

The Relationship between Computer-Mediated-Communication Competence, Apprehension, Self-Efficacy, Perceived Confidence, and Social Presence

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The purpose of this study was to create a model for examining the relationships between computer-mediated-communication (CMC) apprehension, CMC skill, and CMC presence. Using structural-equation modeling, the study found that CMC apprehension and CMC skill negatively correlated with each other ($-.36$). Furthermore, CMC apprehension was not shown to relate to CMC presence ($-.09$), but CMC presence was shown to be impacted by CMC skill ($.41$). Increased skill in virtual environments likely enhances perceptions of presence in CMC.

In 1985, Rice and Boan called attention to the lack of research completed by social scientists in new communication technologies. At that time, Rice and Boan provided a list that would “allow the reader to become familiar with some of the journals and magazines covering aspects of new communication technologies—specifically, media involving a computer in some way” (p. 70). Since the publication of this basic article, the realm of computer-mediated communication (CMC) has flourished and grown into a complete subdiscipline in human communication with its own textbooks, courses, and journals (Barnes, 2003; Witmer, 1998; Wood & Smith, 2001).

Although all of the early research in CMC and much of the current research has examined how people interact with the technology and with other people through the

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technology in contrived experimental conditions (Tidwell & Walther, 2002; Walther 1993, 1994, 1996), increasingly researchers have examined how people in the nonexperimental world interact with technology and with each other in the mediated context (Walther, 1992; Wrench, 2004). The purpose of the current article is in line with the second generation of CMC research, tending to be considerably more variable analytic than the first generation of CMC research. The goal of the current project is to examine the relationship between CMC apprehension, self-perceived efficacy, CMC competence, and social presence. Before we develop arguments for specific research questions and hypotheses, a brief overview of the literature in CMC and communication apprehension will be useful.

Review of Literature

Pappacharissi and Rubin (2000) noted that individuals use the Internet for a variety of reasons. Similar to television viewers, Internet users decide how much time and what time they will use the communication medium. The freedom to utilize the Internet in a way that is beneficial and pleasing to the user offers an alternative to conventional and traditional forms of communication, such as telephones and postal mail. Yet, Internet communication patterns need further investigation. To understand better the research agenda proposed in this article, it is important to highlight previous research studies that have looked at: (a) the Internet; (b) computer-mediated communication; (c) chat rooms, Internet relay chat, and instant messaging; (d) CMC competence; (e) perceived self-efficacy; and (f) presence.

The internet

According to Flaherty, Pearce, and Rubin (1998), the Internet is “the fastest growing new communication technology” (p. 251). The researchers also affirmed that more and more households are getting connected to the Internet. From their study, they observed that the average Internet user spent 2.73 hours per day. Due to the increased popularity of the Internet, Newhagen and Rafaeli (1996) stressed the importance of studying the Internet, arguing that the nature of the Internet provides a very unique communication medium, allowing communication to be interactive, visual, and elastic.

The Internet has become a common source of information. Johnson and Kaye (1998) discovered that individuals rated online information more credible than other types of information. In addition, females were more likely than males to regard information on the Internet as credible. Beyond its informational use, the Internet is also a place where relationships can start, flourish, and terminate. Lea and Spears (1995) noted that relationships on the Internet occur at a slower pace because of the scarcity of nonverbal cues. They asserted that Internet relationships take a longer time to acquire trust and to communicate intimacy than face-to-face relationships. The limited cues on the Internet cause individuals to rely on the cues that are readily present, such as an Internet user’s handle or name, her or his communication

patterns, and what he or she chooses to disclose. Perhaps the biggest concern about the Internet is not relationship development but Internet privacy (Hertzel, 2000). Hertzel noted that many individuals are very worried about the potential misuse of their personal information on the Internet. Thus, it is important for individuals to attend to what they communicate and how they communicate information to other Internet users.

Computer-mediated communication

Communication that occurs on the Internet is referred to as computer-mediated communication (CMC). Walther (1992) defined computer-mediated communication as “synchronous or asynchronous electronic mail and computer conferencing, by which senders encode in text messages that are relayed from senders’ computers to receivers” (p. 52). Trevino and Webster (1992) asserted that CMC differs from other types of communication mediums due to feedback capabilities and speed. Nevertheless, Rice and Love (1987) maintained that CMC was impersonal compared to face-to-face (FtF) interactions. Rice and Love argued that CMC was not suitable for negotiating or persuading others, as CMC contains limited audio and visual cues that are present in FtF interactions; therefore, they contended that CMC interactions contain only a small amount of socioemotional content.

Contrary to Rice and Love’s (1987) arguments, Chenault (1998) held that CMC included emotion. Despite what other CMC research studies have stated in their results, she argued that CMC relationships can be lasting and meaningful. Chenault affirmed that most CMC relationships may start via the Internet and then evolve to real-life. In another study, Walther (1995) found no differences between computer-mediated relationships and FtF relationships regarding intimacy. He mentioned that in order for CMC to be an effective vehicle for interpersonal transactions, one must have the time and an appeal for CMC. Most importantly, he concluded that CMC is very seldom impersonal. Parks and Floyd (1996) observed that CMC-initiated relationships often develop into FtF relationships, results that were then replicated by Wrench (2004). Moreover, Parks and Floyd noticed that CMC users frequently do not differentiate their online and offline personas. At the same time, men were less likely than women to initiate a relationship on the Internet. They reported that 60.7% of their subjects developed a relationship with someone they had met for the first time via the Internet newsgroup and 30% had developed a highly personal relationship with someone from the Internet newsgroup. From their results, they identified the Internet as becoming a popular place where individuals can meet other people. Postmes, Spears, and Lea (1998) stated that CMC can “liberate individuals from social influence, group pressure, and status and power differentials that characterize much face-to-face interaction” (p. 689). Similar to FtF interactions, they found that Internet users are vulnerable to persuasion, criticism, and attraction.

