DOES MESSAGE INTERACTIVITY HELP OR HINDER THE EFFECTS OF
ANTHROPOMORPHIC ONLINE CHAT AGENTS?
COMPENSATION VS. EXPECTATION EFFECTS IN ORGANIZATIONAL WEBSITES

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ABSTRACT

The popularity of providing customer service via online chat assistants is on the rise. Chat agents provide numerous benefits, including low cost and ease of use. However, using online chat agent, especially, a chat-bot poses challenges as well, in that their conversation styles are somewhat limited and impersonal. Given that chat-bots are designed to substitute for actual human agents, this study suggests that the message interactivity that is characteristic of human-to-human conversation may be one means for improving chat-bots’ communication. In particular, this study aims to investigate how the ability of chat-bots to exchange messages in a contingent manner may compensate for their lack of humanness. In order to investigate this effect, this study conceptualizes the ability to exchange messages in a contingent manner as message interactivity and humanness in terms of the chat agents’ visual representation (as anthropomorphic or not) and role identity (as chat-bot or human).

A human-like conversation style of a chat-bot is expected to compensate for the chat-bot’s lack of its humanness; however, it is also possible that if its conversation style is too contingent in style, and thus too human-like, an expectancy violation may occur. Thus, this study pays special attention to these two possibilities (i.e., the compensation effect and the expectancy violation effect) to explain the effects of message interactivity using the Interactivity Effects Model (Sundar, 2007) and the theory of interactive media effects (TIME) proposed by Sundar et al. (2015b).

These possibilities were investigated with a 2 (anthropomorphic visual cue: high vs low anthropomorphism) × 2 (identity cue: chat-bot vs. sales associate) × 2 (message interactivity: high vs. low message interactivity) between-subjects experiment. Participants were asked to interact with an online chat agent by using “live chat” function on an e-
commerce website. By examining the interactions of visual cue, identity cue and message interactivity, this study revealed distinctive mechanisms through which message interactivity affects users’ psychological, attitudinal, behavioral and relational responses. Specifically, findings show that message interactivity works to compensate for the impersonal nature associated with low anthropomorphic visual cue and chat-bot identity cue. Moreover, the identity cue turned out to be a key factor in eliciting certain expectations regarding the agent’s performance in conversation. Therefore, this study suggests using chat agents on organizational websites in order to help mitigate users’ negative evaluations or experiences due to high expectations given that users tend to have different expectations of agents’ performances, depending on whether the agents are human or chat-bots. Therefore, agents’ actual communication styles should align with users’ expectations. More theoretical as well as practical implications of these findings are discussed.
## TABLE OF CONTENTS

List of Figures .................................................................................................................. vii
List of Tables .................................................................................................................... ix
Acknowledgements ......................................................................................................... x

Introduction ..................................................................................................................... 1

Chapter 1 Literature review .......................................................................................... 6
  Anthropomorphic Visual Cues of Online Chat Agents ................................................ 6
  Source Identity Cues of Online Chat Agents .............................................................. 13
  Online Chat Agents and Their Conversational Cues ................................................. 16
  Interactions Among Visual Cues, Identity Cues, and Message Interactivity .......... 22
    Compensation effect .................................................................................................. 24
    Expectancy violation effect ..................................................................................... 28
    Another expectancy violation effect: The eeriness effect ...................................... 32

Chapter 2 Method ......................................................................................................... 35
  Research design ........................................................................................................... 35
  Participants ................................................................................................................... 35
  Stimulus material ......................................................................................................... 36
  Experimental manipulation ......................................................................................... 37
  Procedure ..................................................................................................................... 40
  Measures ..................................................................................................................... 42

Chapter 3 Results .......................................................................................................... 47
  Data analyses ................................................................................................................. 47
  Manipulation check ...................................................................................................... 47
  Part I: Effects of anthropomorphic visual cue of the agent on social presence, perceived homophily, attitudes, behavioral intention and relational outcomes ........ 48
  Part II: Effects of identity cue of the agent on social presence, perceived contingency, attitudes, behavioral intention and relational outcomes .......................... 50
  Part III: Effects of message interactivity on perceived contingency, perceived dialogue, social presence, attitudes, behavioral intention and relational outcomes .......... 52
  Part IV: Compensation vs. expectancy violation effects of anthropomorphic visual cue, identity cue, and message interactivity on psychological outcomes ............. 56
  Summary of findings .................................................................................................... 66

Chapter 4 Discussion ..................................................................................................... 69
  Effects of message interactivity on psychological, attitudinal, behavioral, and relational outcomes .......................................................... 69
  Interaction effects among visual cues, the identity cue, and message interactivity: the compensation effect vs. the expectancy violation effect vs. the eeriness effect .... 71
  1) The importance of message interactivity on compensation effects ................. 73
  2) The importance of the identity cue in building expectations ......................... 74
3) The effect of the identity cue and visual cues on the eeriness effect and perceived homophily..................................................................................................................77
Practical implications........................................................................................................78
Limitations and future research.....................................................................................80
Conclusion .......................................................................................................................84

References.........................................................................................................................86
Appendix. Chatting script ................................................................................................95
LIST OF FIGURES

Figure 1. Theory of interactive media effects (TIME) ................................................................. 24
Figure 2. Compensation effect between identity cue and message interactivity ...................... 27
Figure 3. Compensation effect between visual cue and message interactivity ........................ 28
Figure 4. Expectancy violation effect between identity cue and message interactivity ......... 31
Figure 5. Expectancy violation effect between visual cue and message interactivity .......... 32
Figure 6. Uncanny Valley Proposition ....................................................................................... 33
Figure 7. Eeriness effect between identity cue and message interactivity ............................ 33
Figure 8. Homepage of stimulus website .................................................................................. 37
Figure 9. A live chat window with a highly anthropomorphic visualized online chat agent ... 38
Figure 10. A live chat window with a low anthropomorphic visualized online chat agent .... 38
Figure 11. Indirect effects of message interactivity on perceived expertise ............................. 54
Figure 12. Indirect effects of message interactivity on perceived friendliness ....................... 54
Figure 13. Indirect effects of message interactivity on attitudes toward the website .......... 55
Figure 14. Indirect effects of message interactivity on behavioral intention ......................... 55
Figure 15. Indirect effects of message interactivity on control mutuality .............................. 55
Figure 16. Indirect effects of message interactivity on satisfaction ........................................ 55
Figure 17. Indirect effects of message interactivity on trust ...................................................... 56
Figure 18. Indirect effects of message interactivity on commitment ....................................... 56
Figure 19. Interaction effect of visual cue and identity cue ...................................................... 57
Figure 20. Interaction effect of visual cue and message interactivity ....................................... 58
Figure 21. Interaction effect between identity cue and message interactivity ........................ 59
Figure 22. Interaction between identity cue and message interactivity .................................. 60
Figure 23. Interaction effects between identity cue and message interactivity ....................... 61
Figure 24. Interaction between visual cue and message interactivity ..................................... 62
Figure 25. Interaction between identity cue and message interactivity .................................. 62
Figure 26. Interaction effect between identity cue and message interactivity ....................... 63
Figure 27. Interaction effects between identity cue and message interactivity..........................64

