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Developing and Validating Feedback and Coherence Measures in Computer-Mediated Communication

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Developing and Validating Feedback and Coherence Measures in Computer-Mediated Communication

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Abstract: Interpersonal persuasion is definitionally distinguished from broadcast persuasion by the presence of anticipated personal feedback and message coherence. Distinguishing interpersonal from broadcast messages in computer-mediated communication (CMC) may be an important individual tactic for avoiding information overload and filtering spam; however, we found no existing measures suitable for assessing these factors in CMC. This deficiency motivated the present study to develop and validate feedback and coherence questionnaire measures and conduct an initial test of the relevance of these measures to CMC. The measures met recommended criteria for content validity, construct validity, reliability, and predictive validity. In addition, the measures predicted most of the variance in social presence subjects perceived in our test messages and entirely mediated effects of whether the purported message sender was known or unknown to our subjects. These findings suggest feedback and coherence are important antecedents to persuasion in email, texting, instant messaging and similar forms of CMC.

Keywords: Persuasion, influence, interpersonal communication, broadcast communication, mass communication, email, texting, computer-mediated communication (CMC).

I. INTRODUCTION

As information technologies (IT) mature, understanding user interactions with IT has become a major focus of information systems (IS) research and an essential part of technology design [Tractinsky, 2005]. In this paper, we draw from structural definitions of interpersonal and broadcast (mass) persuasion to develop new measures of individuals' reactions to persuasive messages that they receive via computer-mediated communications, such as email, instant messaging, or online texting. These textual forms of computer-mediated communication (hereafter referenced simply as *CMC*) are frequently applied to influence intentions and behavior of message receivers [Elron and Vigoda-Gadot, 2006], and significant research has been conducted to understand persuasion tactics and their effects in CMC [Abele, 2011; Janneck and Staar, 2011; Wilson, 2003] and to predict message persuasiveness based on system features [Wilson, 2005], message receivers' goals [Wilson and Lu, 2008], and involvement and social presence [Fortin and Dholakia, 2005].

We approach the study of persuasion in CMC from a different perspective, one which has previously received little attention and has not, to our knowledge, been studied empirically. We question whether the persuasiveness of CMC messages may be based on the receiver's evaluation of the message as interpersonal or broadcast in form. In order to answer this question we find it is necessary to construct measures that can reliably assess individual perceptions that distinguish between interpersonal and broadcast CMC messages.

In the following sections we first provide the background for our study and explain why creating perceptual measures to distinguish between interpersonal and broadcast CMC messages is interesting and important. We then describe how our measures were developed, refined, and validated, and we present an initial test to demonstrate whether the measures are relevant to CMC research. We conclude with a discussion of the findings and their implications as well as suggesting several directions for future research.

II. BACKGROUND

Most communication media are structurally biased toward primarily supporting interpersonal or broadcast modes of communication. For example, face-to-face and telephone media primarily support interpersonal communication, i.e., interactive communication between two or more interdependent people [Devito, 2010]. Television, radio, and print media primarily support broadcast communication, i.e., non-interactive, one-way communication that typically is designed to address a mass audience.

However, email, instant messaging, online texting, and similar forms of CMC ubiquitously support both interpersonal communication, such as corresponding with a friend, and broadcast communication, such as reading a newsletter delivered via email [Reardon and Rogers, 1988]. As a result, when categorized on objective impersonal-personal characteristics, CMC occupies the approximate midpoint between broadcast communication media and interpersonal communication media [Hoffman and Novak, 1996]. There also is evidence that CMC users consider the ubiquitous nature of CMC in their subjective assessments of this medium. Rice [1992, 1993] reports that users perceive the CMC medium to be intermediate to interpersonal media and broadcast media in the level of support it provides for social cues.

Managing messages is an important issue, in general, due to the information overload CMC increasingly presents to users [Bellotti et al., 2005]. In addition, many CMC messages are persuasive, i.e., they ask users to comply with some request, such as buying a product or service, completing a survey, or making a pledge, thus requiring receivers to make evaluative decisions. Because both interpersonal and broadcast persuasive messages are communicated via CMC, there is greater cause for individuals to evaluate the interpersonal/broadcast characteristics of each message they receive via CMC than is the case with most other media where the communication mode is obvious.

Managing persuasive messages in CMC is complicated by the fact that many are of the message category generically referred to as spam, including deceptively addressed spoofed messages and fraudulent phishing messages which attempt to collect private information from receivers. Because most CMC users want to avoid messages that are time-wasting, deceitful, or fraudulent, software designers have developed elaborate algorithms to automatically filter out spam based on whether the message appears to be broadcast in origin [Tseng et al., 2011]. This leads to the interesting question of whether CMC users subjectively filter messages in a similar manner. If this is the case, then it may be possible to predict and explain individuals' reactions to CMC persuasive messages by their perception of messages as having primarily interpersonal or broadcast characteristics.

Interpersonal Persuasion vs. Broadcast Persuasion

Interpersonal and broadcast modes of persuasion¹ are distinguished by two key characteristics: anticipated personal feedback (hereafter referenced as *feedback*) and message coherence (hereafter referenced as *coherence*). Reardon [1991, p. 112] writes:

Interpersonal persuasion occurs when two or a few people interact in a way that involves verbal and nonverbal behaviors, personal feedback, coherence of behaviors (relevance or fit of remarks and actions), and the purpose (on the part of at least one interactant) of changing the attitudes and/or behaviors of the other(s). This definition separates interpersonal persuasion from mass media persuasion, in which personal feedback and coherence are not present.

Feedback is the perception that there is opportunity for the message receiver to respond to the message and receive a reply from the sender. Coherence is the perception that the sender's message is relevant to the receiver's situation [Reardon, 1991].

