AIS Transactions on Human-Computer Interaction

Volume 9 | Issue 4 Article 2

12-2017

Information Technology Enabled Persuasion: An Experimental Investigation of the Role of Communication Channel, Strategy and Affect

Haiqing Li
City of Hope, hali@coh.org

Samir Chatterjee
Claremont Graduate University, samir.chatterjee@cgu.edu

Ozgur Turetken
Ryerson University, turetken@ryerson.ca

Recommended Citation

Li, H., Chatterjee, S., & Turetken, O. (2017). Information Technology Enabled Persuasion: An Experimental Investigation of the Role of Communication Channel, Strategy and Affect. *AIS Transactions on Human-Computer Interaction, 9*(4), 281-300. https://doi.org/10.17705/1thci.00099
DOI: 10.17705/1thci.00099

Transactions on Human – Computer Interaction

Research Note

Information Technology Enabled Persuasion: An Experimental Investigation of the Role of Communication Channel, Strategy and Affect

Haiqing Li
City of Hope, USA

Samir Chatterjee
Claremont University, USA

Ozgur Turetken
turetken@ryerson.ca
Ryerson University, Canada

Abstract:

With advances in information and communication technologies (ICT), organizations of various forms now deploy an increasing number of ICT-enabled persuasive systems in several domains. Traditional computer-mediated communication (CMC) theories mainly focus on the effectiveness of media in the synchronous/asynchronous spectrum for effectively matching medium with communication task. The contemporary communication environment is rich with asynchronous channels such as email, Web, and text messaging, which makes it important to go beyond synchronicity and determine the nuances among various asynchronous channels. No rigorous research has compared the effectiveness of these channels in the persuasive systems domain where organizations use technology to persuade users to modify their behavior in a direction that they mutually agree to be desirable. In this paper, we study the effectiveness of CMC and the strategy used to frame the persuasive message. We explore persuasive strategies of *praising*, *reminding*, *suggesting*, and *rewarding* for health behavior and promotion. We model user experience as a mediator between channel strategy combinations and persuasive effectiveness. Through controlled user studies, we compared sixteen combinations of communication channel and persuasive strategy with or without emoticons. We found that channel/strategy combinations affect persuasive effectiveness (mediated by user experience) in varying degrees. Our findings contribute to the body of CMC and persuasive system knowledge and have practical implications for online advertising, health promotion, and persuasive technology design.

Keywords: Individual Behaviors, Personal Applications, Experiment, Survey.

Dennis F. Galletta was the accepting senior editor for this paper.

Recommended Citation

Li, Haiqing; Chatterjee, Samir; and Turetken, Ozgur (2017) "Information Technology Enabled Persuasion: An Experimental Investigation of the Role of Communication Channel, Strategy and Affect," *AIS Transactions on Human-Computer Interaction* (9) 4, pp. 281-300

DOI: 10.17705/1thci.00099

Available at: http://aisel.aisnet.org/thci/vol9/iss4/2

1 Introduction

Persuasion refers to the process of guiding people towards adopting an idea, attitude, or action through shaping, reinforcing, or changing their response (Miller, 1980) by rational and symbolic means (Marková, 2008). A persuasive system communicates with persuadees to influence their behavior and/or attitude using persuasive messages (Oinas-Kukkonen & Harjumaa, 2009). With advances in information and communication technologies, organizations now deploy an increasing number of ICT-enabled persuasive systems in several domains such as healthcare, marketing, and politics. The persuasive strategy (such as *reward* or *suggest*) and the communication channel (such as *email,* or *Web*) are two major elements of a contemporary persuasive system. New communication technologies allow for more communication channel options to deliver messages (Wilson, 2015).

Past research in this domain has mainly compared the persuasive effectiveness of face-to-face communication (FtFC) to that of email, the primary computer-mediated communication (CMC) channel (Guadagno & Cialdini, 2002; Wilson, 2003). For example, Wilson (2003) presents different perceptions of persuasive effectiveness between email and FtFC and concludes that it is important to choose the correct communication based on the persuasive strategy in order to achieve persuasive effectiveness. However, little research has examined the persuasive effectiveness of different strategies over more recent CMC channels such as short message service (SMS), websites, or social media (e.g., Facebook) (Cugelman, Thelwall, & Dawes, 2009; Zhu, 2007). Our aim is to fill this gap in research by addressing the following research question:

RQ1: How do various communication channel and persuasive strategy combinations influence persuasive effectiveness?

In addition to the role of channels and strategy in persuasion, recent studies show that adding an affect component such as an emoticon can impact the performance of a persuasive system (Nguyen & Masthoff, 2009; Oinas-Kukkonen & Harjumaa, 2009; Reitberger et al., 2009; Torning & Oinas-Kukkonen, 2009). Affective computing is an emerging area in human-computer interaction research that explores how emotional information can be integrated into the communication and interaction between the user and the computer (Picard, 1995). We believe that including an affect component could affect the relationship between channel, strategy, and persuasion and add an “affect” dimension to our exploration through the following research question:

RQ2: How does the affect (emotion) of the message moderate the impact of strategy and channel on persuasive effectiveness?

Several groups should find interest in our results. For researchers, they help to explain the interplay between technology and behavior. For persuasive system developers, they provide systematic help for them to develop clearer strategies for behavior change. Addressing these research questions is also important for marketers who spend billions of dollars in advertising over new media without knowing if they will persuade their target customers to buy their product or services.

This paper proceeds as follows. In Section 2, we review the relevant theoretical base and empirical evidence to guide our study. In Section 3, we present our research model and, in Section 5, the methodology we used to test this model. In Section 5, we analyze the data collected from controlled user experiments to test the differences in persuasive effectiveness of different communication channel/strategy/affect combinations mediated by user experience (UX). In Section 6, we discuss these results and their implications for future research and conclude the paper.

2 Background

Fogg (2003) defined the term persuasive technology as “a computing system, device, or application intentionally designed to change a person's attitude or behavior in a predetermined way” and coined the term “captology”, which refers to the study of computers as persuasive technology. His behavior grid model (Fogg, 2016) proposes that three elements (motivation, ability, and trigger) must converge for a behavior to occur. In our study, we control for users’ ability and motivation with a randomized experimental design. We focus on manipulating the trigger—those cues, prompts, or calls to action that we are often surrounded with and something that users of social media sites such as Facebook are very used to. We manipulate the “trigger” aspect of persuasion by delivering messages to persuadees via different communication channels.

The communication channel is key in ICT-enabled persuasion (Ajzen, 1992; Holbert, 2002). With the same persuasive message content, different communication channels can generate different levels of persuasive effectiveness (Ajzen, 1992); therefore, selecting the right channel to deliver a persuasive message is a critical step in designing an ICT-based persuasive system (Fogg, 2009). In this study, we focus on computer-mediated communication channels, which is a well-studied area in general but not in ICT-enabled persuasion. As per the media richness theory (MRT) (Daft & Lengel, 1986; Daft, Lengel, & Trevino, 1987), richer media work better with equivocal messages where leaner media work better with unequivocal messages. In the context of our research, the persuasive messages are fairly unequivocal; hence, our use of "leaner" asynchronous media is appropriate. One could similarly assess media choice through the lens of the more recent media synchronicity theory (MST) (Dennis, Fuller, & Valacich, 2008), which argues that asynchronous media are a better fit for "conveyance" type of communication tasks whereas synchronous media work better with "convergence" tasks. The persuasive content we focus on in this study is essentially there to "convey" a message, whereas a two0way interaction with the persuadee is beyond the persuasive activity's scope. Therefore, our choosing widely used asynchronous channels to deliver persuasive messages also concurs with the basic tenets of MST.