Figure 28. Interaction effects between identity cue and message interactivity..........................76
LIST OF TABLES

Table 1. Distribution of participants across conditions .................................................36
Table 2. Mean and standard deviation of social presence and perceived homophily..49
Table 3. Main effects of anthropomorphic visual cue on psychological variables......49
Table 4. Main effects of identity cue on psychological variables.................................51
Table 5. Mean and standard deviation of perceived contingency, perceived dialogue and social presence .................................................................53
Table 6. Main effects of message interactivity on psychological variables ..............54
Table 7. Significant indirect effects of message interactivity on attitudinal, behavioral and relational outcome via mediators .................................................56
Table 8. Interaction effects among three independent variables.............................65
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INTRODUCTION

Interactive online chat agents have now become quite common on the internet, with several sites and applications using a variety of chatbots, ranging from Apple’s Siri to online customer-service agents in e-commerce sites. The main functions of online chat agents are to interact with users, respond to their questions and address their concerns. These agents are better than static delivery of information, such as listing the most Frequently Asked Questions, or FAQs, because they afford a more interactive delivery of messages to users, by responding specifically to questions posed by users. So much so that several companies use these agents as replacements for human agents or telephone-based call support. As such, the use of online chat agents for chatting seems to hold tremendous promise for providing users with quick and convenient support. However, it also results in new challenges in online communication in that online chat agents are short on humanness in conversation, considering that their conversation styles tend to be artificial and somewhat limited because of their adherence to pre-programmed scripts.

Nonetheless, if online chat agents are to assume roles hitherto held by humans, designers have to strive to make their interactions as similar as possible to those with human beings. The core characteristic of human-to-human communication is the ability to exchange messages in a contingent manner. Interdependent message exchange is called “message interactivity” and is based on mimicking the back-and-forth message exchange common in interpersonal interactions between humans (Sundar, 2007). Therefore, this study raises an important theoretical question for online communication with online chat agents: Can the interactivity of online chat agents compensate for their lack of humanness?

In order to investigate this question, it is important to conceptualize both interactivity and humanness as variables, in keeping with the variable-centered approach of media-effects
research (Sundar, 2007; Nass & Mason, 1990). Interactivity in a chat context can be conceptualized as the level of contingency (or interdependent threadedness) in message exchange, in keeping with the aforementioned conceptualization of message interactivity. Humanness of an online chat agent can be conceptualized in terms of its visual representation on the interface (as anthropomorphic or not) as well as its role identity (chatbot vs. sales assistant).

If the agent is low on humanness (i.e., non-anthropomorphic presence on the interface or a chat-bot identity), then the provision of message interactivity may serve to compensate for this lack of humanness. However, message interactivity might not always work in a compensatory way; rather, it can cause violation in expectancy towards an online chat agent. In other words, depending on the appearance and defined identity of an online chat agent, message interactivity can cause a discrepancy between a customer’s expectation and an agent’s style of communication. For example, human-like visual cues combined with a high level of message interactivity will result in desirable outcomes because an optimal level of message interactivity satisfies the expectation of humanness triggered by human-like visual cues. However, if human-like visual cues are combined with a low level of message interactivity, this can result in negative effects because such a combination would violate the expectation of humanness triggered by human-like cues. In other words, when users are exposed to human-like cue of an online chat agent, they will be more likely to expect human-like conversation with the online chat agent, which can be achieved through higher levels of message interactivity. But, if the users are faced with a low level of message interactivity, they will tend to evaluate the online chat agent’s performance in a negative way, because the agent’s behavior violates their expectations triggered by visual cues suggesting a higher level of humanness on the part of the agent.
Acknowledging such possible interactions between message interactivity and the level of humanness of online chat agents, this study attempts to test these two comparative hypotheses (i.e., compensation effect and expectancy violation effect) in the context of organizational Web sites. In particular, this study examines how different combinations of online chat agents’ visual representation, identity cues and conversational style influence users’ attitudes and behavioral intentions to use a given organization’s website in the future.

The reason why this study focuses on attitudes and behavioral intentions as study outcomes is because a primary objective of persuasive communication is the creation or alteration of people’s behaviors. Therefore, predicting the behaviors that are likely to take place after communication is the main task of research in the communication domain. Attitudes and behavioral intentions have been shown to be significant behavioral predictors. Ajzen and Fishbein (1980), for example, have suggested that the most efficient way to determine an individual’s probability to engage in a given behavior is to measure his or her intention to do so. For this reason, a vast body of communication studies (e.g., Ajzen & Fishbein, 1980; Gorsuch & Ortberg, 1983; Warshaw & Davis, 1985) has focused on attitudes and behavioral intentions as critical outcomes of persuasive communication. Moreover, many theories such as the theory of reasoned action (Fishbein & Ajzen, 1975), the theory of planned behavior (Ajzen & Fishbein, 1980), and theory of trying (Bagozzi & Warshaw, 1990) have been developed to identify which factors lead to favorable attitudes and behavioral changes in a wide variety of contexts. Given that users’ interactions with online chat agents are also a form of persuasive communication, this study explores how users’ attitudes and behavioral intentions develop or shift as a result of this online communication.