Cognitive Filtering of Persuasive Messages

Research conducted in advertising contexts generally finds interpersonal messages to be more persuasive than broadcast messages [Buttle, 1998]. For example, word of mouth communication has been shown to be more persuasive than broadcast messages such as advertising [Sheth, 1971] or printed resources such as *Consumer Reports* (Herr et al., 1991). These findings are due at least in part to a cognitive filtering process occurring in communication exchanges between message senders and receivers that results in broadcast media receiving less attention than interpersonal messages. Ducoffe and Curlo [2000, p. 248] write:

“For an exchange to occur, an advertisement must be processed with sufficient effort so that the receiver comes away with at least some appreciation of the message intended by the sender. By this standard, the vast majority of advertisements that are ignored or dismissed can be viewed as ineffective or failed communications exchanges.”

Although Ducoffe and Curlo studied communication exchange in the context of advertising, we anticipate cognitive filtering by message receivers occurs similarly in the general use of CMC, as receivers have incentive to filter out and avoid those messages that they do not desire. One implication of findings that interpersonal messages are generally more persuasive than broadcast messages is that people tend to selectively filter based on feedback and coherence characteristics that distinguish interpersonal and broadcast modes. In the following sections we investigate the background literature that supports the proposition that feedback and coherence play important roles within the persuasion process.

Feedback and Persuasion

To the best of our knowledge, effects of anticipated personal feedback in the persuasion process have not been studied directly, however, the importance of feedback is implied by findings in several closely related research streams. The simple offer of personal feedback has been shown to increase response rates to online surveys [Marcus et al., 2007], and online interactivity with humans or computer programs has been found to increase enjoyment [Jiang and Benbasat, 2007] and feelings of social presence [Fortin and Dholakia, 2005] among users. In addition, online mechanisms that support interpersonal recommendation feedback help to build trust in large web organizations, such as eBay [Dellarocas, 2003], persuading users to assume the risk of transacting with strangers [Ba and Pavlou, 2002]. Findings from these related literature streams suggest feedback can play an important role in the persuasion process.

Coherence and Persuasion

We follow Reardon's [1991] definition of coherence as the perception that a message has personal relevance to the receiver. Personal relevance is known to contribute to persuasiveness through its impact on involvement. “In the advertising domain, involvement is manipulated by making the ad ‘relevant:’ the receiver is personally affected, and hence motivated, to respond to the ad” [Zaichkowsky, 1985, p. 342], and in general communication, “When personal relevance is high, people are more motivated to scrutinize issue-relevant arguments” [Reardon, 1991, p. 69]. In addition, personal relevance forms the basis for distinguishing the dual routes to persuasion described in the well-

¹ Fogg [2008] has identified mass interpersonal persuasion (MIP) as an emerging phenomenon in which individuals use online social networks to persuade a mass audience interactively. MIP does not directly impact our objective of developing perceptual measures to distinguish interpersonal and broadcast modes of persuasion in CMC, however, we note that these measures, once developed, may be highly relevant to MIP research

known elaboration likelihood model [Petty and Cacioppo, 1986]. This literature suggests coherence plays an important role in the persuasion process.

III. MEASURE DEVELOPMENT AND VALIDATION

Our research was conducted in three stages: 1) development of pilot measures, 2) assessment and refinement of pilot measures, and 3) validation of the completed measures, including a test that addresses the relevance of these measures to CMC research. The first stage was performed through conceptual analysis of feedback and coherence. Data for the second and third stages was gathered through two online studies. We applied procedures recommended by Clark and Watson [1995] to guide measure development and refinement and procedures proposed by Straub, Boudreau, and Gefen [2004] to guide validation of the completed measures. This section describes the procedure and results organized by stage number.

Stage 1: Development of Pilot Measures

Questionnaire items representing feedback and coherence were developed by one of the authors, who followed the objective of identifying items that represent the universe of content [Cronbach and Meehl, 1955] for each construct. Feedback and coherence are accepted characteristics distinguishing interpersonal persuasion from broadcast persuasion [Harjuma and Oinas-Kykkonen, 2007; Wilson, 2003, 2005], yet review of the literature failed to identify significant conceptual development or empirical assessment of these characteristics. Therefore, items were created based upon the definitions provided by Reardon [1991]. Feedback items emphasized the perception that the message is from a sender who would read and respond to feedback from the receiver. Coherence items focused on the perception that the message is relevant and well-aligned to interests of the receiver. Feedback and coherence are conceptualized as being reflective in composition, meaning that the item measures are expected to represent a unidimensional construct [Gefen et al., 2000].

Item creation applied the domain-referenced approach [Anderson, 1981] in which the target, direction, and intensity of each characteristic under study are carefully inspected to ensure that resulting measurement items and semantic transformations reflect the underlying category. Eight questionnaire items were created for each pilot measure (see Table 1) with the anticipation that the measures would be pruned during assessment and refinement of pilot measures.

Table 1: Pilot Measures
<p><i>Feedback Pilot Measure</i></p> <p>My feeling is that this message is: [Real/Artificial]</p> <p>If I replied to this message, my reply would be read. [Strongly Disagree/Strongly Agree]</p> <p>My feeling is that this message is: [Unresponsive/Responsive]</p> <p>If I replied to this message, the person who sent it would read my reply. [Strongly Disagree/Strongly Agree]</p> <p>My feeling is that this message is: [Distant/Close]</p> <p>My feeling is that this message is: [Unconcerned with me/Concerned with me]</p> <p>If I replied to this message to ask a question, someone would respond to answer my question. [Strongly Disagree/Strongly Agree]</p> <p>If I replied to this message to ask for a small change in the terms, my request would be met. [Strongly Disagree/Strongly Agree]</p>
<p><i>Coherence Pilot Measure</i></p> <p>For me, this message is: [Inappropriate/Appropriate]</p> <p>For me, this message is: [A misfit/A good fit]</p> <p>This message has personal relevance to me. [Strongly Disagree/Strongly Agree]</p> <p>For me, this message is: [Right for me/Wrong for me]</p> <p>For me, this message is: [Not pertinent/Pertinent]</p> <p>This is a message I am able to appreciate. [Strongly Disagree/Strongly Agree]</p> <p>For me, this message is: [Applicable/Not applicable]</p> <p>This message fits with my interests. [Strongly Disagree/Strongly Agree]</p>

All items were phrased to elicit a response of agreement or disagreement with the item, measured using a seven-position semantic differential scale. The seven-response format offers a reasonable trade-off between precision and ease of use [Comrey and Montag, 1982]. In tests with college student subjects, endpoint-marked scales have been found to produce equivalent responses to scales that have all categories marked [Dixon et al., 1984].