Along with communication channel, the strategy that one uses to frame the persuasive message is critical for ICT-enabled persuasion. The marketing and psychology literatures contain many studies that focus on message framing for persuasion (e.g., Gallagher & Updegraff, 2012; Meyers-Levy & Maheswaran, 2004; Rothman & Salovey, 1997; Smith & Petty, 1996). To frame persuasive messages, we explore persuasive strategies that we adapted from Oinas-Kukkonen and Harjumaa (2009), who present seven postulates for persuasive system design along with 28 persuasive design principles that they group under four categories:

1. Principles that focus on carrying out the primary task (*primary task support*)
2. Principles for the interaction between the user and the system that help users keep moving towards their goals or target behaviors (*dialogue support*)
3. Principles for designing a system that is more trustworthy and, thus, more persuasive (*system credibility support*), and
4. Principles for designing a system so that it motivates users by leveraging social influence (*social support*).

Since we are interested in the communication aspects of persuasive technology, we draw from the strategies grouped under dialogue support. According to Oinas-Kukkonen and Harjumaa (2009), the dialog support principles that help users keep moving towards their goal or target behavior include *praise*, *reward*, *remind*, *suggest*, *similarity*, *liking*, and *social role*. The similarity principle concerns systems that remind persuadees of themselves; hence, it requires one to identify a target audience in advance. For the impracticality of manipulating this aspect along and to keep the research model parsimonious, we do not adapt this principle in designing the prototypes in this study. Likewise, we omit the *liking* principle, which refers to the visual appeal of the system, for its subjective and user-dependent nature. As we discuss in Section 3, we partially control for this aspect because we include hedonic user experience, which we expect to capture visual appeal in our research model. Meanwhile, because the message content is identical among different treatment groups, we experimentally control for the *social role* aspect of the prototypes. We use the remaining design principles (i.e., praise, reward, remind, and suggest) to frame the persuasive messages used in the study.

We explore effective means of delivering messages for each of these strategies through widely used asynchronous CMC channels. To support the delivery of persuasive messages, we also use affective computing. Researchers have tried to identify the role of affect in persuasion by analyzing the source of the affect and the structure of affect. According to the source/structure framework (Dillard, Meijnders, Dillard, & Pfau, 2002), the source of affect can be message irrelevant or message induced. We expect the different persuasive messages we use in this study to induce different affect on the persuadees based on their contents. This model also proposes that affect can be transferred by structural elements. Past research also organizes structure models of affect into three categories: the bipolar valence model, the two-dimensional model, and the discrete emotion model. Because of its fit with an asynchronous communication channel, we adopt a bipolar valence model that models "affect" in one (positive to negative) dimension operationalized through an emoticon.

A central construct in the context of persuasive systems is user experience (UX). UX describes the overall experience and satisfaction a user has when using a product or system (ISO 13407 and ISO/FDIS 9241-

210). It has been widely disseminated and accepted in the human-computer interaction (HCI) community (Law, Roto, Hassenzahl, Vermeeren, & Kort, 2009) as an important component of system success. According to Roto and Rautava (2008), UX covers four factors:

1. *Utility*, which factor covers the usefulness and reliability of the system
2. *Usability*, which focuses on ease of use, efficiency and accessibility
3. *Social value*, which refers to the ability to connect people and identifications, and
4. *Enjoyment and pleasure*, which focus on personal pleasure and stimulation.

Utility and usability compose the pragmatic aspects of UX, and social value and enjoyment and pleasure comprise the hedonic aspects of UX (O'Brien, 2010).

Segerståhl and Oinas-Kukkonen (2007) found that a successfully designed coherent user experience has a positive effect on the overall effectiveness of a persuasive system. In this study, we build on that premise and propose that persuasive system features impact user experience and, in turn, that better user experience has a positive effect on persuasive effectiveness.

The review in this section illustrates the theoretical arguments and empirical evidence on the important role of channel, strategy, and affect in persuasive systems, but research has yet to propose and empirically test a comprehensive conceptual model. According to media theories, channel effectiveness depends on factors such as the equivocality of messages, yet the moderating effect of message framing on channel effectiveness is unclear. For that reason, our model goes beyond channel, strategy, and affect as persuasion factors and considers their interactive effects on persuasion. Our review also suggests that user experience should mediate the effects of these factors on persuasion. In Section 3, we present a conceptual model that ties these propositions together towards a more thorough understanding of ICT-enabled persuasion.

3 Research Model

The persuasive system effectiveness model in Figure 1 comprises communication channel, persuasive strategy, affect, user experience, and persuasive effectiveness. Zhu (2007) reviewed persuasive systems for healthy lifestyle behavior using Fogg's (2003) persuasive technology framework and tried to determine the effectiveness of persuasive technology. The author's results show that prior research either does not show significant differences between different persuasive systems in terms of effectiveness or does not address the effectiveness issue at all. As we discuss above, we theorize that the effectiveness of a persuasive system depends on the user experience. Zhu (2007) shows that most previous studies have focused on evaluating persuasive systems' usability only. Unlike those studies, we focus on both pragmatic experience (usability and utility) and hedonic experience (enjoyment and pleasure and social value).

The communication channel and the persuasive strategy impact user experience (i.e., the usability and utility of the persuasive system). As we review in Section 2 (Roto & Rautava, 2008), usability and utility are two direct factors of the pragmatic aspect of the overall user experience. The persuasive system should also have an effect on the hedonic aspect of user experience. The overall user experience with the persuasive system then influences persuasive effectiveness. Thus, we propose:

P1a: Different combinations of computer-mediated communication channels and persuasive strategies have differing effects on persuasive effectiveness**.**

P1b: User experience mediates the differing effects of computer-mediated communication channel and persuasive strategy combinations on persuasive effectiveness.

According to Walther and D'Addario (2001), affective computing impacts persuasion but only indirectly via user experience's mediation. Likewise, Huang, Yen, and Zhang (2008) report that emoticons could increase users' enjoyment level of the system first and increase the perceived information richness and perceived usefulness second. Thus, we also propose:

P2: Adding affect to a message moderates the effects of strategy-channel combinations on user experience and persuasive effectiveness.

Propositions 1 and 2 correspond to research questions 1 and 2, respectively. Figure 1 depicts the resulting research model.