In addition, this study focuses on the effects of the three aforementioned factors (i.e., anthropomorphic visual representation, identity cues, and message interactivity) on
relationship-associated outcomes. This is because an organization’s fundamental goal in communicating with the public is to build and maintain a good relationship (Crable & Vibbert, 1986). Therefore, public relations scholars have attempted to study the organization-public relationship with an emphasis on how an organization can build and maintain a good relationship with the public. Since the paradigm of relationship management was introduced, it has become a hallmark of public-relations scholarship. The paradigm of relationship management embraces the notion of public relations as a field that aims to cultivate “mutually beneficial relationships between an organization and the publics” (Cutlip, Center & Broom, 1994, p. 2). However, until now, relational outcomes have not been widely considered in one-time experimental studies, given that such outcomes are generally associated with long-term relationships. Nonetheless, by demonstrating that even a single interaction with an online chat agent on an organization’s website can contribute to relational outcomes, this study aims to reveal the potential of using these agents for relationship development and management. More specifically, given the fact that good relationships begin with creating psychological or emotional connections between organizations and their publics, thereby inspiring loyalty that will foster additional bonding, this study aims to identify some relationship-associated psychological variables (e.g., social presence, perceived dialogue, and perceived homophily) that explain why an online chat agent’s visual representation, identity cue, and conversational style all contribute to relational outcomes.

Ultimately, the findings will not only advance our theoretical knowledge about the psychological effects of different aspects of interactive online chat agents, but also provide practical guidelines on how the human-like characteristics of online chat agents should be combined with interaction functionalities in order to create the most desirable outcomes for
users in a number of domains, ranging from customer-service in e-commerce to counseling services in e-health.
Chapter 1

LITERATURE REVIEW

This chapter consists of four sections. The first three sections discuss three factors associated with the anthropomorphic characteristics that an online chat agent may possess. More specifically, the literature review begins with a discussion of the effects of agents’ anthropomorphic visual cues as used on websites. To explain such effects, the study adopts the computers-as-social-actors (CASA) paradigm. The next section of the literature review addresses the role of agents’ identity cues (i.e., human vs. chat-bot) on attitudinal, behavioral, and relational outcomes. The subsequent section is devoted to discussing message interactivity. This section uses the model of interactivity effects suggested by Sundar (2007) as its key theoretical framework. Finally, the study reviews the combinatory effects of these three factors: anthropomorphic visual cues, identity cues, and message interactivity. In particular, the study examines two comparative assumptions associated with interaction effects: the compensation effect and the expectancy violation effect.

Anthropomorphic Visual Cues of Online Chat Agents

To understand the effects of online chat agents embedded in websites, scholars have begun to investigate how people treat online chat agents in computer-mediated communication, showing that they respond to agents socially by treating them as humans. In other words, people apply the social rules of human-to-human interaction to their interactions with agents, in a demonstration of what is known as the computers-as-social-actors (CASA) paradigm (Nass & Brave, 2005; Reeves & Nass, 1996).

This research on people’s tendency to apply social rules to non-human objects can be traced back to a series of experimental studies conducted by Nass et al. in the late 1990s and
early 2000s (Gong & Nass, 2007; Nass & Lee, 2001; Nass, Moon, & Green, 1997). For example, in 1997, Nass, Moon, and Green found that computers with differently-gendered voices embedded in computer programs elicited different reactions from participants. More specifically, participants perceived computers with male voices as friendlier and more competent than computers with female voices. This result indicates that people tend to draw conclusions about the personalities of computers based on their voices by applying gender stereotypes. In addition, some studies have demonstrated that when a computer compliments a participant’s performance, the participant is more likely to perceive the interaction with the computer positively (Fogg & Nass, 1997; Lee, 2010). Finally, Nass, Moon, and Carney (1999) have also demonstrated that people have a tendency to apply the norm of politeness, which usually guides interaction between humans, to objects.

It is evident that people’s reactions to online chat agents are not that different from their reactions to computers. Studies have investigated which characteristics of online agents elicit the greatest social reactions. For example, some studies (Gong & Nass, 2007; Baylor & Kim, 2003; Nowak, 2004; Kim & Sundar, 2012) have focused on the appearance of online agents. Since some online agents have human-like faces, while others are more nondescript, having more obviously artificial appearances, the extant research on online agents has shown that online agents’ anthropomorphic visual cues influence people’s judgments of them.

The importance of online chat agents’ visual representation is also backed by the MAIN model (Sundar, 2008), which explains how the agents’ anthropomorphic visual cues influence people’s perceptions, attitudes, and behaviors towards the agents. More specifically, Sundar (2008) has argued that interface cues can trigger mental shortcuts, or “heuristics,” which are “general purpose judgmental tools that can be applied in a wide variety of decision-making circumstances” (Sherman & Corty, 1984, p. 193). These
heuristics are usually stored in one’s memory as schemata and are activated by a stimulus or cue represented in media artifacts (Bellur & Sundar, 2014). In the MAIN model, heuristics serve as important drivers of human perceptions. When it comes to online chat agents on the interface, agents’ anthropomorphic visual cues can trigger “humanness” heuristics; thus, users who are presented with online chat agents imbued with human-like visual cues are more likely to treat the agents as human and to act socially towards them.

In terms of the psychological effects of these visual cues, it has been found that anthropomorphic visual presentation increases the sense of social presence among users who are having conversations with such agents. Given that social presence is defined as the “degree of salience of the other person in the interaction” (Short, Williams, & Christie, 1976, p. 65), online chat agents with highly anthropomorphic visual cues (e.g., a human figure) are more likely to increase the awareness or salience of the “other person” than those with low anthropomorphic visual cues (e.g., a bubble). Therefore, users will experience greater social presence when interacting with online chat agents with human morphology than those with non-human morphology. Indeed, Kim and Sundar (2012) have reported that participants in human-like agent conditions show greater feelings of social presence. In a similar vein, studies have found that anthropomorphic elements on the interface, such as human audio (Lombard & Ditton, 1997), talking-face displays (Sproull et al., 1996), and human video (Kumar & Benbasat, 2002), create a sense of social presence among users.

Higher levels of social presence achieved through the anthropomorphic visual cues of online chat agents have been shown to result in diverse outcomes. Researchers have argued that social presence is a multidimensional construct including several psychological dimensions (Bente et al., 2008; Biocca, Harms, & Burgoon, 2003). In particular, researchers (Rice, 1984; Palmer, 1995) have pointed out that social presence is related to two key
psychological concepts: intimacy and immediacy. Considering that intimacy represents psychological/emotional closeness and immediacy indicates direct involvement in the interactions, both concepts may enhance psychological or social connectedness and closeness; therefore, when people experience greater social presence with greater perceptions of intimacy and immediacy while interacting with online chat agents, such heightened social presence results in positive perceptions of the agents, such as positive attitudes toward the agents. The positive attitudes toward the agents subsequently engender favorable attitudes toward both the agents’ organizations and the organizations’ websites, and ultimately creates behavioral intentions among users to visit the websites again in the future.