An online questionnaire was created to implement the pilot measures along with demographic questions. The questionnaire was designed to uniquely randomize the administration order of questions for each subject as recommended by Straub et al. [2004]. In addition, the questionnaire would redisplay on the subsequent screen any item for which the subject failed to enter a response, and it allowed subjects to continue on from the point they had completed in the questionnaire in the event that their Internet connection was disrupted or other events caused them to temporarily disconnect from the study.

Stage 2: Assessment and Refinement of Pilot Measures

An online study (Stage 2 Study) was conducted that asked subjects to evaluate three messages. The first two messages were an interpersonal message and a broadcast message that subjects were asked to recall from past experiences. The self-reflection involved in relating the descriptions of interpersonal and broadcast messages to their own experiences was designed to promote conceptual clarity and thereby render these message types as “concrete” in subjects’ minds [Rossiter, 2002]. The third message implemented the research treatment. The subjects were 78 students attending undergraduate business communications and information systems courses at a large university in the Midwest U.S. Gender distribution of subjects is 42 male and 36 female, with average age of 23 years.

Stage 2 Administration Procedure

Subjects who had signed up to participate in the Stage 2 Study were notified to begin via an email message that contained participation instructions and a hyperlink to access the online study. When subjects accessed the online questionnaire, they were first notified of their rights and responsibilities regarding participation and then asked demographic questions. Only records of subjects who completed the entire questionnaire were included in the Stage 2 Study dataset.

Subjects were then given the following instructions to recall an interpersonal request message they had received: *Interpersonal messages are defined as being relevant to your interests and sent by someone who is responsive to what you have to say. A phone call from a friend is one example of an Interpersonal message. Using this definition, think of a specific Interpersonal message that you have received in the past that requested you to do something.*

Subjects were not restricted in any way as to who sent them this message or the medium by which it was sent. After subjects described the topic and source of the message, they were asked to rate the message on items representing feedback and coherence.

Subjects were next instructed to recall a broadcast request message they had received:

Broadcast messages are not necessarily relevant to your interests or responsive to what you have to say. A television commercial is one example of a Broadcast message. Using this definition, think of a specific Broadcast message that you have received in the past that requested you to do something.

After subjects described the topic and source of the message, they were asked to rate the message on items representing feedback and coherence, as with the prior interpersonal message.

In the final part of the Stage 2 Study, a CMC request message treatment was presented in which the subject was told that he/she has received a new email message (see Figure 1). The message asked the subject to consider volunteering his/her time to help raise money to fund equipment purchases for the University men’s and women’s basketball teams by selling university logo attire. This message was designed to be relevant to subjects’ personal experiences as university students, and represented itself as being sent by a university student who was not known to subjects. After the subject viewed the message, he/she then rated it on the same measures as the previous messages.

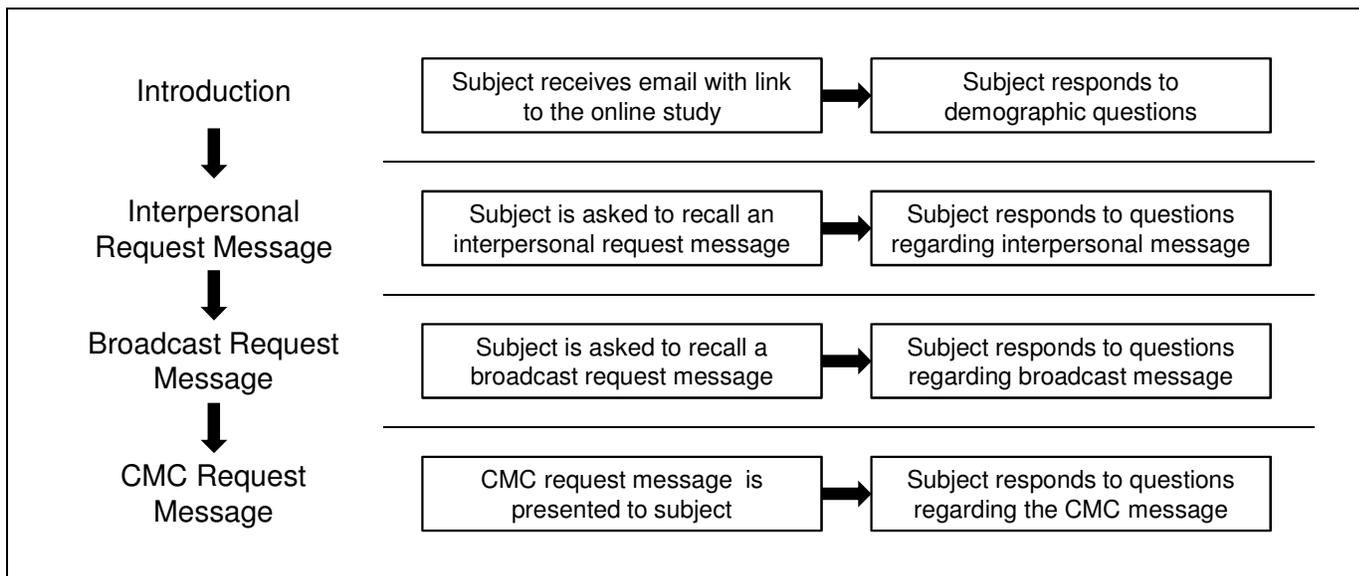


Figure 1: Administration procedure of Stage 2 and Stage 3 studies.