Walther (1992) noted that many CMC research studies occur in experimental conditions. He believed that these studies overlook possible intervening variables, such as CMC experience and the intensity of the relationship. He noted that research studies

that included time limits often restricted the transformation of relationships. Further, Walther maintained that an individual may consider a relationship as very intimate, while another may interpret the relationship as very friendly. Therefore, future research must take into account these two variables. Nevertheless, Papacharissi and Rubin (2000) noted that very few studies have addressed why individuals utilize CMC and the Internet. Moreover, few studies have analyzed why individuals employ CMC and the Internet to self-disclose (Punyanunt-Carter, 2006).

Chat rooms, internet relay chat, and instant messaging

Chat rooms on the Internet have become a popular place for social interaction. According to Rintel and Pittam (1997), the type of CMC that occurs in Internet chat rooms is referred to as Internet Relay Chat (IRC), defined as “one of a group of electronic interaction media that combine orthographic form with the ephemerality of real-time, virtually synchronous transmission in an unregulated, global, multi-user environment” (p. 508). According to Cornetto (1999), IRC is the “most highly interactive form of CMC” (p. 4). She asserted that IRC provides an appropriate circumstance for investigating communication behaviors. Because of its synchronous nature, Cornetto believed that IRC resembles FtF interaction. Rintel and Pittam (1997) recognized similarities between FtF interactions and telephone interactions. They also found similarities between IRC and FtF interactions, observing that interaction-management strategies are similar in both types of contexts and also that the crucial parts of the maintenance and evolvment of IRC relationships are the opening and closing statements. Moreover, the handle or name that the IRC user employs makes a huge impression; and likewise they noted that writing style provides another form of nonverbal expression.

The most recent development in CMC has been the development of instant-messaging technologies. Where chat rooms and IRC typically enabled people to engage in communication with a group of people, Instant Messaging (IM) has allowed people to engage in interpersonal interactions (Leung, 2001). According to the Pew Internet and American Life Project (2004), approximately 60% of American adults, or roughly 128 million people, regularly go online in some fashion. When asked if a participant had ever used a specific internet technology at any point in their life, 93% had used e-mail, 24% of them had used IM, and 25% had participated in a chat room (Pew Internet and American Life Project). When asked if a participant used a specific internet technology on a typical day, 43% used e-mail, 12% IMed another person, and 4% participated in a chat room (Pew Internet and American Life Project). Currently, there are a number of different IM systems available for free on the Internet (AOL Instant Messenger, Yahoo Messenger, MSN Messenger, ICQ).

In a study conducted by Hu, Fowler-Wood, Smith, and Westbrook (2004), the relationship between instant-messaging behaviors and perceived intimacy between CMC interactants was explored. Overall, they found that the amount of IMing an individual did was positively related to verbal, affective, and social intimacy. The researchers further found a negative relationship between the amount of IMing an

individual did and her or his age, indicating that younger CMC users are more likely to engage in IM as a communicative tool. Because these chat rooms and the Internet are fairly new, it is hard to assess the effects of these modern communication mediums. Unlike other Internet channels, like electronic mail, newsgroups, and home pages, the communication in all three of these forums is synchronous, which means that feedback is more immediate than feedback in media like electronic mail or bulletin boards.

CMC competence

While the study of communication competence is constantly debated (McCroskey, 1982; Rubin, Martin, Bruning, & Powers, 1993; Wiemann, 1977), everyone agrees that communication competence is an extremely important part of healthy communicative relationships. Spitzberg's (2001) model for CMC competence starts with the notion that people must be motivated to be competent in a CMC environment, possess specialized knowledge and technical know-how, and learn the conventions, rules, and roles that affect CMC interactions. Furthermore, Spitzberg noted that a competent user of CMC will possess four specific skills. First, a competent CMC user shows attentiveness or interest and concern for one's CMC interaction partner. Second, by interaction management, the user attracts a CMC partner by engaging a partner actively and controls the time and relevance of communication. Third, expressiveness or filling the CMC interaction with emotion is a skill of a competent CMC user. Fourth, composure is another skill associated with competence, including displaying confidence, mastery, and comfortableness as a CMC interactant.

In a study conducted by Wrench (2004) examining online friendships, he found a positive relationship between how long someone had been actively communicating using computer-mediated technology and communication competence. This result validates the notion that CMC competence is definitely a skill-based set that improves with exposure and experience. Furthermore, Wrench found a positive relationship between CMC competence and perceptions of both online-friendship intimacy and online-communication satisfaction. As a whole, competence in the CMC context clearly is important for establishing long-term, meaningful Internet-based relationships.

Self-efficacy

Bandura (1997) defined self-efficacy as the belief in "in one's capabilities to organize and execute the courses of action required to produce given attainments" (p. 3). According to social cognitive theory (Bandura, 1977, 1982, 1997), self-efficacy is a self-evaluative technique that has the ability to influence decisions about what behaviors to engage in, how much effort is needed to overcome obstacles, and the ultimate mastery of a specific behavior. Self-efficacy is not a measure of actual skill but rather a measure of an individual's perception of her or his ability to perform a specific behavior.

In the realm of computer-mediated communication (CMC), two different forms of self-efficacy are commonly discussed in the literature: Computer self-efficacy and

Internet self-efficacy. Computer self-efficacy is the extent to which an individual perceives he or she can use a specific form of computer technology. Previous research by Compeau and Higgins (1995) found that individuals who perceived their own ability to use computer technology were more likely to engage in future computer-usage behaviors when compared to people who did not have computer self-efficacy. Internet self-efficacy, on the other hand, is the extent to which an individual perceives he or she can use the Internet. Early research on Internet self-efficacy (Nahl, 1996, 1997) focused primarily on the creation of Web sites and the various behaviors that are necessary for creating Web sites. Ren (1999) found that people with high-Internet self-efficacy perceived that they could search for government documents online more efficiently than individuals with low-Internet self-efficacy. Eastin and LaRose (2000), on the other hand, created a more generalized approach for examining Internet self-efficacy. According to their findings, there is a positive relationship between Internet self-efficacy and social/informational outcome expectancy, Internet experience, and Internet use. The researchers further found a negative relationship between Internet self-efficacy and Internet stress and self-disparagement (negative talk about one's skills while using the Internet).