By the same token, anthropomorphic visual cues seem to have particular potential for relationship-building and maintenance between an organization and its online visitors. Among the four dimensions of relational outcomes (i.e., trust, satisfaction, commitment, and control mutuality), social presence has been shown to influence the first three: trust, satisfaction, and commitment. Gefen and Straub (2003) have found that social presence leads to increased trust. Trust can only occur in the course of interactions that can be considered social. For example, one can develop trust in his or her bank or a perception of safety in making transactions with that bank through interacting with one of the bank’s clerks. However, this is not quite possible on a bank website because users are unable to physically interact with human bank clerks. In general, the opportunities to experience human warmth and sociality are lower in e-commerce websites than brick-and-mortar settings because the websites tend to be more automated and impersonal (Wang & Emurian, 2005; Riegelsberger et al., 2003). However, thanks to recent advancements in technology (i.e., diverse interactive affordances), websites allow users to experience the presence of others without physical co-presence. An organization can therefore increase its users’ trust perceptions by taking
advantage of technology to convey social presence on its website. In addition to trust, social presence can compensate for the lack of face-to-face interaction, thereby cultivating richer online interactions, and in turn, more satisfying user experiences (So & Brush, 2008). In computer-mediated communications (CMC), the concept of social presence has been widely used to demonstrate the effects of CMC (over Face-to-Face) on such interpersonal factors as relationship satisfaction and commitment. This is because immediacy and intimacy, as psychological dimensions of social presence, are powerful enough to foster the development of a social relationship (Isotalus & Muukkonen, 2002). In other words, social presence can carry over to satisfaction in relationships by enhancing feelings of affective accessibility (i.e., immediacy) (Biocca, Harms, & Gregg, 2001) and affective connectedness (i.e., intimacy) (Tu & McIsaac, 2002). For this reason, Walther (1992) has argued that CMC may be richer than face-to-face communication. Key studies (Hackman & Walker, 1990; Cobb, 2011) have likewise provided evidence that within CMC settings, such as those of distance education and computer conferencing, social presence may contribute to users’ satisfaction with the online interactions. Therefore, even though users in CMC settings are not physically co-present, as long as they experience social presence, they are able to have richer interactions, which ultimately lead to greater satisfaction with those interactions or relationships with other users. If online users in CMC settings are satisfied with their interactions, it is natural that they would engage more frequently in those interactions or relationships, which in turn results in greater relational commitment. Studies have shown that feelings of social presence increase commitment to online communities and feelings of belonging since commitment can be enhanced by social interactions among group members (Prentice, Miller & Lightdale, 1994; Ren, Kraut, & Kiesler, 2007). Chidambaram (1996) has also found that social presence
causes users to spend more time with members in online groups, thus promoting the users’ commitment to the interactions or relationships.

Taken together, this study suggests that the anthropomorphic visual cues of an online chat agent can lead greater feelings of social presence, which contribute to more favorable attitudes, greater behavioral intentions to return to a given website, and greater trust, satisfaction and commitment as relational outcomes.

**Hypothesis 1:** Higher levels of anthropomorphic visual cues in an online chat agent will lead to greater feelings of social presence.

**Hypothesis 2:** Greater feelings of social presence achieved through the anthropomorphic visual cues of an online chat agent will lead to (a) more favorable attitudes, (b) greater behavioral intentions to return to a given website, and (c) greater relational outcomes (particularly trust, satisfaction and commitment).

Another way the anthropomorphic visual cues of an online chat agent might influence a user’s perception or evaluation of an organization and its website is through perceived homophily, which is defined as “the amount of similarity two people perceive themselves as having” (Rocca & McCroskey, 1999, p. 309). Individuals have a propensity to evaluate those similar to themselves favorably (Goethals & Nelson, 1973). The more similar two people are to each other, the more they attempt to communicate with and understand each other (Rogers & Bhowmik, 1970). Because users are likely to perceive an online chat agent with highly anthropomorphic features as more similar to them than an agent with minimally anthropomorphic features, they are more likely to evaluate the former agent favorably. Indeed, studies have found that an online chat agent with human-like morphology is likely to be rated as more likable than an agent with less human-like morphology (Koda,
Favorable attitudes toward the online chat agent are also likely to result in greater behavioral intentions to visit a website. Furthermore, given that individuals have a tendency to have more frequent interactions or communication with others who are similar and homophilous (Lazarfeld & Mertan, 1954; Rogers & Shoemaker, 1971), and that perceived homophily leads to more effective interactions in relationships (Rogers & Bhowmik, 1971), increased perceptions of homophily toward an online chat agent with highly anthropomorphic visual cues may play an important role in the building and maintenance of a given relationship. In other words, if people perceive an online chat agent as similar to them, they are more likely to communicate with it, to understand, and to engage in future interaction with it (Rocca & McCroskey, 1999). Therefore, such a tendency may translate into an intention to make a relational commitment to the organization. The effect of similarity has been explored in several marketing and social psychology studies. These studies have reported that perceived homophily or perceptions of similarity facilitate trust, satisfaction, and commitment in relationships. For example, Tang, Gao, Hu, and Liu (2013) found that individuals who are similar to one another are more likely to establish trusting relationships with each other. Research has also suggested that perceptions of similarity exert a positive influence on relationships, increasing individuals’ expectation that similar others will help make their goal (or wish) possible (Johnson & Johnson, 1972). As a result, perceptions of similarity breed trust and enhance the relationship. Studies have also shown that individuals are more likely to feel satisfied with their relationships when they perceive greater similarity (Burleson & Denton, 1992; Russell & Wells, 1991). This is because similarity increases initial attraction (Klohnren & Luo, 2003), thereby heightening each party’s feelings of being understood and lowering the probability of relationship dissolution, which ultimately results in greater satisfaction (Murray et al., 2002).
Thus, based on the aforementioned discussion, the current study proposes that anthropomorphic visual cues of online chat agents lead to systematic variations in attitudinal, behavioral and relational outcomes via the mediating role of perceived homophily by examining the following hypotheses.