Item Pruning

Because item creation is inherently limited by the creators' experiences and subjective viewpoints, developers are urged to prune less-effective items from the overall pool of pilot items as guided by empirical testing [Clark and Watson, 1995]. Numerous strategies have been proposed to guide the pruning process. For example, Gable and Wolf [1993] recommend using item analysis procedures to prune items for which means deviate substantially from typical items in the measure, items for which standard deviations are low, items that do not contribute to measure reliability, and items that do not correlate reasonably well with the overall measure score. However, while intercorrelation and reliability among items that are assessed by such strategies are necessary, these conditions are not sufficient to ensure unidimensionality of constructs. Clark and Watson [1995] instead recommend using exploratory factor analysis (EFA) as the principal test to drive item pruning.

We conducted EFA on the Stage 2 Study data using Principal Components extraction with Varimax rotation (see Table 2). Three factors with eigenvalues larger than 1 were retained in the EFA, corresponding with our analysis of the scree plot of the data showing a leveling trend in the fourth and subsequent factors. An alternative EFA constrained to two factors was conducted. Cumulative variance explained in the two-factor EFA dropped to 65% versus 72% in the three-factor EFA. The ratio of subjects to items in this EFA was approximately 5:1, and communality averaged .72 across all items, a high level [MacCallum et al., 1999]. These characteristics indicate that our use of EFA was appropriate for this data set. As MacCallum et al. [2001, p. 636] write:

Our results also reinforce the evidence regarding the critical role of communality level, while demonstrating the limited value of traditional rules of thumb regarding sample size in factor analysis. For example, one common rule of thumb regarding sample size is that, to ensure stability of a factor solution, a researcher should have a ratio of subjects to variables that is 4:1 or larger. However, our results show that if communalities are high, recovery of population factors in sample data is normally very good, almost regardless of sample size, level of overdetermination, or the presence of model error.

Based on results of EFA, we pruned the feedback and coherence measures to four items each. Items were pruned that loaded strongly on Factor 3, which we interpret post hoc as the perception of the sender's feelings toward the receiver rather than anticipated personal feedback, or loaded on the unintended factor, e.g., the intended feedback item, "My feeling is that this message is: (Unconcerned with me/Concerned with me)" loaded on factor 1. Coherence factors with relatively low loadings on Factor 1 were pruned to reduce the measure to four items.

Table 2: Results of Exploratory Factor Analysis of Stage 2 Study Data*

<i>Feedback Pilot Measure</i>	1	2	3
My feeling is that this message is: [Real/Artificial]	.293	.326	.678
If I replied to this message, my reply would be read. [Strongly Disagree/Strongly Agree]	.110	.767	.327
My feeling is that this message is: [Unresponsive/Responsive]	.257	.288	.795
If I replied to this message, the person who sent it would read my reply. [Strongly Disagree/Strongly Agree]	.138	.781	.298
My feeling is that this message is: [Distant/Close]	.229	.210	.807
My feeling is that this message is: [Unconcerned with me/Concerned with me]	.658	.225	.295
If I replied to this message to ask a question, someone would respond to answer my question. [Strongly Disagree/Strongly Agree]	.051	.825	.309
If I replied to this message to ask for a small change in the terms, my request would be met. [Strongly Disagree/Strongly Agree]	.268	.785	-.041
<i>Coherence Pilot Measure</i>			
For me, this message is: [Inappropriate/Appropriate]	.668	.194	.437
For me, this message is: [A misfit/A good fit]	.868	.146	.269
This message has personal relevance to me. [Strongly Disagree/Strongly Agree]	.872	.182	-.012
For me, this message is: [Right for me/Wrong for me]	.799	-.077	.308
For me, this message is: [Not Pertinent/Pertinent]	.787	.091	.282
This is a message I am able to appreciate. [Strongly Disagree/Strongly Agree]	.710	.332	.246
For me, this message is: [Applicable/Not Applicable]	.811	.074	.167
This message fits with my interests. [Strongly Disagree/Strongly Agree]	.840	.185	.016
<i>Rotation Sums of Squared Loadings (Eigenvalues)</i>	5.83	3.04	2.65

* Principal Component Analysis extraction; Varimax rotation with Kaiser normalization; KMO measure = .876; bolding indicates the item was retained following analysis

The decision regarding the size of our measures for subsequent administration took into consideration the trade-off between the statistical need for adequate overdetermination, i.e., that each construct should be defined by multiple measurement items [MacCallum et al. 2001], and the pragmatic need to limit measure size in order to minimize undesired effects, e.g., subject fatigue when completing surveys with multiple measures. Fabrigar et al. [1999] find that four measures per construct provide a reasonable level of overdetermination where communalities are high, thereby supporting our target of four-item measures.

Although coherence is measured by four items in the completed measure, we note that the construct could have been measured by three other items from the pilot measure which focused on whether the message is “right for me”, “pertinent”, and one “I am able to appreciate”. Our interpretation is that the seven items that load at greater than .7 on Factor 1 of the Stage 2 EFA all measure content that is part of the coherence construct but the four items retained in the completed measure provide the clearest indication of coherence.

Stage 3: Measure Validation

The Stage 3 Study follows the design of the Stage 2 Study but included a significantly larger sample pool and two message treatment levels that differed by whether the message sender was purported to be known or unknown to the receiver.

Stage 3 Administration Procedure

A new online study was conducted which included the completed feedback and coherence measures, demographic items, and additional measures that are described later in the paper. As in the Stage 2 Study, subjects were asked

to evaluate three messages, two of which were messages they were asked to recall from past experiences and one that was presented to them as part of the study. Subjects were 414 students attending undergraduate IS courses at a large university in the Midwest U.S.