Presence

How people interact with modern communication technologies has long been a question that media researchers have investigated. In 1976, Short, Williams, and Christie devised social presence theory to explain how different media provide users with different forms of interaction. In essence, social presence "is the degree to which we as individuals perceive another as a real person and any interaction between the two of us as a relationship" (Wood & Smith, 2001, p. 72). Social presence theory basically suggests that different media formats (e.g., television, radio, the Internet) provide people with differing forms of interactions as a result of available nonverbal communication in a particular medium. Since television provides both nonverbal cues that are both auditory and physical in nature, people watching TV will experience greater presence than people who are listening to a radio, which only provides auditory nonverbals. Furthermore, people listening to the radio will experience greater presence than people interacting on the Internet, which cannot provide true nonverbal communication (Wood & Smith).

Presence as a concept has seen a shift in perception over the years as work within the virtual environment has shown that the virtual environment (VE) can be perceived in similar ways to the physical environment. For this reason, computer-mediated-communication (CMC) researchers now view presence as being based on the notion that people will feel connected to a remote location while being physically situated in a secondary location (B. G. Witmer & Singer, 1998). Ultimately, presence seems to be based less on the filtering of nonverbals and more on an individual's ability to focus on the VE. B. G. Witmer and Singer believed that "how sharply users focus their attention on the VE partially determines the extent to which they will become involved in that environment and how much presence they will report"

(p. 226). In creating their questionnaire for measuring social presence, B. G. Witmer and Singer discussed four distinct factors necessary for determining the presence an individual experiences in the virtual environment: control, sensory factors, distraction, and realism.

The first factor necessary for an individual to experience presence in a VE is individual control of the VE, based on the notion that control over one's environment will create a heightened sense of presence (B. G. Witmer & Singer, 1998). Along with basic control over the VE, how quickly an individual's behavior impacts the VE, or immediacy of control, is also important. Held and Durlach (1992) noticed that when an individual's behavior does not immediately impact the VE, social presence is diminished. Another aspect of control discussed by B. G. Witmer and Singer relates to an individual's anticipatory state, those who can accurately anticipate what will occur next in the VE will experience greater degrees of presence (Held & Durlach). Learning how to interact with a VE could impact one's level of presence with that VE. In VEs where individuals can interact in natural, known, and practiced manners, people will experience more presence than individuals who are undergoing a learning curve to determine how to interact within the VE (Lombard & Ditton, 1997). The last aspect of the control factor deals with the physical environment modifiability. In essence, as an individual's ability to physically manipulate objects within one's environment increases, so does that individual's perception of presence within that environment (Sheridan, 1992).

The second factor of presence discussed by B. G. Witmer and Singer (1998) consists of sensory factors within the environment. The first sensory factor, sensory modality, examines the type of sensory information an individual is experiencing whether visual or not. The second sensory factor, environmental richness, is based on Sheridan's (1992) notion that the more an individual receives appropriate sensory information, the more presence he or she will experience in the VE. Under this factor, VE is ultimately about sensory stimulation, so an environment with little sensory stimulation will create little presence. The more ways an individual's senses are stimulated, "the greater . . . the capability for experiencing presence" (B. G. Witmer & Singer, 1998, p. 229). However, Held and Durlach (1992) noted that multimodal information within a VE must also describe the VE in the same objective world or presence can be negatively affected. The fourth sensory factor involves the degree of movement perception, as "presence can be enhanced if the observer perceives self-movement through the VE, and to the extent that objects appear to move relative to the observer" (B. G. Witmer & Singer, p. 230). The last sensory factor of presence discussed by B. G. Witmer and Singer examined the extent to which an individual can control her or his relation of their sensors to the VE. The more active control an individual has over what he or she can see and hear within the VE, the more presence he or she will experience in that VE (Lombard & Ditton, 1997).

The third set of factors related to presence is what B. G. Witmer and Singer (1998) referred to as distraction factors. The more isolated an individual is from one's external environment, the more presence one will experience in the VE. Whether wearing head gear that projects a screen and blocks out external visual cues, or wearing a

headset that blocks out external auditory cues, the fewer external world distractions a VE user experiences the more present he or she will be in the VE. Although physically blocking out external cues via a headset is not always realistic, the degree to which an individual can naturally focus on the VE and block out cues in his or her external environment will also impact the degree of presence he or she experiences in the VE (Lombard & Ditton, 1997). Lastly, Held and Durlach (1992) believed that the more natural an individual's experience within a VE can be, the more presence one will experience. If interfacing with a VE involves interface devices that cause interaction within a VE to be encumbered, people's overall perception of presence will be diminished.

The last set of presence factors discussed by B. G. Witmer and Singer (1998) involve how real an individual perceives his or her VE. Scene realism incorporates the "connectedness and continuity of the stimuli being experienced" (p. 230). There are a number of factors that feed into whether a VE environment enables scene realism (e.g., content, texture, resolution, field of view, dimensionality). Furthermore, the extent to which the information presented within the VE must be consistent with how people view the real world and the experiences they have in the real world. The closer one's experience within the VE is to the real world, the more present that individual will feel while in the VE (Held & Durlach, 1992). The third realism factor involves an individual's meaningfulness of his or her experience within the VE. People who have deeply meaningful experiences in a VE will also have a stronger sense of presence within the VE. Lastly, people who experience high-presence levels within a VE will often explain that they have separation anxiety when returning to the real world. In essence, returning from the VE to the real world will cause people with higher presence perceptions to become disoriented as they come back to the real world (B. G. Witmer & Singer, 1998).