**Hypothesis 3:** Higher levels of anthropomorphic visual cues of an online chat agent will lead to greater perceived homophily.

**Hypothesis 4:** Higher levels of perceived homophily achieved through the anthropomorphic visual cues of an online chat agent will lead to (a) more favorable attitudes, (b) greater behavioral intentions to return to a given website, and (c) greater relational outcomes (particularly trust, satisfaction and commitment).

**Source Identity Cues of Online Chat Agents**

The value of source cues in persuasion has been extensively investigated (Hass, 1988). In traditional media, the effects of source cues have been examined in the perception of content. Such studies have investigated how source cues such as an expertise cue determine the quality (e.g., credibility) of content. Hovland et al. (1953), for example, have found that a message with a high-expertise source cue is perceived as more credible than a message with a low-expertise source cue. A tremendous amount of follow-up research has documented the positive effects of source characteristics on persuasive outcomes, such as attitudinal change and behavioral intentions (Ross, 1973; Maddux & Rogers, 1980).

In considering the effect of source cues on people’s perceptions, this study investigates source identity cues. Identity cues are considered to be significant factors in individuals’ perceptions. Cognitive psychologists have emphasized the category-based perceptions activated by the social labels (or identity cues) assigned to individuals or objects,
arguing that people tend to use the major attributes attached to the labels in order to minimize cognitive efforts in making judgments or forming impressions of others (Ashforth & Humphrey, 1997; Gelman & Heyman, 1999). Such labels, then, evoke certain stereotypes or perceptions from one’s schema, allowing one to make heuristic judgments based on the cues. This category-based perspective calls for an understanding of the function of labeling. According to Ashforth and Humphrey (1997), an assigned label related to the social identity of an individual may signify one’s authority, status, or power in society. For instance, Koh and Sundar (2010) found that participants perceived a wine-related website or web agent labeled “specialist” as more expert and trustworthy than one with a “generalist” label. This suggests that the presence of a mere label attached to an object can function as a heuristic cue that allows users to make decisions with minimal effort. Furthermore, the labeling effect occurs regardless of an object’s actual quality—in this case, the object’s actual level of expertise about wines.

In human and chat agent interactions, the effects of the online chat agent identity can be investigated by comparing the machine identity with the human identity attached to the agent. An online chat agent embedded in an organizational website can be operated by either an actual human or a chat-bot, the latter operating in accordance with pre-programmed scripts. Offering the user information about whether the agent is a real human or a chat-bot may elicit machine vs. human heuristics that can be related to anthropomorphic perceptions. As mentioned earlier, the MAIN model suggested by Sundar (2008) explains that individuals tend to use “heuristics” or “rules of thumb” triggered by interface cues when making decisions. Among these various heuristics, the machine heuristic, or “attributions of randomness, objectivity, and other mechanical characteristics to [the machine’s] performance” (p. 83), can be elicited when a user encounters machine-like cues. On the other
hand, human identity cues can elicit anthropomorphism or human-associated perceptions. In this situation, as Koh and Sundar (2010) have argued, the actual conversational quality of the online chat agent might not matter in evaluating the agent’s performance if the identity assigned to the agent already elicits stereotypical judgments. In other words, if an agent is presumed to be operated by a chat-bot, then users are more likely to evaluate the quality of the agent’s performance based on their pre-existing perceptions of chat-bots or machines elicited by that identity cue, regardless of the agent’s actual performance quality. Human identity cues as opposed to chat-bot identity cues are expected to make users evaluate the quality of the agent’s performance based on their expectations of the characteristics of human agents. Indeed, Sundar et al. (in press) have shown that participants in a human agent condition evaluate the chat agent as more human-like, natural, and life-like than those in a chat-bot agent condition. If online users are more likely to perceive online chat agents with human identity cues as human-like, then it is likely that participants in a human identity cue condition will show a greater sense of social presence than those in a chat-bot identity cue condition because human identity cues can increase the awareness or salience of “another person.” Furthermore, if human identity cues can enhance a sense of social presence, this will lead to more favorable attitudes, greater behavioral intentions to visit the website, and greater relational outcomes, as discussed in the previous section. Therefore, the following hypotheses are proposed.

**Hypothesis 5:** Human identity cues of online chat agents will lead to greater feelings of social presence.

**Hypothesis 6:** Greater feelings of social presence achieved through the human identity cues of online chat agents will lead to (a) more favorable attitudes, (b) greater
behavioral intentions to return to a given website, and (c) greater relational outcomes (particularly trust, satisfaction, and commitment).

**Online Chat Agents and Their Conversational Cues**

The degree of online chat agents’ anthropomorphism can be determined by identifying how human-like their conversational styles are. In other words, in order to increase the sense of humanness on a given website, studies (Kelleher, 2009; Kelleher & Miller, 2006) have pointed out the pertinent role of contingent interactivity. Since the advent of new media, the concept of interactivity, which is a hallmark of new media technology, has been of central interest to scholars. Interactivity can be achieved through diverse media experiences, including two-way or reciprocal communication (Liu & Shrum, 2002; Ha & James, 1998; Rafaeli, 1988), tailored content (i.e., customization or personalization) (McMillan & Hwang, 2002; Wu, 2006), and synchronous interaction with a system (Liu & Shrum, 2002).

Such definitions generally adopt one of two perspectives: the functional view or the contingency view. Functionalists view interactivity as residing in the medium or technological feature itself, and suggest that this then permits interaction (Sundar et al., 2003). This approach, therefore, suggests that the very presence of interactive features constitutes interactivity. On the other hand, the contingency view of interactivity regards interactivity as something that occurs during interactions between humans. In other words, interactivity rests on the contingent and responsive (back-and-forth) transactions between two interactants. These two categorizations are analogous with Stromer-Galley (2004)’s ideas of interactivity-as-product vs. interactivity-as-process. According to Stromer-Galley, interactivity-as-product occurs “when a set of technological features allows users to interact
with the interface or system itself” during human-computer interactions (HCI), whereas interactivity-as-process occurs “between two or more people communicating with each other, in which subsequent messages consist of responses to prior messages in a contingent fashion” during computer-mediated communication (CMC) (Stromer-Galley, 2004, p. 391).