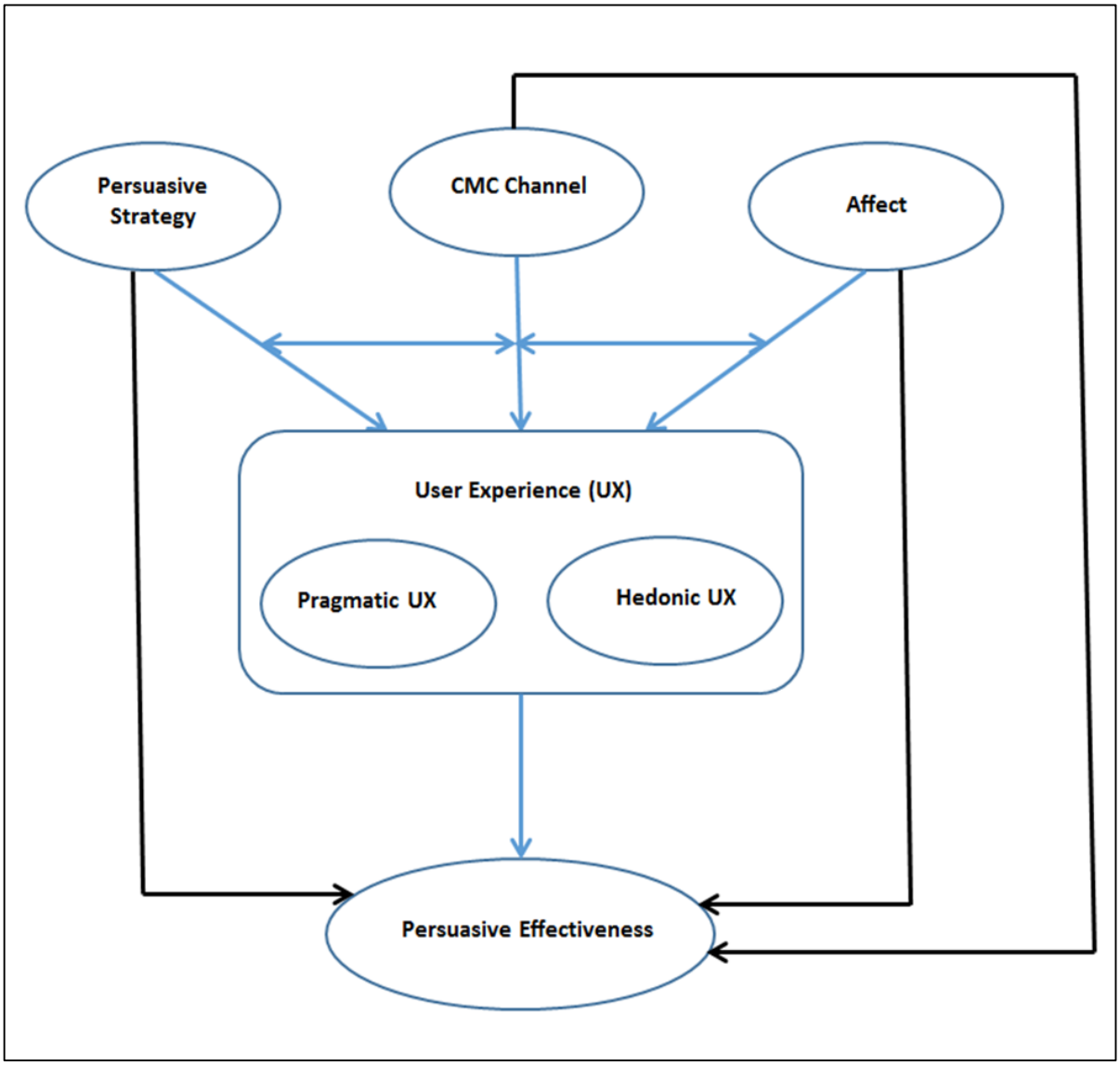

Figure 1. Research Model

4 Research Methodology

We conducted our persuasion task in the healthy lifestyle domain (Xu, Chomutare, & Iyengar, 2014). Design and use of persuasive systems to promote healthy behavior is an ongoing research area in healthcare IT (Chatterjee & Price, 2009). These systems are promising for improving healthy living, reducing the cost of healthcare systems, and allowing senior citizens to maintain a more independent lifestyle (Chatterjee et al., 2013). We created a persuasive system to emulate different communication channels with different persuasive strategies using mock-up technology. We then used this system in a field experiment that we designed to measure the user experience with, and the persuasive effectiveness of, the strategy channel combination with and without an affect add-on. Before conducting the full-scale field experiment, we conducted a pilot study using some experts from two fields (i.e., persuasive technology and human-computer interaction (HCI)), to evaluate the mock-up system and survey questions. We used the initial results from the pilot study to further refine the mock-ups and questionnaires in the full study.

4.1 Mock-up Design

Each persuasive system represents a combination of one CMC channel and one persuasive strategy. We selected four popular instances of communication channel: SMS, email, social networking (Facebook) site, and website. SMS is one of the most popular wireless communication services. It is also one of the main channels for healthcare and health lifestyle persuasion systems (Fogg & Allen, 2009). We implemented a mock-up of SMS on a mobile phone while keeping the exact size and dimensions in mind; we delivered all the other channel mock-ups on a large personal computer screen. Email is the most popular CMC channel, and has been studied widely in CMC research (Maheshwari, Chatterjee, & Drew, 2008) and as a component of persuasive systems (Cugelman et al., 2009; Zhu, 2007). Cugelman et al. (2009) reviewed 32 computer-mediated persuasive systems and found that all of those systems used websites as the communication channel. Recent research has examined the persuasive potential of Web-based health behavior change systems (Lehto & Oinas-Kukkonen, 2015), while others have found that social networking sites such as Facebook could be good persuasive channels due to their social effectiveness (Fogg & Iizawa, 2008; Rosenfeld, 2008).

As we discuss in Section 2, we operationalize persuasive strategy through praise, reward, remind, and suggest. We chose the content/text of the persuasive messages from a prior study (Li & Chatterjee, 2010) and from the U.S. Department of Health and Human Services and Center for Disease Control and Prevention's (CDC) healthy life campaigns. Figure 2 lists the four strategies and the example message content for each strategy.

Praise:
You did great! You have reached your fitness goal. Congratulations! Keep up the good work!

Reward:
Congratulations! As you have achieved your exercise goals this week, we offer your $5 iTune gift certificate. Here is the certificate code "TTD3VBBWXDFVXX".

Remind:
Just a reminder ...
Did you drink eight 8-ounce glasses of water today?

Suggestion:
How about avoiding dessert or sharing it with someone? Many desserts contain around 1100 calories or more, and it takes more than 2 hours of running on treadmill to burn the calories.

Reward Message on Facebook:
Congratulations to David!
As you have achieved your exercise goals this week, we offer your $5 iTune gift certificate. The redeem code has been sent to you by email.

Praise Message on Facebook:
David, You did great!
You have reached your fitness goal. Congratulations! Keep up the good work!

Figure 2. The Content of the Persuasive Messages

The message on Facebook slightly differed from the same message on other channels because of Facebook's special media properties. We used the message wall feature of Facebook as the social networking communication channel. For the reward message, one cannot display the reward code on the message wall directly due to security issues. Instead, the user is informed that the reward code has been

sent by email ("The redeem code has been sent to you by email"). The messages on the email channel include a closing with a signature. We also counted these texts as part of the message content because they presented the attitude and identity of the author of this message, which the literature considers to be important factors in persuasion.

An emoticon is a well-accepted symbol for affect expression (Riordan & Kreuz, 2010). We analyze the impact of affect by adding an emoticon at the end of the persuasive message. Based on the communication capacity of each channel, the format of the emoticon could be a text emoticon, a small icon emoticon, or a large icon emoticon. Figure 3 shows the emoticons and their formats that we used in the study. To keep a "pure" relationship (Walther & D'Addario, 2001) between the emoticon and the message content, we added a "sad" emoticon with suggest messages because we framed those messages with negative affect. We framed both reward and praise messages with positive affect. We added a "smiley" emoticon to these messages. The content of remind messages is neutral. For neutral messages, we chose to use a "smiley" emoticon.

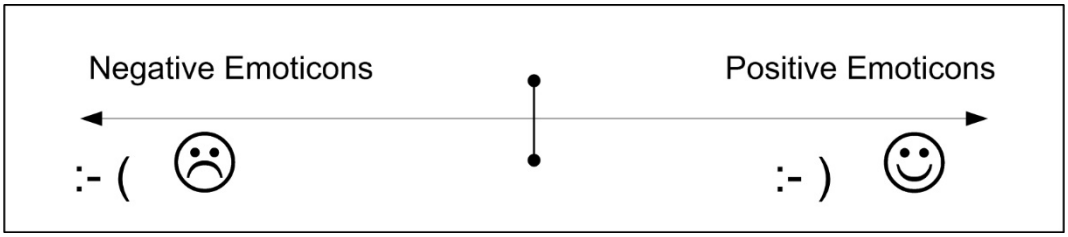

Figure 3. Emoticons in Bipolar Valence Model

We created 16 (4x4) mock-ups for the combination of the different CMC channels (4) and strategies (4). Next, we added emoticons to these mock-ups to create a second set of (16) mock-ups that represented an affect integrated persuasive system. We collected the templates of the mock-up are from instances of real healthy life interventions online. We used a well-established healthcare and health lifestyle social networking website (i.e., "HelloHealth") from facebook.com as the template of the social networking site mock-up and emulated the user wall feature. We also used "www.smallstep.gov" as the template of the persuasive website mock-up. For text messages on mobile phones, we used a general model of a phone with a common screen size (2.2 inch) as the template. The sizes of all mock-ups were the same as the corresponding real-world system.