In a project designed to test B. G. Witmer and Singer's (1998) conceptualization of presence, the researchers found a negative relationship between presence and the degree to which a VE caused someone to become nauseous or disoriented. Individuals who experienced high levels of presence in a VE were also able to perform tasks at a greater level than people who experienced low levels of presence in the same VE. Lastly, individuals who experienced high levels of presence in a VE had greater spatial ability than people who experienced low levels of presence in the same VE. In a study conducted by Nicovich, Boller, and Cornwell (2005) individuals in interactive VEs reported higher levels of presence than people who were in VEs that caused them to experience the VE as a single individual without interaction. This study also validated the necessity for environmental realism. The researchers found that the more vivid a VE was the more presence the individuals within that environment experienced.

Communication Apprehension

The most commonly used definition for communication apprehension comes from McCroskey (1977), where he defined communication apprehension as "an individual's level of fear or anxiety associated with either real or anticipated

communication with another person or persons” (p. 78). From 1977 to 1997 when Daly, McCroskey, Ayres, Hopf, and Ayres released the second edition of *Avoiding Communication: Shyness, Reticence, and Communication Apprehension*, communication apprehension became the single most researched concept in the field of communication studies. Yet, only recently have people started to turn attention to the effect that communication apprehension may have on CMC. A variety of researchers have looked at a number of factors related to anxiety caused as a result of computers: computer anxiety (Cambre & Cook, 1985; Laguna & Babcock, 1997); computerphobia (Hudiberg, 1990; Weil, Rosen, & Wugalter, 1990); technostress (Champion, 1988); and technophobia (DeLougherty, 1993). With the onslaught of CMC technologies in our society, recent researchers have also started to examine how communication apprehension relates to CMC processes.

Patterson and Gojdydz (2000) examined the relationship between computer anxiety, communication apprehension, writing apprehension, receiver apprehension, and three modes of CMC (e-mail, chat, and web-browsing). The researchers found that computer anxiety positively related to communication apprehension, writing apprehension, and receiver apprehension and negatively to the three modes of CMC. Communication apprehension was also positively related to writing apprehension and receiver apprehension but was not related to any of the three modes of CMC. In essence, even though computer-mediated communicative activities like e-mail and chatting are primarily writing-based communication styles, writing apprehension was not related to them. Thus, communication apprehension and writing apprehension do not offer explanatory reasons for who will and will not be likely to engage in computer-mediated communicative activities. Based on these results, an individual's temperament may be a stronger predictor in determining who will and will not engage in CMC behaviors.

Another study by Scott and Rockwell (1997) set out to examine the effect that an individual's communication apprehension has on the likelihood of using a variety of new communication technologies. The results from this study found a minimal negative relationship between communication apprehension and the likelihood of using online services but did not find a relationship between communication apprehension and the likelihood of using other forms of computer technology (e-mail, electronic discussion groups, CD-Roms, & computer/ video conferencing). Furthermore, writing apprehension was not found to be related to any of the computer technologies at all; while computer anxiety was negatively related to all the forms of new computer technology. This study further illustrated that the traditional notions of communication apprehension as a strong predictor of apprehension across communicative contexts may not hold true for computer-mediated communication.

In a third study examining the effects of apprehension on CMC, Neumann and Pugliese (2000) actually attempted to create a 32-item scale for measuring what they called Computer-Mediated Communication Apprehension (CMCA). Ultimately, Neumann and Pugliese's scale for measuring CMCA ended up not measuring anything that remotely looked like communication apprehension at all. Instead, the

researchers ended up with a five-factor model: keeping up with advances, valence toward e-mail and computers, privacy, stress and isolation, and trust and credibility. While a few of the items on the scale were anxiety related, none of the items actually attempted to measure communication apprehension in the CMC context.

Study Purpose

The goal of this study was to determine if the proposed model (Figure 1) is an accurate depiction of the relationships between the study variables. The first part of the model is the creation of a latent variable with three indicators (e-mail apprehension, chatting apprehension, and instant messaging apprehension). Patterson and Gojdydz (2000) found that computer anxiety related to the amount of e-mail and chatting (IMing was not studied). However, the researchers did not find a relationship between communication apprehension and the two CMC modes. For this reason, CMC apprehension appears to function differently from communication apprehension, so

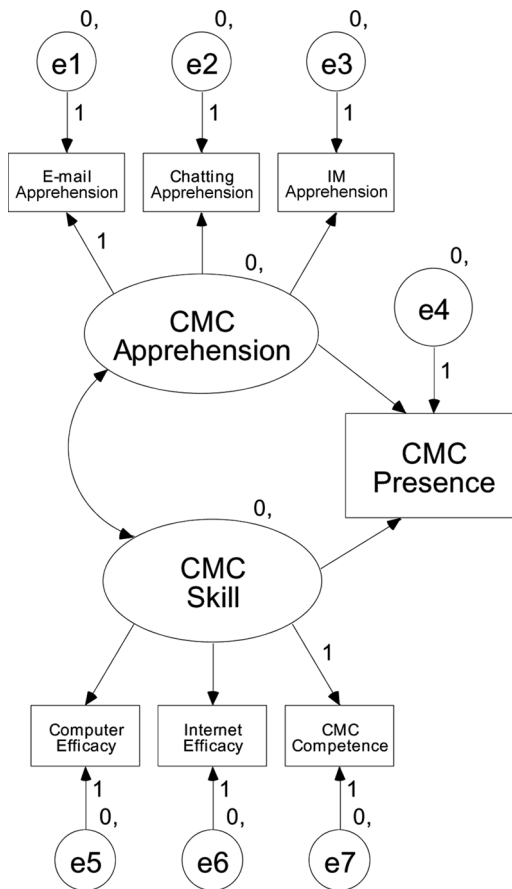


Figure 1 Structural-Equation Model.

examining the three-factor approach (e-mail, chatting, and IMing) to come up with an overall latent variable for CMC apprehension makes sense.