While a useful starting point, Stromer-Galley’s argument is limited insofar as that even in the HCI context, “interactivity” can function as a process, not as a product. In other words, if a system responds to a user’s actions or inputs in a contingent manner, the user may perceive the entirety of her or his back-and-forth interactions with the system as an interactive process. Therefore, without any human-to-human interaction via technology, a series of contingent interactions between a user and the system can be seen as falling within the process-based conceptualization of interactivity.

Sundar (2007) has therefore suggested a more overarching definition of interactivity that encompasses both the functional and contingent views. To explain the concept of interactivity, Sundar consider three elements of all basic communication models—source, medium and message. These elements correspond to three types of interactivity – source interactivity, modality interactivity, and message interactivity. Source interactivity refers to the extent to which a given user adopts the role of source or gatekeeper, choosing and formatting information according to his or her preferences. Features permitting a user to tailor his or her information feed, such as customization features, epitomize this type of interactivity. Interactivity as a modality feature refers to “interface tools that afford users greater activity, resulting in greater depth and breadth of mentally representing and experiencing mediated content” (Sundar, Xu, & Bellur, 2010, p. 2248). Interactivity as a modality feature is accordingly related to delivered modes of information such as audio, video, zoom, and slide features. Modality interactivity influences users’ “perceptual
bandwidth,” which is “the type and number of sensory channels involved during an interaction between media and its users” (p. 2249). The more modalities that are offered by a given website, the more perceptual representations of such modalities users can sense, and the greater the user’s perception of the site’s interactivity. Finally, interactivity as a message feature is evident “when media content obtained by the user is a direct function of the user’s previous actions” (p. 2253). This is best illustrated through hyperlinks, which allow users to create their own “idiosyncratic browsing path[s] with a series of interlinked messages by navigating through various layers of an interface” (p. 2253). In this way, users can feel greater levels of contingency while interacting with the interface. Greater levels of contingency can also be achieved through back-and-forth chat message exchanges in which the current message is contingent upon the previous message.

In considering these three types of interactivity, it is crucial to note that the degree of message interactivity achieved through a conversation with an online chat agent seems to be the critical element that would allow an online chat agent to appear to have a “human-like voice.” This is because message interactivity can carry over a high level of contingency in the exchange of messages (Rafaeli, 1988) which is a core characteristic of human-to-human communication. The principle of contingency in interactivity has been extensively explored by Rafaeli (1988), who has categorized interactivity according to three ordinal levels—noninteractive, reactive, and responsive (the highest level of interactivity)—based on the degree to which a given message reflects or responds to the previous message. For example, when two individuals are having a conversation, if one conversation partner’s response is not very closely related to the other’s message, then the conversation is considered to be noninteractive. However, if one acknowledges the other’s message in a conversation, then the conversation is regarded as reactive. Finally, if one not only acknowledges the other’s
message, but also shows an awareness of previous conversations when responding to the message in a back-and-forth fashion, then the conversation is considered fully interactive or responsive (Rafaeli, 1988). Thus, responsive conversations, operated by high message interactivity, are more likely to deliver high levels of contingency than noninteractive or reactive conversations (Hrastinski, 2008; Sundar et al., 2010).

Due to the back-and-forth nature of high message interactivity, as with contingency, people are more likely to perceive it as a dialogue. In other words, like perceived contingency, greater levels of dialogue arise from threaded message exchanges with others during computer-mediated communication. Both of these psychological outcomes, perceived contingency and perceived dialogue, are known to result in positive attitudinal and behavioral outcomes (Bellur, 2012). First, according to the interactivity effects model (Sundar, 2007), perceived contingency can be considered a critical component for creating favorable attitudinal and behavioral outcomes from message interactivity affordances. If users perceive that a system works in a contingent manner based on their inputs, then they are more likely to be involved in its content, which in turn leads to cognitive, attitudinal, and behavioral consequences. For instance, Sundar and his colleagues (in press) have documented that the message interactivity that can occur through live-chatting may promote greater engagement in content, while concurrently fostering positive attitudes and increasing behavioral intentions to return to a given website, by way of imbuing users with perceptions of contingency. Bellur (2012) have also shown that higher levels of contingency are positively associated with users’ positive attitudes toward messaging systems. In a similar vein, perceived dialogue may also lead to positive attitudinal and behavioral outcomes. Dialogue perception is critical in two-way symmetrical communication (Kent & Taylor, 2002; Seltzer & Mitrook, 2007), as it may make online interactions feel like face-to-face conversations, which in turn, creating positive
attitudes toward an organization that offers dialogic communication and behavioral intentions
to interact with the organization.

Furthermore, both perceived dialogue and perceived contingency can promote
relational outcomes. First, message interactivity affordances that enable users to engage in
back-and-forth communication with an organization can increase perceived responsiveness of
the organization among users. In general, the more contingent communication is perceived to
be, the more people perceive that communication as responsive. Responsiveness is a key
predictor of relationship outcomes. In previous studies, perceived responsiveness has been
shown to be a core factor in helping people maintain satisfying relationships because
responsiveness in a relationship conveys the idea that one cares, understands, listens, and
values one’s partner (Gable & Reis, 2006). Indeed, Reis and Shaver (1988) have also
suggested that satisfying relationships develop through the perception of mutual
responsiveness between interactants. Therefore, an organization can achieve mutual
understanding with their publics through engaging in threaded communication, thereby
building and sustaining good relationships with their publics. Park and Reber (2008) have
also argued that back-and-forth communication via organizational websites enhances
information sharing between organizations and publics which allows both organizations and
publics can have balanced power or control. Furthermore, they can develop the feeling of
intimacy because through information sharing they are able to know more each other. In
addition, back-and-forth communication may result in publics’ increased trust in
organizations and commitment because through engaging in contingent or threaded
communication by responding to publics’ responses, organizations can demonstrate their
commitment to the building and maintaining relationships with publics (Park & Reber, 2008).
Moreover, given that back-and-forth communication is associated with open communication, publics are able to have increased trust in organizations.

In addition to perceived contingency, perceived dialogue also plays a significant role in relationship maintenance. The importance of dialogue or dialogic communication has been widely investigated in the literature on public relations (e.g., Kent & Taylor, 1998; 2002). A dialogue is regarded as “an interactive process of reasoning together” (Grönroos, 2004, p.107); through a dialogue, therefore, two parties in communication with one another are able to share knowledge more easily. Such shared knowledge enables an organization to create extra value for its public (Grönroos, 2004). Creating additional value for the public via dialogue or reasoning allows the public to have increased trust in an organization, which ultimately creates greater customer satisfaction and customer commitment to the relationship. Furthermore, by sharing knowledge, and participating in the co-creation of meaning and values, the parties are able to increase their sense of control over one another. Thus, based on the aforementioned discussion, the following hypotheses are proposed.