The mock-up provided the general interface, functions, and communication capacity of each channel. For example, the mock-up of email provided the general email client interface (similar to Microsoft Outlook) interface, and a full message viewer, which included from, to, subject, time, and message fields. The mock-up also used animation with sound to emulate interactive features of the channel such as incoming message alert, interface displays, and so on. For communication capacity, we focused on common features of each channel. For example, we limited the email mock-up to only text and small icon and the SMS mock-up to 140 characters of text. Table 1 lists the details of the interface, feature(s), and communication capacity of each mock-up. Each mock-up matched the scale of the real system.

4.2 Emulation System

We designed and developed a system using Microsoft Visual Basic for Applications (VBA) to display the mock-ups. The system also had an integrated evaluation feature to simplify data collection. Figure 4 presents the architecture of the system. Each test of the experiment included two parts: the first part was the mock-up of the emulated persuasion system, which included the interface and the persuasive message content; the second part was the evaluation interface, which presented all questionnaires regarding user experiences and persuasive effectiveness. The system automatically collected the evaluation results and stored them in a standard format that we could export into data-analysis tools (SPSS version 24) easily.

Table 1. Mockup Design Overview

CMC channel	Interface	Feature(s)	Communication capacity
Email	• Microsoft Outlook with default setting • The email full message view interface included from, to, subject, time, and message fields	• Animation to simulate the incoming email alert • Click on the incoming email alert icon to open a general Microsoft Outlook full message view window	• Text and small icons only
SMS on mobile phone	• Look and feel of a phone showing screen and keypad • The SMS interface included from, time, and message fields and multiple function soft buttons	• Animation to simulate the incoming message alert (vibrate) • Animation to simulate the flipping open of the mobile phone	• Text only • Limited to 140 characters
Website	• Microsoft Internet Explorer with default setting	• Click on a hyperlink (with website address) to open a general Web browser • Login (for reward and praise message only)	• Text and images
Social networking site	• Microsoft Internet Explorer with default setting	• Click on a hyperlink (with website address) to open a general Web browser • Standard Facebook user wall layout	• Text and images • Other peoples' ratings and comments

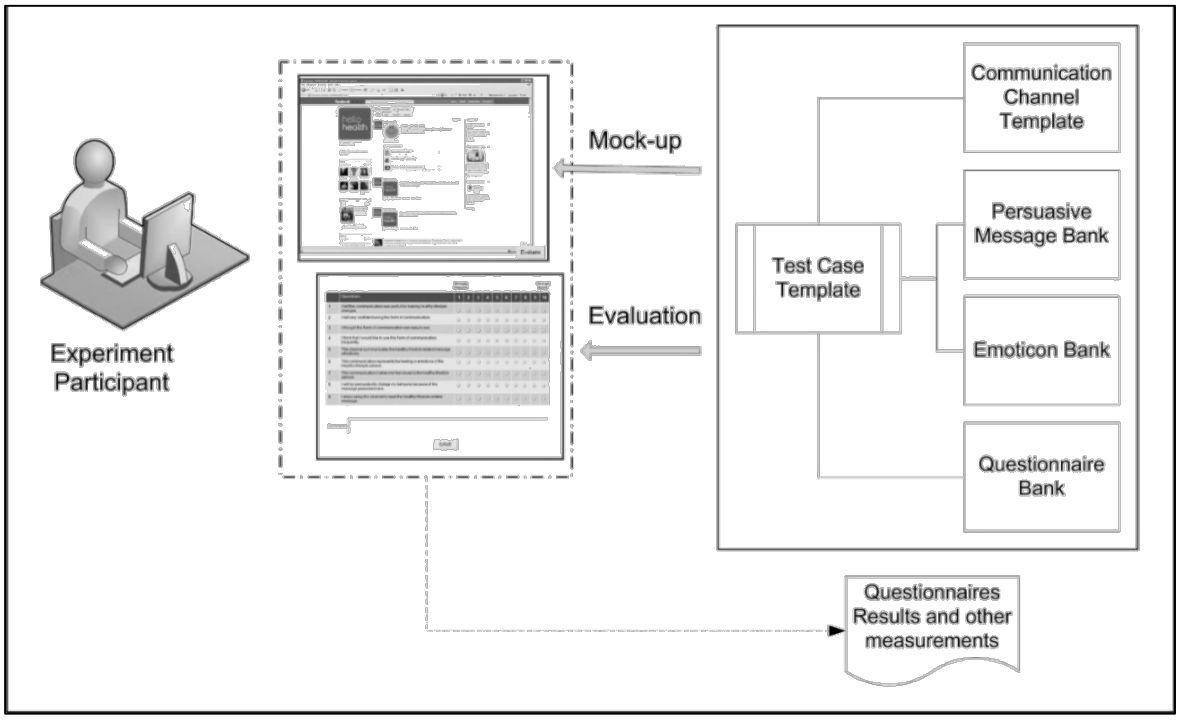

Figure 4. Emulation and Evaluation System

4.3 Subjects

We recruited voluntary graduate students from a major North American University and used the student email list as the recruitment pool. In all, 40 individuals participated in the study (23 females and 17 males). Participants were all well-educated in that over 87.5 percent held a graduate degree. The participants' ages ranged from 18 to 60, but the majority (87.5%) was between 18 and 40 years of age.

4.4 Experimental Procedure

We divided the participants into two groups randomly using the randomized controlled trial (RCT) technique: 18 participants reviewed the persuasive messages with no emoticons, and 22 participants reviewed the messages with emoticons. The message content and communication channel features remained the same across the two groups. To validate the random assignment of participants to groups, we conducted a chi-square analysis that showed no significant difference between the demographic information of the participants in the two experiment groups ($p > 0.05$ for gender, education level, age, and occupation). We conducted all experimental conditions in the computer lab of the university using a Dell OptiPlex 320 desktop computer with a single 19-inch LCD monitor. The participants used the emulation system that we describe above. The participants had no time limit to complete experiment. Most participants finished all tasks of the experiment within 30 minutes. During the experiment, participants used only the given computer to complete all reviews and tasks.

We employed a repeated measures design that exposed all participants to all sixteen treatment conditions (full factorial combination of four strategies and four channels). A repeated measures design is known to be a powerful alternative to between-subjects designs because the former reduces power issues from limited sample size and the need to control the random assignment of participants into different groups (Lawal, 2014). Meanwhile due to carryover and fatigue concerns that a repeated measures design can cause, we manipulated the "affect" variable through a between subjects design in which we asked participants in each group (with and without an emoticon) to view the system in each of its sixteen different versions using the mock-up. Then, they filled out the evaluation questionnaires immediately before they moved to the next mock-up. To eliminate the learning effects that a repeated measure designs can lead to, the sequence of the 16 cases was random for each participant. We collected a total of 640 evaluation results (352 with emoticons, 288 without emoticons) with this experimental design. We excluded incomplete results from data analysis, which resulted in 528 data points (272 with emoticons, and 256 without emoticons).

4.5 Measurement of Variables

We operationalized communication channel, persuasive strategy, and affect (via emoticons) through the mock-up systems as we describe above. Bevan (2008) suggests that one can measure UX using questionnaires: a usability questionnaire for the pragmatic aspects of UX and a satisfaction questionnaire for the hedonic aspects of UX. Because we do not focus on UX metric development in this study, we used well-established questionnaires (Albert & Tullis, 2013) to measure UX. Specifically, we used two sets of questionnaires. The pragmatic experience covered the utility and usability factors. The hedonic experience covered the social value and enjoyment factors. We used a subset of system usability scale (SUS) (Brooke, 1996) to measure pragmatic experience and a subset of user interface satisfaction (QUIS) (Chin, Diehl, & Norman, 1988) to measure hedonic experience. Each question included a 10-point Likert scale (1 = strongly disagree; 10 = strongly agree) (Law et al., 2009). Table 2 lists the detailed questionnaires.

