.16 | 0.22 | 0.17 | |
| Shyness ⇒ Use of TMC | —0.23 | | —0.23 | —0.27 |
| CMIN/DF | 2.087 | 2.226 | 2.191 | 2.146 |
| TLI | 0.904 | 0.892 | 0.895 | 0.899 |
| CFI | 0.930 | 0.920 | 0.922 | 0.925 |
| RMSEA | 0.057 | 0.061 | 0.060 | 0.059 |

| Paths | 5 | 6 | 7 | 8 |
|---|---|---|---|---|
| Shyness ⇒ Perceived Social Presence | | | —0.22 | |
| Perceived Social Presence ⇒ Use of TMC | | 0.21 | | |
| Shyness ⇒ Use of TMC | —0.26 | | | |
| CMIN/DF | 2.258 | 2.341 | 2.355 | 2.454 |
| TLI | 0.889 | 0.882 | 0.881 | 0.872 |
| CFI | 0.917 | 0.912 | 0.911 | 0.903 |
| RMSEA | 0.061 | 0.063 | 0.064 | 0.066 |

Table 3 The Best Models of the Effect of Shyness on TMC use

| Paths | Sent | Received | Address |
|---|---|---|---|
| Shyness ⇒ Perceived Social Presence | —0.22 | —0.22 | —0.22 |
| Perceived Social Presence ⇒ Use of TMC | 0.16 | 0.17 | 0.15 |
| Shyness ⇒ Use of TMC use | —0.23 | —0.25 | —0.28 |
| CMIN/DF | 2.087 | 2.049 | 2.144 |
| TLI | 0.904 | 0.908 | 0.900 |
| CFI | 0.930 | 0.932 | 0.927 |
| RMSEA | 0.057 | 0.056 | 0.059 |