**Hypothesis 7:** Higher message interactivity will lead to greater perceived contingency.

**Hypothesis 8:** Higher levels of perceived contingency achieved through higher message interactivity will lead to (a) more favorable attitudes, (b) greater behavioral intentions to return to a given website, and (c) greater relational outcomes.

**Hypothesis 9:** Higher message interactivity will lead to greater perceived dialogue.

**Hypothesis 10:** Higher levels of perceived dialogue achieved through higher message interactivity will lead to (a) more favorable attitudes, (b) greater behavioral intentions to return to a given website, and (c) greater relational outcomes.
In addition to perceived contingency and dialogue, back-and-forth communication via the live-chatting function, which conveys higher levels of message interactivity, may also facilitate a feeling of co-presence without physical co-presence, which is called social presence (Kim & Sundar, 2012). This is because when having communication in a back-and-forth (contingent) manner, he or she is more likely to increase the awareness or salience of the “other person.” As previously discussed, social presence is a key psychological factor in creating more positive relationships, as well as positive attitudes and behavioral intentions. Thus, based on the aforementioned discussion, the following hypotheses are suggested.

**Hypothesis 11:** Higher message interactivity will lead to greater social presence.

**Hypothesis 12:** Greater feelings of social presence achieved through higher message interactivity will lead to (a) more favorable attitudes, (b) greater behavioral intentions to return to a given website, and (c) greater relational outcomes.

**Interactions Among Anthropomorphic Visual Cues, Identity Cues, and Message Interactivity**

The crux of this study is the identification of the interaction effects of the three aforementioned factors—anthropomorphic visual cues, identity cues, and message interactivity—of which there is currently no empirical examination. More specifically, this study is interested in how message interactivity—which results from actual conversations—influences the effects of two types of source cues that can be manipulated by either their presence or absence. According to the theory of interactive media effects (TIME) proposed by Sundar et al. (2015b; Figure 1), cues and actual actions offered by diverse affordances lead to different routes in explaining psychological outcomes. Affordances are defined as “action possibilities suggested by visual stimuli in our environment” (Gibson, 1977, cited in
Sundar et al., 2015b, p.50), and “perceivable properties of a system suggesting ways in which it could be operated” (Norman, 1988, cited in Sundar et al., 2015b, p.50). According to TIME, affordances can be recognized by either noticing interface cues or completing an action triggered by affordances. As Figure 1 indicates, if affordances lead to psychological outcomes by inviting specific actions (e.g., browsing content, sending messages, and having chats), then these very interactive actions may result in cognitive, attitudinal, and behavioral outcomes by way of enhancing psychological mediators such as users’ perceived contingency (when using message-based interactivity affordances) and sense of agency (when using source-based interactivity affordances). Similarly, if an affordance is perceived when using an interface, it may trigger certain heuristics, thereby leading to consequences such as online content quality perception (e.g., the number of “likes” on a Facebook post, in which a bandwagon cue triggers the perception that the post must be interesting [the bandwagon heuristic]). Thus, given these two different processes that explain how affordances affect user psychology, this study attempts to closely investigate the interaction effects among message interactivity and two types of cues (anthropomorphic visual cues and identity cues). With respect to such combined effects, this study postulates two possible outcomes: 1) a compensation effect and 2) an expectancy violation effect. The following sections discuss these two effects.
1) Compensation effect

A compensation effect or compensation hypothesis has been investigated in the areas of interpersonal communication, with studies emphasizing how people behave differently in relation to their partners depending on their estimations of intimacy or emotional attachment (Patterson, 1973). More specifically, researchers have found that people tend to adjust their behaviors, particularly their non-verbal behaviors, in order to compensate for a lack of intimacy or emotional attachment. For example, decreased levels of intimacy result in increased non-verbal behavior during dyadic interactions and vice versa (Coutts & Schneider, 1976).
The compensation hypothesis has also been applied in the context of online communication. In studies of online communication, researchers have focused on how online communication may compensate for a lack of real-life communication or interaction (McKenna et al., 2002). Individuals who do not have enough offline interactions due to shyness, social anxiety or inhibition are more likely to turn to online communication, which allows the individuals to compensate for their lack of offline interactions. Indeed, many studies have cited the ability of social networking sites to connect individuals who have abruptly lost social contact with others; this helps to explain such sites’ exponential growth in popularity (Sundar et al., 2011; Jung et al., 2013).

As such, regardless of the context in which a compensation effect or hypothesis applies, this effect can best be understood as helping to explain how a certain factor works to compensate for another factor’s deficiency in order to maintain or achieve a certain desirable outcome. Given this basic principle, when it comes to interactions between humans and online chat agents, a compensation effect can be investigated in considering how the interactions are made to be more like human-to-human interactions. In this study, the intersection of three factors—an online chat agent’s anthropomorphic appearance, its identity cue, and message interactivity—is a major focus. More specifically, this study attempts to examine how a high level of message interactivity can compensate for low levels of two source-related factors—an online chat agent’s anthropomorphic appearance and its identity cue. Figure 2 and Figure 3 illustrate the interactions between message interactivity and the identity cue and between message interactivity and the appearance cue, respectively.

First, Figure 2 illustrates the interaction effect between the identity cue and message interactivity. When message interactivity is at its optimal point (i.e., at its highest level) and is then combined with the human identity cue, this creates the highest levels of the
psychological outcomes proposed in previous sections (e.g., social presence, perceived homophily, perceived contingency etc.) which in turn leads to more positive attitudinal, behavioral and relational outcomes. This expected result is explained by the “cue-cumulation effect,” which proposes additive effects of interface cues (Sundar, Knobloch-Westerwick & Hastall, 2007) by suggesting that the positive effects of interface cues add up. For example, in Sundar et al. (2007)’s study, the additive effects of the NRA cue (i.e., “number of related article’’), the source credibility cue (i.e., “perceived credibility of news organization”), and the upload recency cue (i.e., “the number of minutes or hours since the story broke”) were examined, with the researchers finding that optimal levels of all three cues lead to the greatest credibility perceptions of the news among users. Kim and Sundar (2011) have also demonstrated the cue-cumulation effect, showing that a combination of the high expertise cue, as indicated by the “authority badge,” and the bandwagon cue, operationalized as “the number of stars received from readers,” boosts positive perceptions of a given website.