RQ₁: Will the three-factor approach (e-mail, chatting, and IMing) create a reliable and valid measure for examining the latent variable CMC apprehension?

The second major component of our predictive model is the creation of an exogenous variable, which has been labeled CMC skill. The CMC-skill variable is the combination of three endogenous indicators (CMC competence, Internet efficacy, and computer efficacy). The structure from this model primarily stems from Spitzberg's (2001) model for CMC competence. Based on Spitzberg's notion that skill is inherently necessary for CMC competence, one would expect that computer efficacy and Internet efficacy are highly related concepts (Eastin & LaRose, 2000), so we would expect that these two would also be related to CMC competence. While the Wrench (2004) scale for CMC competence measures the degree to which individuals perceive themselves as competent communicating using the computer in a number of situations, the current study is proposing that both efficacy (computer and Internet) and perceived CMC competence are factors that enable someone to be skillful communicating using a computer. Further justification for this hypothesis comes from Rubin, Martin, Bruning, and Powers (1993) who found that in FtF communication there is a positive relationship between perceived self-efficacy and communication competence.

RQ₂: Will the three-factor approach (CMC competence, Internet efficacy, and computer efficacy) create a reliable and valid measure for examining the exogenous variable CMC skill?

With the creation of the two variables CMC apprehension and CMC skill, one can surmise that the relationship between the two would be negative. Previous research by McCroskey, Burroughs, Daun, and Richmond (1990) found a negative relationship between communication apprehension and self-perceived communication competence. While the new variable "CMC skill" is not communication competence, the new variable does embody Spitzberg's (2001) notion of communication competence. For this reason, we are predicting that the two variables will be negatively correlated in this study as well.

The last endogenous variable in our proposed model is presence. As B. G. Witmer and Singer (1998) proposed, one of the factors of social presence is control. One of the basic facets of anxiety is that it causes people to feel innately out of control (Richmond & McCroskey, 1995). Furthermore, anxiety causes a person to focus internally on their anxiety, prohibiting them from attending to external stimuli in the environment. For this reason, people who have CMC apprehension will probably not be able to attend appropriately to sensory information, decreasing the amount of presence experienced in the virtual environment. In essence, we expect that CMC apprehension will relate negatively to presence in our model.

As for the relationship between the CMC-skill exogenous variable and presence, we expect this relationship to be positive. Research has already demonstrated that

CMC competence (Wrench, 2004), Internet self-efficacy (Eastin & LaRose, 2000), and computer self-efficacy (Compeau & Higgins, 1995) increase with time and exposure. B. G. Witmer & Singer (1998) believed that learning how to interact within a virtual environment increases an individual's overall perception of presence within the virtual environment. Furthermore, all four of B. G. Witmer and Singer's factors of presence can be increased with exposure and learning within the virtual environment. For this reason, we expect that there will be a positive relationship between CMC skill and presence.

Based on previous literature, we proposed the following hypotheses:

- H₁: There is a negative relationship between CMC apprehension and CMC skill.
- H₂: There is a positive relationship between CMC skill and CMC competence.
- H₃: There is a negative relationship between CMC apprehension and CMC presence.
- H₄: There is a positive relationship between CMC skill and CMC presence.

Method

Participants

The sample consisted of 145 undergraduates in introduction to communication courses at a large southwest university. The sample consisted of 81 (55.9%) females, 63 (43.4%) males, and 1 (.7%) who did not answer the biological sex question. The average age for the sample was 20.91 ($SD = 2.11$) ranging from 18 to 31. Participants were approached during class and received extra credit for filling out the survey.

Measurement

CMC apprehension scales

For the purpose of this study, three new CMC apprehension scales were created based on Richmond, Smith, Heisel, and McCroskey's (1998) Fear of Physician scale. The Fear of Physician scale is a simple five-item scale that measures the degree to which an individual is apprehensive while communicating with her or his physician. In this study, we retooled the five items to examine the degree to which an individual is apprehensive while e-mailing, chatting, or instant messaging. Each of the three newly devised scales was factor analyzed to make sure the retooling did not alter the scale reliability and structure. Because Richmond et al.'s (1998) Fear of Physician scale had not been utilized in other contexts, we felt it was necessary to determine if the scale would factor the same across the three contexts. To determine this, the three factors were analyzed separately in the same fashion Richmond et al. used in their study by utilizing a series of principal component analyses. Table 1 consists of the factor structures, alpha reliabilities, means, and standard deviations of the three CMC Apprehension Scales. The E-mail Apprehension scale had only one eigenvalue over 1, which accounted for 67.71% of the variance in the scale ($\alpha = .88$; $M = 9.43$; $SD = 3.34$). The Chatting Apprehension Scale had only one eigenvalue over 1, which