The interpersonal request message and broadcast request message procedures were identical to those used in the Stage 2 Study (see Figure 1) except that subjects were asked to respond to the completed four-item feedback and coherence measures instead of the pilot measures. In the CMC request message treatment, however, each subject was told that he/she had received a new CMC message asking him/her to donate textbooks for use by African students. Version A asked subjects to imagine the message was sent by his or her favorite professor at the university. Version B presented the message as being sent by a person unknown to them (see Figure 2). The purpose of incorporating two treatment levels in this study is to assess the degree to which results may be generalized across diverse message senders. After the subject viewed the CMC message, he/she was then asked to rate it on feedback and coherence as well as several additional perceptual measures shown in the Appendix.

Received: 11/24/2011 8:23:19 AM
From: "Your Favorite Professor" In Version A; "bdayo@texts2africa.com" in Version B
Subject: Need your help

African students need your used textbooks.

Students in African countries like Zambia and Nigeria have little money to pay for college textbooks, and they need your help. When you finish your coursework this semester you can make a big difference in their lives by donating your used textbooks to deserving African students instead of reselling them to book buyers. Textbooks are needed in all subject areas.

Here's how to donate.

First, reply to this message to pledge a donation of one, two, or all your used textbooks. When you are finished using your textbooks for the semester, carefully package them and ship them to:

Texts2Africa
P.O. Box 43502
Brooklyn, NY 10024

Our volunteers will be waiting to accept your donation in fulfillment of your pledge.

I look forward to receiving your reply, and really appreciate your help in this good cause.

Figure 2: Stage 3 Study CMC request message.

Validation Procedures

Our validation focuses on the procedures Straub et al. [2004] consider to be mandatory to IS research. These are reliability, construct validity—comprising discriminant, convergent, and factorial validities—and manipulation validity. In addition, we address content and predictive validities of the constructs, beginning with content validity. Descriptive statistics for the Stage 3 Study are presented in Table 3.

Content Validity. Content of feedback and coherence items was grounded by carefully considering the definitions of these constructs within a process where measure items were iteratively reviewed by one of the researchers over a two-week period. Content validity is essentially a test of representativeness [Straub et al., 2004], in which indicators are expected to measure closely-related—but not identical—aspects of the construct. We address content validation through logical analysis of the completed measures.

Feedback items focused on descriptions of the perception that there is opportunity for the message receiver to respond to the message and receive a reply. Items include variations on two related themes: 1) a reply by the receiver would be read by the sender or some other individual, and 2) a reply by the receiver would cause some action on the sender's part. These items logically reflect both definitional components of feedback. Pilot measure items that were pruned out during EFA in Stage 2 appeared to focus on the subject's perception of the sender's feelings toward the receiver rather than anticipated personal feedback.

Table 3: Descriptive Statistics

Message Treatment	Measure	Mean	Std. Dev.
Stage 3 Study Combined Treatment Levels (n = 414)	Subject Gender	48.6% Male	
	Subject Age	20.9 Years	3.92
	Coherence	4.01	1.48
	Feedback	3.46	1.69
	Involvement	4.36	1.41
	Message Categorization (1 = Broadcast, 7= Interpersonal)	3.54	1.35
Stage 3 Study Unknown Sender (n = 211)	Subject Gender	45.6% Male	
	Subject Age	21.3 Years	4.22
	Coherence	3.64	1.48
	Feedback	3.43	1.73
	Involvement	4.02	1.44
	Message Categorization (1 = Broadcast, 7= Interpersonal)	3.26	1.33
Stage 3 Study Known Sender (n = 203)	Subject Gender	51.7% Male	
	Subject Age	20.5 Years	3.54
	Coherence	4.39	1.38
	Feedback	3.50	1.65
	Involvement	4.72	1.29
	Message Categorization (1 = Broadcast, 7= Interpersonal)	3.84	1.30

Coherence items focused on the perception that the sender's message is relevant to the receiver's situation. Coherence items focus on relevance, applicability, and fit of the message to the receiver's personal interests. These items logically reflect the characteristic of situational relevance that is essential to the definition of coherence.

Reliability. Internal consistency of the feedback and coherence measures was assessed using the Reliability Analysis procedure of SPSS 17.0 statistical software on both Stage 2 and Stage 3 data sets. All α values for the measures were well above the .70 level, considered to be a standard for confirmatory research [Hair et al., 1998]. In the Stage 2 Study data, Cronbach's α was .74 for feedback and .86 for coherence. All items in both measures increased α . In the Stage 3 Study data, α was .85 for feedback and .88 for coherence. All items in coherence increased α , however, feedback measure α would be increased to .89 by deleting the item, "If I replied to this message to ask for a small change in the terms, my request would be met". This is a minor improvement to an already-strong α value. In addition, the point biserial correlation of this item with the measure computed from the remaining items (called Corrected Item-Total Correlation in SPSS) is .50, a relatively high value. Based on these considerations, we retained this item in the feedback measure following reliability analysis.

Manipulation Validity. Before assessing manipulation validity, we first verified that the CMC message used in our study was representative of the CMC medium. Because CMC is typically perceived by subjects as intermediate to interpersonal media and broadcast media in its support for social cues [Rice, 1992, 1993], a key objective in our study was to design a CMC message that encompasses such characteristics. We verified the representativeness of

the message used in our study by comparing user evaluation of the CMC message with the interpersonal and broadcast messages that they recalled earlier in the study. This comparison was conducted using separate MANOVAs to jointly contrast summated feedback and coherence results of 1) the interpersonal request message vs. the CMC request message and 2) the broadcast request message vs. the CMC request message. We find the CMC request message treatment was perceived to have significantly higher feedback and coherence than the broadcast request messages subjects recalled and significantly lower feedback and coherence than the interpersonal messages subjects recalled (see Table 4). These results show that the overall CMC request message treatment was designed in the Stage 3 Study in a manner that is representative of the CMC medium and is consistent with prior research [Rice, 1992, 1993].