Persuasive effectiveness of the message is the dependent variable in our model. There can be two kinds of measurements for persuasive effectiveness. The first, the actual effectiveness of the persuasion system, measures users' real attitudes and/behavior changes after they use the persuasive system. The second, perceived effectiveness, measures users' perceptions (Wilson, 2003). Since we conducted this study in a lab, we collected data at one point in time, which made it impossible to observe participants' behavior change over time. Therefore, we focus on perceived persuasive effectiveness. Different from Wilson's study (Wilson, 2003), which measures the senders' perceived effectiveness, we measured the receivers' perceived effectiveness. We measured persuasive effectiveness with one question on a 10-point Likert scale (see Table 3).

One challenge in measuring persuasive effectiveness is "contamination" that occurs in a research design (Bettinghaus, 1986): when researchers try to use behavioral intention as the measure of the attribute changes, the pre-measure can introduce a direct and contaminating effect on the subjects of the experiment. We used a perceived persuasion effectiveness measure without a pre-measure and tried to reduce this kind of contamination. The participants reviewed a total of 16 mock-ups with four different messages. The frequency of messages could also cause system bias on the effectiveness measurement. To control this bias, we mixed the messages and made sure that the same messages did not repeat for a

particular participant. The experimental system also generated the 16 cases randomly for each participant to reduce measurement bias.

Table 2. Questionnaires for User Experience (Adapted from Brooke, 1996; Chin et al., 1988)

Construct	Instrument	Scale
Pragmatic experience	I felt this communication was useful for making healthy lifestyle changes.	10-point Likert scale (from "strongly disagree" to "strongly agree")
	I felt very confident using this form of communication.	
	I thought this form of communication was easy to use.	
	I think that I would like to use this form of communication frequently.	
	This channel communicates the healthy lifestyle related message effectively.	
Hedonic experience	This communication represents the feeling or emotions of the healthy lifestyle advisor.	10-point Likert scale (from "strongly disagree" to "strongly agree")
	This communication makes me feel closer to the healthy lifestyle advisor.	
	I enjoy using this channel to read the healthy lifestyle related message.	

Table 3. Questionnaires for Persuasive Effectiveness

Construct	Instrument	Scale
Persuasive effectiveness	I will be persuaded to change my behavior because of the message presented here.	10-point scale (from "strongly disagree" to "strongly agree").

5 Analysis and Results

Because we measured user experience through multi-item scales, we conducted a factor analysis to establish the (convergent and discriminant) validity of these scales. As Table 4 shows, one of the hedonic user experience (UXH) items loaded higher on the factor that represents pragmatic experience (factor 1). Therefore, we dropped the data for this item from the hedonic UX and added it to the UXP score calculations. We conducted the subsequent analysis with UX scores that we had modified accordingly. Next, we assessed the reliability of these modified scales through Cronbach's alpha and found both to be reliable as the Cronbach's alpha values were higher than the recommended 0.7 threshold (0.921 for UXP and 0.913 for UXH).

Table 4. Factor Analysis for the Assessment of UX Instrument Validity

Item	Component	
	Factor 1	Factor 2
UX_P1	0.706	0.408
UX_P2	0.893	0.050
UX_P3	0.886	0.072
UX_P4	0.844	0.305
UX_P5	0.661	0.510
UX_H1	0.203	0.924
UX_H2	0.164	0.928
UX_H3	0.772	0.415
Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalization.		

Because we conceptualized user experience (UX) as a mediator between persuasive system features and persuasive effectiveness (PE), we first tested whether such mediation exists and, if so, determined the mediation's nature (partial versus full). To do so, we followed the below steps that Baron and Kenny (1986) suggest:

1. We tested the significance of the relationship between channel, strategy, and affect combinations and PE using repeated measures ANOVA. As Table 5 shows, both strategy ($p = 0.000$) and channel ($p = 0.001$), the strategy-channel interaction ($p = 0.021$), and the strategy-affect interaction ($p = 0.020$) had a significant effect on persuasive effectiveness. These results support P1a.

Table 5. The Effect of Strategy, Channel, and Affect Combinations on PE

Source	DF	F	P
Strategy	3	12.033	0.000
Channel	3	5.421	0.001
Affect	1	1.096	0.302
Strategy * channel	9	2.189	0.021
Strategy * affect	3	3.294	0.020
Channel * affect	3	1.371	0.251
Strategy * channel * affect	9	0.819	0.599

2. We tested the significance of the relationship between channel, strategy, and affect combinations and UX using repeated measures MANOVA. Table 6 lists the results at the multivariate level and Table 7 at the univariate level.

Because Mauchly's tests of sphericity indicated that the assumption of sphericity was violated for several relationships, we corrected degrees of freedom using Greenhouse-Geisser estimates of sphericity. The results indicate that both strategy ($p < 0.001$) and channel ($p = 0.002$) and the strategy channel interaction ($p = 0.012$) had a significant effect on UX, although the significance of channel strategy combination mainly resulted from its strong effect on the pragmatic user experience (UX_P) ($p = 0.001$).

Table 6. The Effect of Strategy, Channel, and Affect Combinations on UX: Multivariate Analysis

Source	F	DF	P
Channel	3.723	190	0.002
Channel * affect	1.279	190	0.269
Strategy	4.471	190	0.000
Strategy * affect	0.994	190	0.431
Channel * strategy	1.930	574	0.012
Channel * strategy * affect	1.431	574	0.111

Table 7. The Effect of Channel, Strategy, and Affect Combinations on UX: Univariate Analysis

Source	Measure	DF	F	P
Channel	UX_p	2.419	3.477	0.019
	UX_H	2.113	4.523	0.005
Channel * affect	UX_p	2.419	1.802	0.152
	UX_H	2.113	1.773	0.157
Strategy	UX_p	2.605	6.158	0.001
	UX_H	2.595	8.270	0.000
Strategy * affect	UX_p	2.605	1.184	0.320
	UX_H	2.595	.663	0.577
Channel * strategy	UX_p	5.289	3.132	0.001
	UX_H	5.971	.928	0.501
Channel * strategy * affect	UX_p	5.289	1.207	0.290
	UX_H	5.971	.898	0.527

3. We tested the effect of UX on PE. For that, we conducted a regression analysis with the following functional form: $PE = a*UX_P + b*UX_H + c$.

Due to the interdependence of measurements taken from the same subject, we ran the regression analysis with one value per subject for each of the variables PE, UX_P , and UX_H. We obtained this value by averaging the repeated measurements (obtained with different combinations of channel and strategy for each subject) of each variable. Table 8 summarizes the regression analysis results.

Table 8. Regression Analysis for Persuasion Effectiveness

Variable	Coef.	p
Constant	0.028	0.891
Pragmatic user experience	0.576	< .001
Hedonic user experience	0.392	< .001
$R^2 = 0.628$; $R^2_{adjusted} = 0.627$		

According to the results, UX explained 62.7 percent of the variance in PE, and both hedonic experience ($p < 0.001$) and pragmatic experience ($p < 0.001$) were significant predictors of persuasive effectiveness. Relationships between these two predictors and persuasive effectiveness were positive. Pragmatic experience had a stronger effect on persuasive effectiveness than hedonic experience. The results of steps two and three combined suggest a mediation effect, which supports P1b.