Table 1 Factor Analysis of Apprehension Scales

Apprehension items	Factor loadings for each scale
E-mail Apprehension $-\alpha = .88$ ($M = 9.43$; $SD = 3.34$)	
When communicating using e-mail, I feel tense.	.80
When communicating using e-mail, I feel calm.	.80
When communicating using e-mail, I feel jittery.	.85
When communicating using e-mail, I feel nervous.	.87
When communicating using e-mail, I feel relaxed.	.80
Chatting Apprehension $-\alpha = .91$ ($M = 11.43$; $SD = 4.25$)	
When communicating in a chat room, IRC, or MUDD, I feel tense.	.82
When communicating in a chat room, IRC, or MUDD, I feel calm.	.67
When communicating in a chat room, IRC, or MUDD, I feel jittery.	.72
When communicating in a chat room, IRC, or MUDD, I feel nervous.	.78
When communicating in a chat room, IRC, or MUDD, I feel relaxed.	.68
Instant-Messaging Apprehension $-\alpha = .91$ ($M = 9.06$; $SD = 3.62$)	
When communicating using an Internet-messaging program, I feel tense	.80
When communicating using an Internet-messaging program, I feel calm.	.68
When communicating using an Internet-messaging program, I feel jittery.	.73
When communicating using an Internet-messaging program, I feel nervous.	.79
When communicating using an Internet-messaging program, I feel relaxed.	.71

Note: MUDD stands for Multi-User Dungeon, Domain, or Dimension

accounted for 73.62% of the variance in the scale ($\alpha = .91$; $M = 11.43$; $SD = 4.25$). The Internet Messaging Apprehension Scale had only one eigenvalue over 1, which accounted for 74% of the variance in the scale ($\alpha = .91$; $M = 9.06$; $SD = 3.62$).

CMC competence scale

The Computer-Mediated-Communication Competence Scale was created by Wrench (2004) as a retooling of Wiemann's (1977) Communication Competence Scale. The Computer-Mediated-Communication Competence Scale consists of 16 Likert-type items ranging from 1 *strongly disagree* to 5 *strongly agree*. The CMC Competence Scale had an alpha reliability of .91 ($M = 59.44$; $SD = 9.15$). To receive an overall perception of CMC Competence, the 16 items on the CMC Competence Scale are summed to create one score. Higher reported scores on the CMC Competence Scale correspond with higher perceptions of CMC competence.

Presence questionnaire

The Presence Questionnaire was created by B. G. Witmer and Singer (1998) to examine the degree to which an individual feels present in mediated interactions. The scale consists of 32 Likert-type questions range from 1 *strongly disagree* to 5 *strongly agree*;

8 of the items on the Presence Questionnaire were not used in the final analysis, so the scale only had 24 items used to measure Social Presence. The validity of the Presence Questionnaire has been earlier explored (Slater, 1999; B. G. Witmer & Singer, 1999). The Presence Questionnaire had an alpha reliability of .90 ($M = 55.87$; $SD = 9.12$). Scores on the Presence Questionnaire are coded to indicate that higher scores represent people who are more engaged in the mediated environment.

Internet self-efficacy

The Internet Self-Efficacy Scale was created by Eastin and LaRose (2000) to measure an individual's perception of his or her skill using the Internet. The scale consists of 11 Likert-type items ranging from 1 *strongly disagree* to 5 *strongly agree*. The Internet Self-Efficacy Scale had an alpha reliability of .89 ($M = 24.66$; $SD = 6.51$). Scores on the Internet Self-Efficacy Scale are coded to indicate that higher scores represent people who have greater Internet skills in a variety of capacities.

Computer efficacy

The Computer Efficacy Scale was created for the purpose of this study to examine the confidence an individual has when using computers. Ten items were created to examine an individual's perception of his or her computer skill. The ten items were measured utilizing a Likert-type range from 1 *strongly disagree* to 5 *strongly agree*. To test the dimensionality of the ten items, a Principle Component Analysis was conducted (Table 2). We utilized a Principle Component Analysis without a factor rotation because this method is generally viewed as the most common method for determining exploratory factorial validity (Bryant & Yarnold, 1995). There was only one eigenvalue over 1, which accounted for 56.50% of the variance. The Computer Efficacy Scale had an alpha reliability of .91 ($M = 32.20$; $SD = 7.32$). Scores on the Computer Efficacy Scale are coded to indicate that higher scores represent people who have greater computer skills in a variety of capacities.

Table 2 Factor Analysis of the Computer Efficacy Scale

Scale item	Factor loading
1. I make mistakes when I use the computer.	.50
2. Using my computer is easy.	.73
3. Everyone else knows what they are doing on the computer, but not me.	-.81
4. I am good with computers.	.77
5. I understand how my computer works.	.80
6. I feel stupid using my computer.	-.78
7. I just don't understand my computer.	-.81
8. When something goes wrong with my computer, I can always fix.	.65
9. I know less about computers than most people.	-.79
10. I know I am good on the computer.	.82

Data Analysis

In order to examine the research questions and hypotheses posed in this study, the most parsimonious statistical tool available is the structural-equation model (Klem, 2000; Thompson, 2000). Specifically, we tested whether e-mail apprehension, chatting apprehension, and instant-messaging apprehension create a latent variable we termed CMC apprehension. Furthermore, we used CMC competence, Internet efficacy, and computer efficacy as endogenous indicators of the endogenous variable CMC Skill. Lastly, we utilized the endogenous variable CMC presence. Ultimately, we looked at the interrelationships between the latent variable CMC Apprehension and the two endogenous variables CMC Skill and CMC Presence. We also examined the relationship between CMC Skill and CMC Presence. The hypothesized model can be seen in Figure 1.

Results

The goal of this project was to establish a structural-equation model for examining three types of computer-mediated-communication apprehension (e-mail apprehension, chatting apprehension, and instant-messaging apprehension), the three computer-mediated-communication variables (CMC competence, Internet efficacy, and computer efficacy), and CMC presence. Table 3 has the Pearson product moment correlations for the variables in this study.