Table 4: MANOVA Assessing Representativeness of the CMC Request Message*		
<i>Test</i>	F	Sig.
CMC request message vs. interpersonal request message		
Multivariate test	206.1	<.0001
Univariate test: Feedback	297.9	<.0001
Univariate test: Coherence	320.6	<.0001
<i>Descriptive Statistics</i>	Mean	S.D.
Coherence: Broadcast request message	3.78	1.61
Coherence: CMC request message	4.01	1.48
Coherence: Interpersonal request message	5.50	1.07
Feedback: Broadcast request message	3.29	1.53
Feedback: CMC request message	4.28	1.43
Feedback: Interpersonal request message	5.76	1.04

* $n = 414$

Next, we conducted a test to check manipulation of the two CMC message treatment levels in the Stage 3 study. The same message text was used in both levels, but version A presented the message as being sent by the subjects' favorite university professor while version B presented the message as being sent by a person unknown to them. MANOVA was conducted to contrast treatment levels A and B on two measures: Message Category, i.e., subjects' categorization of the CMC message as primarily broadcast or interpersonal in nature, and Involvement [Zaichkowsky, 1986, 1994]. Measurement items are shown in the Appendix.

Results shown in Table 5 indicate that treatment level was manipulated successfully on both Message Categorization and Involvement. Subjects considered the CMC message presented as being from their favorite professor as being more interpersonal in form and more involving than the CMC message from a person unknown to them. In addition, mean involvement in both treatment levels was at or above 4.0, the median marker on the 1-7 measurement scale. This suggests subjects found both versions of the Stage 3 CMC request message to be relatively involving.

Construct Validity. Straub et al. [2004] recommend using SEM-based confirmatory factor analysis (CFA) to determine discriminant, convergent, and factorial validities of reflective constructs, such as feedback and coherence. Two CFA models were created using AMOS SEM software [Arbuckle and Wothke, 1999]. A two-factor model incorporated separate feedback and coherence latent variables, each determined by the four associated items. A covariance relationship was included between the feedback and coherence latent factors. An alternative one-factor model was constructed in which a single latent factor was determined by all eight feedback and coherence items. Goodness of fit results for the models are shown in Table 6.

The two-factor CFA exceeded goodness of fit standards of GFI > .90, Adjusted GFI > .80, NFI > .90, and RMSEA < .08 [Garver and Mentzer, 1999; Hair et al. 1998; Steiger, 1990] while the one-factor model failed by a wide margin to meet any of the standards. These results demonstrate discriminant validity of the feedback and coherence measures.

Table 5: MANOVA Assessing Manipulation of CMC Message Treatment Level*		
<i>Test</i>	F	Sig.
CMC request message vs. interpersonal request message		
Multivariate test	206.1	<.0001
Univariate test: Feedback	297.9	<.0001
Univariate test: Coherence	320.6	<.0001
<i>Descriptive Statistics</i>	Mean	S.D.
Coherence: Broadcast request message	3.78	1.61
Coherence: CMC request message	4.01	1.48
Coherence: Interpersonal request message	5.50	1.07
Feedback: Broadcast request message	3.29	1.53
Feedback: CMC request message	4.28	1.43
Feedback: Interpersonal request message	5.76	1.04

* Version A $n = 211$; Version B $n = 203$

Table 6: Goodness of Fit Statistics for Two-Factor and One-Factor CFA Models*			
<i>Two-Factor Model</i>	<i>Value</i>	<i>One-Factor Model</i>	<i>Value</i>
GFI	.976	GFI	.724
Adjusted GFI	.955	Adjusted GFI	.503
Normed Fit Index	.977	Normed Fit Index	.747
RMSEA	.054	RMSEA	.231

* Calculated using AMOS SEM software

Item loadings in the two-factor CFA were examined in order to assess convergent validity. All loadings exceeded .707, as recommended by Straub et al. [2004], except for the “If I replied to this message to ask for a small change in the terms, my request would be met” item in the Feedback measure. When the two-factor CFA was run without this item, goodness of fit measures were somewhat improved: GFI = .987, AGFI = .972, NFI = .988, and RMSEA = .035. These results demonstrate convergent validity and factorial validity [Straub et al., 2004] of coherence and the reduced (three-item) feedback measure.

Predictive Validity. Predictive validity demonstrates practical relationships between constructs under development and other factors [Straub et al., 2004]. In the introduction of this paper, we questioned whether CMC users subjectively filter messages based on their perception of whether the messages have interpersonal or broadcast characteristics, specifically feedback and coherence. A related construct is social presence, a measure which assesses the degree of awareness or salience of the other person in a communication interaction [Sallnäs et al., 2000; Short et al., 1976], also described as “the feeling of warmth and sociability conveyed through a medium” [Hess et al., 2009, p. 890]. Although social presence theory was developed as a way of contrasting media [e.g., Keil and Johnson, 2002; Lowry et al., 2006; Zhang et al., 2007], researchers more recently have applied social presence theory to study differences between messages and interactions within a single medium, such as CMC [Fortin and Dholakia, 2005; Hess et al., 2009; Shen, Yu, and Khalifa, 2010].

Choi, Miracle, and Biocca [2001] demonstrated that social presence can be influenced by varying message content within a single medium. Fortin and Dholakia [2005] subsequently found changes in interactivity and vividness within a message to be positively associated with social presence. This observation suggests, first, that anticipated personal feedback in messages will be associated with social presence due to increased expectation of interactivity

and, second, that coherence will be associated with social presence due to increased vividness that is inherent to messages perceived to be closely related to the receiver's interests. Fortin and Dholakia also found social presence to be an important contributor to the persuasiveness of advertising messages, which is especially relevant to the focus of the present study. They write:

By focusing on the enhancement of social presence elements in the design configuration of the advertisement, firms have the unique opportunity of establishing virtual or perceived relationships with their customers on a one-on-one basis, which is formidably achieved in the context of the web. [Fortin and Dholakia, 2005, p. 395]

To test the relationships of feedback and coherence with social presence we created two structural models using AMOS software, as illustrated in Figure 3. Unknown/known sender, the contrast between treatment versions A and B, was modeled in Figure 3-1 as a dichotomous antecedent to social presence based on the expectation that knowledge of the message sender will enhance the receiver's perception of social cues in the message. In Figure 3-2, unknown/known sender was modeled as an antecedent to feedback, coherence, and social presence. The relationships of unknown/known sender to feedback and coherence have not been studied previously, thus these relationships are necessarily exploratory. It is logical, however, that subjects will have higher expectations for both feedback and coherence in messages received from someone they know than from an unknown sender, leading us to anticipate positive associations among these factors.