4. To test whether the mediation effect was full or partial, we tested a model using repeated measures analysis of covariance (ANCOVA) where strategy, channel, and affect (and their interactions) were independent variables, PE was the dependent variable, and UX_P and UX_H were covariates. Table 9 shows the results. As one can see, when we controlled for UX, the effect of strategy-channel interaction ceased to be significant ($p = 0.059$), which suggests that UX fully mediated the relationship between the strategy-channel interaction and PE. Meanwhile, the main effects of strategy ($p < 0.001$) and channel ($p = 0.006$) were still significant, which suggests that UX partial mediated the relationship between channel and PE and the relationship between strategy and PE.

Meanwhile, only in the direct model (i.e., without UX) that we tested (Table 5) did we find that affect had a significant influence on the relationship between strategy and persuasive effectiveness; therefore, we conclude that a smiley versus sad emoticon is not a strong enough operationalization of the *affect* construct. Thus, we found only partial support for P2.

Table 9. Test of Full Mediation: The Effect of Channel, Strategy, and Affect combinations on UX and PE

Source	DF	F	P
Strategy	3	7.274	0.000
Channel	3	4.234	0.006
Affect	1	.254	0.617
Strategy * channel	9	1.838	0.059
Strategy * affect	3	2.002	0.113
Channel * affect	3	.009	0.999
Strategy * channel * affect	9	1.005	0.434
UX_p	1	228.894	0.000
UX_H	1	100.093	0.000

According to these results, both channel and strategy are important influencers of persuasive effectiveness; their effects may depend on each other and are mediated through user experience. Across all the communication channels, praise ($p_{\text{praise vs. remind}} < 0.001$, $p_{\text{praise vs. suggest}} = 0.026$) and reward ($p_{\text{reward vs. remind}} < 0.001$, $p_{\text{reward vs. suggest}} = 0.006$) emerged as the best strategies. Likewise, across all strategies, SMS emerged as the worst channel: ($p_{\text{SMS vs. email}} < 0.017$, $p_{\text{SMS vs. Facebook}} = 0.024$). However, as the significant interaction terms evidence, these results were not uniform among the levels of treatment (i.e., channel for strategy differences or strategy for channel differences). Therefore, we needed to identify the most effective persuasive strategy channel combinations. For that, we tested the effect of the strategy channel interaction on UX because we found that user experience fully mediated the effect of those combinations on persuasion.

First, we tested the effect of strategy on UX for each channel separately. The results suggest that, when Web was the communication channel, strategy had a significant effect on UX ($p < 0.001$). More specifically, when Web was the communication channel, reward and praise led to better pragmatic experience than remind ($p = 0.001$, $p = 0.002$, respectively) and suggest ($p = 0.001$, $p = 0.002$, respectively). Reward and praise also led to better hedonic experience than remind ($p = 0.003$, $p < 0.001$, respectively) and suggest ($p=0.019$, $p = 0.002$, respectively). For all the other communication channels, we found no strategy effect ($p_{Facebook} = 0.168$, $p_{email} = 0.159$, $p_{SMS} = 0.155$). These findings suggest that the significant effect of strategy that we discuss above mainly occurred in the Web channel.

Next, we tested the effect of channel on UX for each strategy separately. We found that channel had a significant effect on UX when remind was the strategy ($p = 0.001$). More specifically, when the persuasive strategy was remind, the email channel led to significantly better pragmatic ($p = 0.002$) and hedonic ($p = 0.001$) user experience than the Web channel. Email also led to significantly better pragmatic experience than Facebook ($p = 0.014$). Channel had a significant effect on UX also when reward was the strategy ($p = 0.013$). More specifically, when the persuasive strategy was reward, the email ($p = 0.001$) and Web ($p = 0.049$) channels led to significantly better pragmatic user experience than the SMS channel. Also, Facebook led to better hedonic user experience than SMS ($p = 0.007$). For the other two strategies, we found no channel effect ($p_{Praise} = 0.059$, $p_{Suggest} = 0.075$). These results are much more nuanced than the main effect of channel that we discuss above and point to the fact that the choice of strategy should inform the choice of channel.

6 Discussion and Conclusions

With this research, we contribute to the extant literature on CMC by examining channel effectiveness in the context of varying message contents. We examined the effectiveness of commonly used asynchronous CMC channels in delivering messages framed by various persuasive strategies. Past CMC theories such as media richness (Daft & Lengel, 1986; Daft et al., 1987) and media synchronicity (Dennis et al., 2008) mainly focus on the effectiveness of media in the synchronous/asynchronous spectrum with the objective of identifying the best media match for a given communication. Because today's technology environment has an abundance of options for asynchronous communication, research such as ours is important in going beyond the synchronicity dimension and determining the nuances among various

asynchronous channels. We found that certain combinations of CMC channels and persuasive strategy have an impact on user experience, which, in turn, leads to higher persuasion.

To our knowledge, this study is the first to investigate the persuasive effectiveness of different CMC channel and persuasive strategy combinations. Our analysis shows that the channel-strategy combination is a significant factor in the effectiveness of a persuasive message. Therefore, persuasive messages should be designed keeping the delivery channel in mind. Depending on the application and cost/budget in hand, designers can make more informed decisions about which CMC channel to use with which strategy. When one delivers messages through the Web, positive reinforcement such as reward and praise lead to a better user experience than more neutral or negative future-oriented message content such as suggest and remind. Subsequently, messages that respond to positive past behavior are more effective than those that encourage future positive behavior. Presumably, individuals perceive the tone of such future-oriented messages to be more negative than those that reinforce past positive behavior, which limits their persuasive ability. However, one still needs to deliver such future-oriented messages especially in the absence of past accomplishments. Therefore, further research in persuasive systems should focus on finding ways to deliver the spirit of suggestions and reminders with an assertive tone but without negative connotations.

Among the subset of those messages with a positive tone framed with a reward strategy, SMS emerged as the worst channel of delivery. As for why, one reason may concern that the way that we emulated SMS in our test system: compared to the other channels we used, SMS was arguably the farthest from its traditional interface, which may have limited its users' perception of this channel despite its fit with messages with a positive tone such as reward. Meanwhile, email emerged as the best channel of delivery for more messages with a more negative tone framed as reminders, although it was not significantly better than the SMS channel. SMS and email are "leaner" (Daft & Lengel, 1986; Daft et al., 1987) channels than the Web and Facebook because the former limit use of color and graphics. The relationship between the tone of message and the richness of channel is one area that we identified as requiring future research.

Our results confirm our conceptualization of user experience as a strong determinant of persuasive effectiveness when technology mediates the communication between the persuader and persuadee. The return on one's persuasive effort depends on not only the pragmatic but also the hedonic aspects of the experience the target persuadee has with the tool used to deliver the persuasive message. We found that user experience was a full mediator of the relationship between persuasion and channel-strategy combinations, which suggests that persuasion is achieved through an indirect and complex mechanism in IT-enabled persuasion as it would be in face-to-face persuasion. In face-to-face persuasion scenarios, the characteristics of the persuader play an important role in achieving the desired outcome. For example, a person perceived as "pleasant" is likely to obtain better results in convincing others to modify their behavior. Our results imply that, when technology takes the role of the messenger, the user experience with the persuasive system replaces the experience with the messenger in the face-to- face scenario.

An experimental design such as ours is effective in isolating the effects of variables and implement controls. One reason for why we selected the strategies we did concerned their suitability for experimental manipulation. Because we found empirical evidence on the relative merits of these relatively simple strategies, future studies could adapt research designs that test the effects of implementing more complex strategies such as similarity (reminding persuadees of themselves) or social role of the system that delivers the persuasive message.