While we proposed a series of research questions and hypotheses, the most parsimonious way to examine them is to utilize a structural-equation model (Klem, 2000; Thompson, 2000). Using structural-equation modeling, the relationships were examined between computer-mediated-communication apprehension, a latent variable with three indicators (e-mail apprehension, chatting apprehension, and instant-messaging apprehension), and the exogenous variable CMC Skill, which had three endogenous indicators (CMC competence, Internet efficacy, and Computer efficacy), along with the endogenous variable presence. The hypothesized model is presented in Figure 1. Circles represent latent variables, and rectangles represent measured variables. Absence of a line connecting variables implies lack of a hypothesized relationship. The structural-equation model was calculated using AMOS version 4.0. Results indicated that the proposed structural model fit the data quite well, χ^2 (12, $N = 145$) = 41.99, $p < .0005$. All the goodness-of-fit indices far exceeded the recommended levels: normed fit index (NFI) = .99, comparative fit index (CFI) = .99, relative fit index (RFI) = .97, incremental index of fit (IFI) = .99, and the Tucker-Lewis index (TLI) = .98. All of the indices of fit were over the .95 mark recommended by Byrne (2001), which indicates that the model proposed is a superior fit. The structural-equation model with standardized estimates can be seen in Figure 2.

Discussion

The primary goal of this article was to examine the proposed model in Figure 1, exploring the relationship between computer-mediated-communication (CMC)

Table 3 Simple Correlations

	Computer efficacy	E-mail apprehension	Chatting apprehension	Instant-messaging apprehension	CMC competence	Internet efficacy
Computer Efficacy						
E-mail Apprehension	-.27**					
Chatting Apprehension	-.29**	.46***				
Instant-Messaging Apprehension	-.32***	.65***	.67***			
CMC Competence	.02	-.29***	-.29**	-.40***		
Internet Efficacy	.65***	-.20*	-.15	-.18*	.11	
CMC Presence	.33***	-.08	-.31**	-.27**	.23**	.37***

* $p < .05$; ** $p < .005$; *** $p < .0005$.

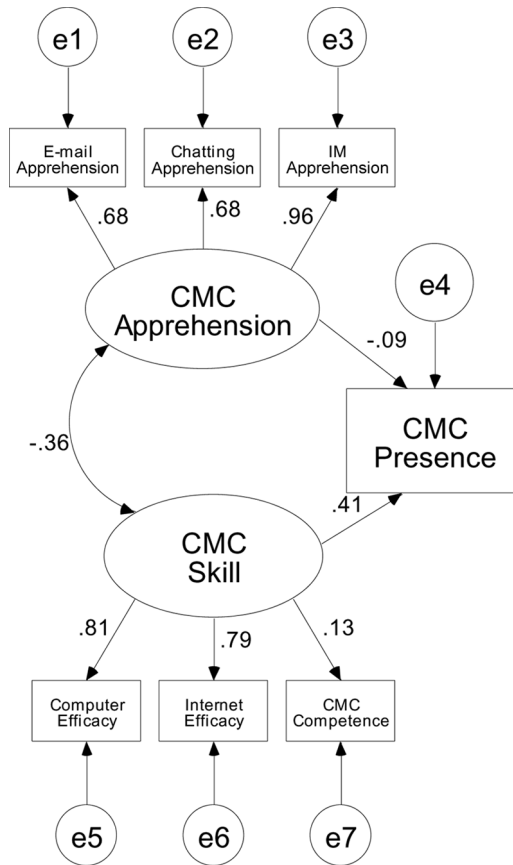


Figure 2 Structural-Equation Model with Standardized Estimates.

apprehension (e-mail, chatting, and IM), CMC skill (computer efficacy, Internet efficacy, and CMC competence), and presence. To analyze the results from this study, we will examine the two created variable results first, followed by an examination of the study relationships.

Created Variables

CMC apprehension

The first part of the model created a latent variable with three indicators (e-mail apprehension, chatting apprehension, and instant-messaging apprehension). Using Richmond, Smith, Heisel, and McCroskey’s (1998) Fear of Physician scale, three scales were created to measure the three factors of CMC apprehension. Based on the correlational results, the three factors were related to each other at .46 and higher, indicating that the three types of CMC apprehension are related to each other. The correlational results are further validated in the structural-equation model, which had the standardized estimates for each of the three factors relating to CMC apprehension

at .68 (e-mail), .68 (chatting), and .96 (IM). With loadings such as those seen in this study, the three factors clearly can be combined together to measure the latent variable CMC apprehension. While the Patterson and Gojdcyz (2000) study found that computer anxiety related to the amount of e-mail and chatting, this study did find a strong relationship between e-mail, chatting, and IMing communication apprehension. Furthermore, although Patterson and Gojdcyz did not find a relationship between communication apprehension and e-mail and chatting frequency, the current study showed that the traditional verbal notion of communication apprehension is not appropriate for studying communication apprehension in the CMC context.

CMC skill

The second major component of our predictive model was the creation of an exogenous variable, which was labeled CMC skill. The CMC skill variable is the combination of three endogenous indicators (CMC competence, Internet efficacy, and computer efficacy). Although Internet efficacy and CMC competence were previously developed scales (Eastin & LaRose, 2000; Wrench, 2004), the Computer Efficacy scale was not. For this reason, a ten-item scale was created for use in this study. The newly developed scale was a single factor accounting for 56.50% of the variance, which is considered very good (Tabachnick & Fidell, 2001). Computer efficacy was found to be positively correlated to both Internet efficacy and CMC presence, while being negatively correlated with all three forms of CMC apprehension. However, computer efficacy was not found to be positively related to CMC competence. In fact, neither computer efficacy nor Internet efficacy were found to be related to CMC competence. In the creation of the exogenous variable, CMC skill, CMC competence related to CMC skill at .13; whereas computer efficacy related to CMC skill at .81 and Internet efficacy related to CMC skill at .79. Based on this result, two possible causes for this finding need to be discussed.

The first possible cause for the low loading of CMC competence on CMC skill could be due to the retooling of Wiemann's (1977) communication competence scale done by Wrench (2004). If this is the case, then Wiemann's conceptualization of communication competence may not be appropriate for examining communication competence outside of face-to-face (FtF) relationships. Simply put, Wiemann's scale was designed for traditional human interaction, and the CMC context is distinctly different (Barnes, 2003).