Social presence (see Appendix) was assessed using a measure developed by Short et al. [1976] and validated in numerous subsequent studies [Biocca et al., 2003]. Goodness of fit for both models exceeded accepted standards.

We found that knowledge of the sender increased social presence in the absence of feedback and coherence (see Figure 3-1), and it increased feedback and coherence when these factors were entered into the model (see Figure 3-2). In addition, effects of unknown/known sender on social presence were entirely mediated by feedback and coherence. As we proposed, feedback and coherence associate positively with social presence. These results indicate the feedback and coherence measures have predictive validity in the context of social presence, an existing measure of persuasiveness and other communication media effects, and that predictiveness extends to effects of unknown vs. known message senders.

IV. DISCUSSION

Our objective to develop and validate feedback and coherence measures applicable to the CMC context was achieved in this research. The four-item coherence measure and three-item feedback measure satisfied all validation tests that Straub et al. [2004] consider mandatory to information system research. In addition, we presented evidence of content validity and predictive validity for the measures.

Implications of the Research

Our interpretation of the SEM analysis of Stage 3 Study data suggests several important implications regarding the relevance of feedback and coherence measures to CMC.

First, the results address a question we posed earlier in the paper—whether CMC users subjectively filter messages by evaluating whether the message is interpersonal or broadcast in form. It is clear from the results that CMC users are capable of conducting this type of subjective evaluation via the perspectives of feedback and coherence. This observation implies that feedback and coherence measures may be used to predict and explain individuals' subsequent reactions to CMC persuasive messages. This will be a useful area for future research, both to ascertain the predictive power of these factors and to contrast them with alternative models based on such antecedents as persuasion strategies [Abele, 2011; Janneck and Staar, 2011; Wilson, 2003], system features [Wilson, 2005], message receivers' goals [Wilson and Lu, 2008], and involvement and social presence [Fortin and Dholakia, 2005].

Second, the associations we found with feedback and coherence explain a surprisingly large portion of the variance in social presence. This suggests that much of the "salience" and "warmth" of social presence is actually grounded in definitional distinctions between interpersonal and broadcast communication. It will be interesting to assess the implications of this finding across the wide range of prior social presence studies in CMC, online advertising, and related contexts, for example, by contrasting the relative importance of vividness in predicting social presence [Fortin and Dholakia, 2005; Hess et al., 2009] to that of feedback and coherence.

Finally, we found that feedback and coherence entirely mediate the association between unknown/known sender and social presence, and the associations of unknown/sender with feedback and coherence are greater overall than with social presence. These findings imply that the joint measures of feedback and coherence are potentially more important than social presence in interpreting how receivers react to CMC messages.