Our findings can help marketing professionals understand CMC channels from a different point of view. Channel selection is a complex task for marketing researchers and practitioners (Kiang, Raghu, & Shang, 2000). Online marketing companies often spend millions of dollars to push their promotional messages or products without particularly knowing which channel and strategy will work. Our finding on the significance of the interaction between channel and strategy adds a new dimension for marketers to consider. The choice of channel should take the persuasive strategy into consideration. Although we experimented with some common channels and strategies for this study, this conclusion likely applies to a range of strategy and channel combinations

The findings on the highly significant impact of user experience on persuasive effectiveness suggest that, even for channel strategy combinations that are not very effective in and of themselves, systems that can provide better user experience can lead to desired persuasive results. Hence, when one designs a persuasive message, one should pay attention to not only the strategy and the channel but also aspects of the user interface such as its enjoyability and ease of use (Roto & Rautava, 2008) as formulated in the

liking principle that refers to a system's visual appeal (Oinas-Kukkonen & Harjumaa, 2009). We did not measure whether subjects liked the given stimulus to keep the experimental design parsimonious because we had to use a repeated measures design to offset the limitations of the small sample size. Future research should address this limitation. For similar reasons, we tried to keep the measurement scales as compact as possible, which meant that we measured persuasive effectiveness through only one question. As this question was the last that experimental participants answered, we chose to reduce the effort on the participants as much as possible. To assess the reliability of the persuasive effectiveness question, we assessed test-retest reliability by calculating the correlations between the persuasive effectiveness scores of different channels for a given strategy. These correlations were all significant at the 0.01 level for the reward strategy and mostly significant at the 0.01 level for the other strategies, which suggests that this single-item measure was reasonably reliable. Nevertheless, the sample size of the experiment and the single item instrument are the major limitations of what we report here; therefore, one should interpret our results with caution. However, it is likely that the good amount of variance on age and education level of the sample combined with the use of a repeated measures design has reduced the negative impact of this relatively small sample size on statistical power because we still found many significant results. This observation implies rather large effect sizes for channel-strategy interactions.

Our results also suggest that a more sophisticated manipulation of affect than a bipolar mode (by adding colors, sound, etc.) could also lead to different effects. This area represents another avenue that future research in persuasive systems should address. We chose to use mock-ups displayed on a PC so that we could control the user interaction and user experience of each subject that participated in our experiments. As most communication shifts to the mobile smart technology platform, one could also replicate our experiments to test for their reliability in a more realistic context.

We adopted an exploratory approach in this study, and our findings are a good step towards identifying the relationships between persuasion related variables. We believe future research in persuasive systems should focus on more theory building as to the reasons and direction of the kind of effects we identified through our exploratory study. The rich theory base in cognitive psychology is likely to be a good starting point for such an endeavor.

In addition to the empirical findings, we designed and developed an emulation system, which serves as a further contribution. This system is available for researchers to use as a standard test bed before they deploy a persuasive system. One could extend our emulation system by using robotic technology such as a sensor and eye-tracking systems for improving the measurement of user experience and subsequent persuasive effectiveness. Doing so would provide more accurate measurement for the mental status of subjects and the information they observe in the mock-up.

References

Ajzen, I. (1992). Persuasive communication theory in social psychology: A historical perspective. In M. J. Manfredo (Ed.), *Influencing human behavior: Theory and applications in recreation, tourism, and natural resource management* (pp. 1-27). Champaign, IL: Sagamore Publishing.

Albert, W., & Tullis, T. (2010). *Measuring the user experience: Collecting, analyzing, and presenting usability metrics*. San Francisco, CA: Morgan Kaufmann.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.

Bettinghaus, E. P. (1986). Health promotion and the knowledge-attitude-behavior continuum. *Preventive Medicine, 15*(5), 475-491.

Bevan, N. (2008). *UX, usability and ISO standards.* In *Proceedings of the CHI Workshop on User Experience Evaluation Methods in Product Development.*

Brooke, J. (1996). SUS—a quick and dirty usability scale. *Usability Evaluation in Industry, 189*(194), 4-7.

Chatterjee, S., Dutta, K., Xie, H., Byun, J., Pottathil, A., & Moore, M. (2013). Persuasive and pervasive sensing: A new frontier to monitor, track and assist older adults suffering from type-2 diabetes. In *Proceedings of the 46th Hawaii International Conference on System Sciences*.

Chatterjee, S., & Price, A. (2009). Healthy living with persuasive technologies: Framework, issues, and challenges. *Journal of the American Medical Informatics Association, 16*(2), 171-178.

Chin, J. P., Diehl, V. A., & Norman, K. L. (1988). Development of an instrument measuring user satisfaction of the human-computer interface. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems.*

Cugelman, B., Thelwall, M., & Dawes, P. (2009). Communication-based influence components model. In *Proceedings of the 4th International Conference on Persuasive Technology.*

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness and structural design. *Management science, 32*(5), 554-571.

Daft, R. L., Lengel, R. H., & Trevino, L. K. (1987). Message equivocality, media selection, and manager performance: Implications for information systems. *MIS Quarterly*, *11*(3), 355-366.

Dennis, A. R., Fuller, R. M., & Valacich, J. S. (2008). Media, tasks, and communication processes: A theory of media synchronicity. *MIS Quarterly, 32*(3), 575-600.

Dillard, J. P., Meijnders, A., Dillard, J., & Pfau, M. (2002). Persuasion and the structure of affect. In J. P. Dillard & M. Pfau (Eds.), *The persuasion handbook: Developments in theory and practice* (pp. 309-327). Thousand Oaks, CA: Sage.

Fogg, B. (2003). *Persuasive technology: Using computers to change what we think and do*. New York: Morgan Kaufmann.

Fogg, B. (2016). *What causes behavior change?* Retrieved from http://www.behaviormodel.org/

Fogg, B., & Allen, E. (2009). 10 uses of texting to improve health. In *Proceedings of the 4th International Conference on Persuasive Technology.*

Fogg, B., & Iizawa, D. (2008). Online persuasion in Facebook and Mixi: A cross-cultural comparison. In *Proceedings of International Conference on Persuasive Technology.*

Fogg, B. J. (2009). Creating persuasive technologies: An eight-step design process. In *Proceedings of the 4th Annual Conference on Persuasive Technology.*

Gallagher, K. M., & Updegraff, J. A. (2012). Health message framing effects on attitudes, intentions, and behavior: A meta-analytic review. *Annals of Behavioral Medicine, 43*(1), 101-116.

Guadagno, R. E., & Cialdini, R. B. (2002). Online persuasion: An examination of gender differences in computer-mediated interpersonal influence. *Group Dynamics: Theory, Research, and Practice, 6*(1), 38-51.

Holbert, R. (2002). Embodied meaning of media form. In J. P. Dillard & M. Pfau (Eds.), *The persuasion handbook: Developments in theory and practice*. Thousand Oaks, CA: Sage.

Huang, A. H., Yen, D. C., & Zhang, X. (2008). Exploring the potential effects of emoticons. *Information & Management, 45*(7), 466-473.

Kiang, M. Y., Raghu, T., & Shang, K. H.-M. (2000). Marketing on the Internet—who can benefit from an online marketing approach? *Decision Support Systems, 27*(4), 383-393.

Law, E. L.-C., Roto, V., Hassenzahl, M., Vermeeren, A. P., & Kort, J. (2009). Understanding, scoping and defining user experience: A survey approach. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems.*

Lawal, B. (2014). *Applied statistical methods in agriculture, health and life sciences*. Berlin: Springer.

Lehto, T., & Oinas-Kukkonen, H. (2015). Examining the persuasive potential of Web-based health behavior change support systems. *AIS Transactions on Human-Computer Interaction, 7*(3), 126-140.

Li, H., & Chatterjee, S. (2010). *Designing effective persuasive systems utilizing the power of entanglement: Communication channel, strategy & affect.* In *Proceedings of the Annual Workshop on Persuasive Technology.*

Maheshwari, M., Chatterjee, S., & Drew, D. (2008). Exploring the persuasiveness of "just-in-time" motivational messages for obesity management. In *Proceedings of the International Conference on Persuasive Technology.*

Marková, I. (2008). Persuasion and social psychology. *Diogenes, 55*(1), 5-8.