A second possible explanation for this finding is that Spitzberg's (2006) link between skill and competence may not necessarily be true in this case. It is theoretically plausible that an individual could be a competent communicator online and not have high levels of either computer or Internet efficacy. And unlike the results found by Rubin et al. (1993), who found that in FtF communication there is a positive relationship between perceived self-efficacy and communication competence, the nature of efficacy may have to do with the concept of self-efficacy. In the Rubin et al. study, the researchers examined how self-efficacy of communication in interpersonal relationships related to self-perceived communication competence. In this

study, we attempted to equate efficacy of communication with efficacy of technology (both computer and Internet) that may not make sense. However, the previous finding from Eastin and LaRose (2000) indicating a relationship between Internet efficacy and social outcome expectancy is problematic. Previous research has shown that both computer and Internet efficacy relates to future intentions to use the technology (Compeau & Higgins, 1995; Eastin & LaRose, 2000). However, actually impacting the nature of CMC communicative relationships appears to be more a function of competence than efficacy. While the current study cannot give a definite answer for the relationships found in this study, we do believe that technological efficacy and CMC competence may not be related as discussed by Spitzberg (2006).

Study Relationships

The basic purpose of this study was to examine the relationships between CMC apprehension, CMC skill, and CMC presence. The first major relationship found was a negative relationship ($-.36$) between CMC apprehension and CMC skill, as was expected. Although the negative relationship between CMC apprehension and CMC skill can only be partially explained by the previous relationship established between communication apprehension and self-perceived communication competence (McCroskey, Burroughs, Daun, & Richmond, 1990), another explanation for this relationship is needed. One simplistic explanation for this finding is that participants used in this study were college students. These participants who are CMC apprehensive may also be technophobic and simply less likely to interact with computers and the Internet, preventing them from developing any level of perceived technological self-efficacy. Conversely, participants who have low levels of CMC apprehension may be more likely to engage computers and Internet technology and to develop a sense of self-efficacy about the technology along the way. More information about the college students' computer practices would help explain their CMC behaviors (Punyanunt-Carter & Hemby, 2006).

The second major relationship in this study examined the direct-path relationship between CMC apprehension and CMC presence. Although it was originally hypothesized that CMC apprehension would negatively relate to CMC presence, the actual relationship was so small ($-.09$) to make the relationship meaningless. However, the correlational analysis did indicate that CMC presence was negatively related to both chatting apprehension and IM apprehension, but not to e-mail apprehension. One possible explanation for this finding could be the covering relationship between CMC apprehension and CMC skill. In fact, if the covering relationship is discounted, the relationship between CMC apprehension and CMC presence would be $-.15$; still very small, but more consistent with the correlations. However, this alteration would not have been as good a fit with the model data as the one shown in Figure 2. For this reason, we must surmise that a clear relationship between CMC apprehension and CMC presence does not exist.

The last relationship in this study is the positive path coefficient between CMC skill and CMC presence ($.41$). This positive relationship could be an indication that

with time spent using and getting acquainted with CMC technology, people learn how to become more present in a CMC interaction than someone who has not spent the time using and getting acquainted with CMC technology. Ultimately, this finding could be an offshoot from the research conducted on CMC competence (Wrench, 2004), Internet self-efficacy (Eastin & LaRose, 2000), and computer self-efficacy (Compeau & Higgins, 1995), indicating that as people use the technology more they perceive themselves as being more CMC competent, having greater Internet self-efficacy, and greater computer self-efficacy. If this is the case, then B. G. Witmer and Singer's (1998) belief that learning how to interact within a virtual environment does in fact increase an individual's overall perception of presence within the virtual environment.

Limitations

As with any study, this study has a handful of limitations that need to be addressed to aid in the understanding of what the results actually entail. The first is that the sample consisted solely of traditional college-age students. Most of the participants in this study grew up with computers and have been online a good deal of their lives. Since the technology is so commonplace to them, it is possible that people who are not as comfortable with the technology would report higher levels of CMC apprehension than those found in this study, which could ultimately affect the way that CMC apprehension relates to both CMC skill and CMC presence.

One limitation that was noted later in this study was the lack of data correlating the newly created CMC apprehension factors (e-mail, chatting, and IM) with the traditional notion of communication apprehension. This is also an area that should be examined in the future when looking at the impact that CMC apprehension has on the computer-mediated interactive environment.

A third limitation invokes the concept of access. Although CMC is increasingly becoming more prominent within the U.S. culture, many groups simply do not have access (Pew Internet and American Life Project, 2004). Even within the survey sample, access was not a variable measured, so the impact of access prior to the study could impact the results.

Future Research

Future research in the area of CMC skill, CMC apprehension, and CMC presence should focus on how the variables interact with other communication variables. For example, when developing romantic relationships online, all three variables could impact the likelihood that an individual will be able to successfully manage a romantic relationship in a virtual environment. Furthermore, a clearer scale needs to be developed to measure CMC self-efficacy similarly to how the Rubin, Martin, Bruning, and Powers (1993) examined self-efficacy in interpersonal relationships. In fact, CMC self-efficacy may ultimately end up being a better fit within the model

used in this study instead of CMC competence in the creation of the exogenous variable CMC skill.

Conclusion

A lot has happened since Rice and Boan (1985) first brought the burgeoning area of computer-mediated communication to the forefront of the human communication field. Although much of the research in the area of CMC during the first 20 years has focused on how humans interact with CMC technology, increasingly CMC research is coming out of its “media niche” and being studied by individuals who are more attuned with other aspects of human communication and see CMC as a new niche for studying communication concepts that have long been exhausted in face-to-face communication. While the future for CMC research is not clear, CMC has definitely become a normalized part of many people’s lives.

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