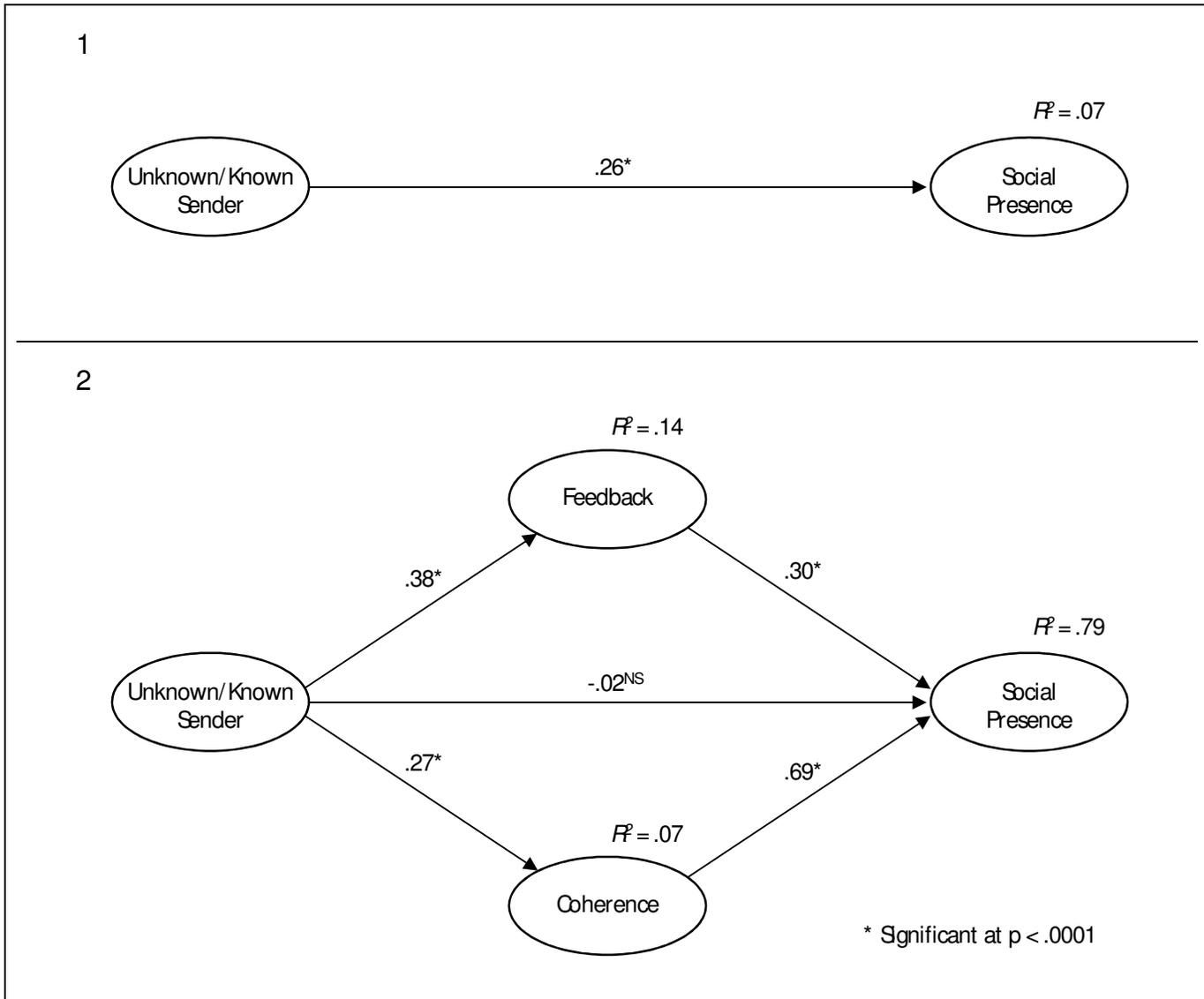


Figure 3: SEM analysis of Stage 3 data.

Limitations

This research is limited in several ways that may be overcome through additional study. First, development and validation of the feedback and coherence measures was based on the responses of undergraduate business students. While these participants form a substantial body of CMC users, they are not necessarily representative of all users. Future confirmatory research using a broad sample of users can help increase the generalizability of the results.

Second, the online study setting, email context, and choice of messages used in the present study may have limited generalizability to other situations. The persuasion process is impacted by dozens of factors, many of which are due to individual characteristics of message senders and receivers [Reardon, 1991]. Thus, virtually any treatment design will bias responses of some subjects. We attempted to mitigate this limitation by including two message treatment levels in our Stage 3 Study, however, additional research in diverse settings will be necessary before assuming results of the present study are widely generalizable.

Finally, we did not succeed in producing a completed four-item measure of feedback, having to drop one of the items during Stage 3 validation. While we recognize that three-item measures are relatively common in IS research, the guidelines we followed recommend including four items [Fabrigar et al., 1999]. Thus, we suggest that future research in this area should attempt to augment the feedback measure with an additional item.

Conclusion

We undertook in our research to build tools that we consider necessary to answer a question which has little obvious connection to the tools themselves—whether the persuasiveness of CMC messages may be based on the receiver's evaluation of the message as interpersonal or broadcast in form. We did not answer that question in this paper, but we did find a surprising level of support for the idea that CMC users do subjectively filter messages based upon the feedback and coherence measures we developed and validated herein. These findings recommend further research to assess whether feedback and coherence predict message persuasiveness in CMC.

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APPENDIX

Items used in the Stage 3 Study ($n = 414$). All items are measured on 7-point semantic differential scales anchored by the statements noted in brackets.

Coherence (Cronbach's alpha = .878)

1. For me, this message is: [1 = "A misfit", 7 = "A good fit"]
2. For me, this message is: [1 = "Applicable", 7 = "Not applicable"] (*Reversed*)
3. This message has personal relevance to me. [1 = "Strongly Disagree", 7 = "Strongly Agree"]
4. This message fits with my interests. [1 = "Strongly Disagree", 7 = "Strongly Agree"]

Feedback (Cronbach's alpha = .848)

1. If I replied to this message, my reply would be read. [1 = "Strongly Disagree", 7 = "Strongly Agree"]
2. If I replied to this message, the person who sent it would read my reply. [1 = "Strongly Disagree", 7 = "Strongly Agree"]
3. If I replied to this message to ask a question, someone would respond to answer my question. [1 = "Strongly Disagree", 7 = "Strongly Agree"]
4. If I replied to this message to ask for a small change in the terms, my request would be met. [1 = "Strongly Disagree", 7 = "Strongly Agree"] (*Dropped in Stage 3 Validation*)

Involvement (Cronbach's alpha = .945)

1. My feeling is that this message is: [1 = "Important", 7 = "Unimportant"] (*Reversed*)
2. My feeling is that this message is: [1 = "Boring", 7 = "Interesting"]
3. My feeling is that this message is: [1 = "Relevant", 7 = "Irrelevant"] (*Reversed*)
4. My feeling is that this message is: [1 = "Unexciting", 7 = "Exciting"]
5. My feeling is that this message: [1 = "Means Nothing To Me", 7 = "Means A Lot To Me"]
6. My feeling is that this message is: [1 = "Appealing", 7 = "Unappealing"] (*Reversed*)
7. My feeling is that this message is: [1 = "Fascinating", 7 = "Mundane"] (*Reversed*)
8. My feeling is that this message is: [1 = "Worthless", 7 = "Valuable"]
9. My feeling is that this message is: [1 = "Involving", 7 = "Uninvolving"] (*Reversed*)
10. My feeling is that this message is: [1 = "Not needed", 7 = "Needed"]

Message Categorization (Cronbach's alpha = .673)

1. In my view, the 'Need your help' email message is: [1 = "Completely a Broadcast Message", 7 = "Completely an Interpersonal Message]
2. The 'Need your help' email message is mostly Interpersonal in nature. [1 = "Strongly Disagree", 7 = "Strongly Agree"]
3. I would describe the 'Need your help' email message as a Broadcast message. [1 = "Strongly Disagree", 7 = "Strongly Agree"] (*Reversed*)

Social Presence (Cronbach's alpha = .742)

1. My feeling is that this message is: [1 = "Impersonal", 7 = "Personal]
2. My feeling is that this message is: [1 = "Hot", 7 = "Cold"] (*Reversed*)
3. My feeling is that this message is: [1 = "Dehumanizing", 7 = "Humanizing]
4. My feeling is that this message is: [1 = "Insensitive", 7 = "Sensitive]

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