Meyers-Levy, J., & Maheswaran, D. (2004). Exploring message framing outcomes when systematic, heuristic, or both types of processing occur. *Journal of Consumer Psychology, 14*(1), 159-167.

Miller, G. (1980). On being persuaded: Some basic distinctions. In J. P. Dillar & M. Pfau (Eds.), *The persuasion handbook: Developments in theory and practice* (pp. 3-16): Thousand Oaks, CA: Sage.

Nguyen, H., & Masthoff, J. (2009). Designing empathic computers: The effect of multimodal empathic feedback using animated agent. In *Proceedings of the 4th International Conference on Persuasive Technology.*

O'Brien, H. L. (2010). The influence of hedonic and utilitarian motivations on user engagement: The case of online shopping experiences. *Interacting with Computers, 22*(5), 344-352.

Oinas-Kukkonen, H., & Harjumaa, M. (2009). Persuasive systems design: Key issues, process model, and system features. *Communications of the Association for Information Systems, 24*, 484-500.

Picard, R. W. (1995). *Affective computing* (technical report no. 321). Cambridge, MA: MIT Media Laboratory.

Reitberger, W., Meschtscherjakov, A., Mirlacher, T., Scherndl, T., Huber, H., & Tscheligi, M. (2009). A persuasive interactive mannequin for shop windows. In *Proceedings of the 4th international Conference on Persuasive Technology.*

Riordan, M. A., & Kreuz, R. J. (2010). Cues in computer-mediated communication: A corpus analysis. *Computers in Human Behavior, 26*(6), 1806-1817.

Rosenfeld, E. (2008). How to build a persuasive Web application. In *Proceedings of the International Conference on Persuasive Technology.*

Rothman, A. J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychological Bulletin, 121*(1), 3-19.

Roto, V., & Rautava, M. (2008). User experience elements and brand promise. In *Proceedings of the International Engagability & Design Conference.*

Segerståhl, K., & Oinas-Kukkonen, H. (2007). Distributed user experience in persuasive technology environments. In *Proceedings of the International Conference on Persuasive Technology.*

Smith, S. M., & Petty, R. E. (1996). Message framing and persuasion: A message processing analysis. *Personality and Social Psychology Bulletin, 22*, 257-268.

Torning, K., & Oinas-Kukkonen, H. (2009). Persuasive system design: State of the art and future directions. In *Proceedings of the 4th International Conference on Persuasive Technology.*

Walther, J. B., & D'Addario, K. P. (2001). The impacts of emoticons on message interpretation in computer-mediated communication. *Social Science Computer Review, 19*(3), 324-347.

Wilson, E. V. (2003). Perceived effectiveness of interpersonal persuasion strategies in computer-mediated communication. *Computers in Human Behavior, 19*(5), 537-552.

Wilson, E. V. (2015). Understanding how message receivers' communication goals are applied in online persuasion. In *Proceedings of the International Conference on Persuasive Technology*.

Xu, A., Chomutare, T., & Iyengar, S. (2014). Systematic review of behavioral obesity interventions and their persuasive qualities. In *Proceedings of the International Conference on Persuasive Technology.*

Zhu, W. (2007). Promoting physical activity through Internet: A persuasive technology view. In *Proceedings of the International Conference on Persuasive Technology.*

About the Authors

Haiqing Li is Staff Scientist at Research Informatics Division, City of Hope National Medical Center. He focuses on cancer biomarker discovery using high throughput sequencing technology and high-resolution imaging technology, and informatics infrastructure for translational research. His main research interests include bioinformatics, healthcare informatics, persuasive behavior change, cybersecurity, network communication, geographic information system, and human-computer interaction. He has published over 20 articles in refereed conferences and journals including *IEEE Network*, *IEEE Journal on Selected Areas in Communications*, *International Journal of Electronic Healthcare*, *Cancer Research*, *Oncotarget*, *Nucleic Acids Research*, *Nature Biotechnology*, *Nature Scientific Reports*, and *Nature Cell Biology*.

Samir Chatterjee is Professor and Fletcher Jones Chair of Design, Technology & Management at Claremont Graduate University. He is also considered a leading technology designer and strategist for 21st century healthcare. He is the founding director of IDEA Labs (Innovations Design Empowerment Applications Laboratory), initially made possible by a grant from NSF. His main research areas are healthcare informatics, persuasive behavior change, cybersecurity and human computer interaction. He has published over 130 papers in refereed conferences and journals including *IEEE Network*, *IEEE Journal on Selected Areas in Communications*, *Communications of the ACM*, *Computer Networks*, *Journal of MIS*, *Decision Support Systems*, *Journal of American Medical Informatics Association* (*JAMIA*), *Journal of Medical Internet Research* (*JMIR*), *Telemedicine & e-Health Journal*, *European Journal of Information Systems*, *Information Systems Frontiers*, *Computer Communication*, *IEEE IT Professional*, *ACM CCR*, *Communications of AIS*, and *Journal of Internet Technology*. He has served as an Associate Editor of the *MIS Quarterly*. He serves on the editorial board of International *Journal of Business Data Communications and Networking*, *Journal of AIS,* and *Health Systems Journal* (from Palgrave Macmillan). His research has been funded by National Science Foundation (NSF), National Institutes of Health (NIH), Internet2, Michigan Diabetes Center, The California Endowment, Northrop-Grumman, BellSouth, Institute for HeartMath, Loma Linda Foundation and several other corporations. In May 2015, he was awarded the distinguished lifetime achievement award for contributions to Design Science Research, presented by the IS design community. In 2017 he was selected as Schoeller Senior Fellow 2017 by Dr. Theo and Friedl Schoeller Research Center for Business and Society in Nuremberg Germany. He is also Founder and CEO of DCL Health, a wireless healthcare startup.

Ozgur Turetken is a professor and the director of the Ted Rogers school of Information Technology Management at Ryerson University. He holds a BSc. in electrical and electronics engineering and an MBA degree from Middle East technical University in Ankara, Turkey, and a PhD in management science and information systems from Oklahoma State University. His current research interests are in applied text analytics and human computer interaction in the Web 2.0 environment. His research has been funded by national and provincial grant agencies in Canada. His previous work has appeared in journals such as *AIS Transactions on Human Computer Interaction*, *Communications of the AIS*, *Communications of the ACM*, *Database*, *Decision Support Systems*, *IEEE Transactions on Professional Communication, IEEE Computer*, *Information & Management*, *Information Systems*, *Information Systems Frontiers*, *Interactions,* and in the proceedings of several high-level international conferences such as ACM CIKM and ICIS. He served as chair of the AIS special interest group on decision support and analytics (SIGDSA) and is currently on the editorial board of the AIS Transactions on Human Computer Interaction. He is also an associate editor for ECIS 2018 and ICIS 2018.

Transactions on Human – Computer Interaction

1.1 Editors-in-Chief

1.2 Advisory Board

1.3 Senior Editor Board

1.4 Editorial Board

1.5 Managing Editor

1.6 SIGHCI Chairs

2001-2004: Ping Zhang	2004-2005: Fiona Fui-Hoon Nah	2005-2006: Scott McCoy	2006-2007: Traci Hess
2007-2008: Weiyin Hong	2008-2009: Eleanor Loiacono	2009-2010: Khawaja Saeed	2010-2011: Dezhi Wu
2011-2012: Dianne Cyr	2012-2013: Soussan Djamasbi	2013-2015: Na Li	2015-2016: Miguel Aguirre-Urreta
2016-2017: Jack Jiang	2017-2018: Gabe Lee	2018-2019: Gregory D. Moody	