However, the compensation effect occurs when two factors are at different levels. For example, when users are told that the online chat agent is not a human but a bot or if they are exposed to low anthropomorphic visual cues of the agent, high message-interactivity will serve to make up for this reduction in humanness. The compensation effect likewise occurs when a low level of message interactivity combines with a human identity cue or highly anthropomorphic visual cues, because human identity cues and anthropomorphic visual cues compensate for the lack of human-to-human communication associated with low message interactivity. Thus, the increase (or gap) from the lowest point of the blue line (low message interactivity) in Figure 2 to the point of the red line (high message interactivity) in a bot condition indicates the compensation effect of message interactivity at work to make up for the lack of humanness associated with a bot. Moreover, on the blue line, the increase from the
lowest point to the highest point signals the compensation effect of the human identity cue at work to compensate for the lack of humanness associated with the low level of message interactivity.

**Figure 2.** Compensation effect between identity cue and message interactivity

Figure 3 demonstrates the interaction effect between visual cues and message interactivity. Due to the cue-cumulation effect, the same pattern is anticipated when both factors are at their optimal levels. Thus, this pairing should also result in the greatest perceptions of the proposed psychological, attitudinal, behavioral and relational outcomes. On the other hand, if the two factors are at their lowest levels, then the lowest levels of such outcomes are assumed. A compensation effect may likewise occur when low message interactivity is combined with an online chat agent’s high anthropomorphic visual cues or when high message interactivity is paired with low anthropomorphic visual cues, as shown in Figure 3.
2) Expectancy violation effect

Another possible pattern in interaction effects is the expectancy violation effect. This effect has been extensively investigated in studies of interpersonal relationships. Expectancy is defined as a “relatively fixed standard of anticipated [behavior] . . . which each [dyadic interactant] holds for the other” (Cappella & Greene, 1982, p. 97). Expectancies are generally formed from diverse sources such as social mores, situational norms, prior experiences, and individuals’ characteristics. Expectancy has pivotal importance for interactions because it allows interactants to predict what will happen, thereby reducing uncertainties regarding particular situations.

An expectancy violation may occur if a certain outcome significantly deviates from expectancies developed via previous experience or norms (Kahneman & Miller, 1986). Such a violation then influences others’ evaluations (Burgoon & Walther, 1990). For example, in a social interaction, one might have certain expectations regarding others’ behaviors. If others’
behaviors are consistent with those expectations, one’s impression or evaluation will be positive. On the other hand, if others’ behaviors violate one’s expectation, one’s impression or evaluation will be negative. Thus, pre-existing expectancies developed via diverse sources can shape subsequent evaluations of observed behaviors. Tedeschi and Norman (1985) have accordingly contended that “violating norms or rules projects an identity of the actor as an immoral and bad person” (p. 300).

Moving beyond human-to-human interactions, expectancies are able to influence interactions with non-human objects, including computers and online chat agents. Studies applying the CASA paradigm have shown that individuals have implicit expectations of computers (Nass & Moon, 2000). Burgoon et al. (2000), for instance, have noted that a set of interface characteristics or cues particularly associated with human characteristics such as gender, ethnicity, and appearance triggers expectations of social responses regarding, as well as judgments of, a computer because individuals attribute the human qualities elicited by such cues to the computer.

If individuals subconsciously apply social rules or norms when interacting with a computer or a computer-generated agent, especially when individuals are exposed to the interface cues typically associated with other humans, they may come to expect human-like behaviors or performances from the computer or online chat agent. In this study, two types of source cues may serve to build users’ expectancies before the users have actual interactions with online chat agents. When considering expectancy, it is necessary to think about the exposure process of experimental manipulations (or cues) because participants produce expectancies based on initial exposures. For example, if participants are told whether an online chat agent is operated by either a chat bot or an actual human (identity cue), they then develop certain expectations regarding the performance of the agent. If they are told that the
agent is an actual human, then they are likely to have higher expectations for contingent interactions. Also, prior to beginning a conversation, the participants see the visual presentation of the online chat agent. Therefore, the anthropomorphic visual cue of the online chat agent serves to further strengthen or weaken the expectations generated by the initial cue (i.e., the identity cue).

Simply put, highly anthropomorphic images or a human-agent manipulation may set up higher expectations regarding verbal interactions. These expectations may subsequently influence users’ evaluations of the interactions. Users’ expectations are met in high message interactivity conditions; thus, evaluations of humanness are more positive. Expectancy confirmations can also occur when participants are exposed to poor anthropomorphic images or a chat-bot identity cue. In both of these cases, users have low expectations regarding their conversations with the agent. Thus, even though levels of message interactivity are low, the users’ expectations are not violated; furthermore, due to the users’ low expectations, the users’ evaluations of the conversations themselves might be more generous than otherwise expected, even though the conversations do not reflect a high degree of contingency. As a result, the score on proposed outcomes (e.g., social presence, perceived contingency etc.) is not very low.

However, if the actual action does not match with users’ expectations in ways such as 1) low expectations due to a chat-bot identity or low anthropomorphic visual cues, but the actual conversations are contingent or 2) high expectations due to a human identity cue or high anthropomorphic visual cues but the actual conversations are not contingent, then one of two possibilities can be expected: a positive or negative expectancy violation. Expectancy violations have two types of valences—negative and positive. Positive violations occur when outcomes are more favorable than expected. Negative violations occur when outcomes do not
match high expectations. In the first scenario, even though there is a mismatch between the low anthropomorphic cues or a chat-bot identity cue and the high level of message interactivity, thereby leading to an expectancy violation, the users’ low expectations mean that the highly contingent conversations that take place with an online chat agent may still result in users’ favorable evaluations due to the positive violation as the expectancy violation theory proposed (Burgoon, Stern & Dillman, 1995). On the other hand, negative violations produce much more negative evaluations than matched situations. Therefore, in the second scenario (when a human identity cue or high anthropomorphic visual cues is combined with low message interactivity), a negative violation will occur. Such a negative violation produces the most negative evaluation of the agent, as presented in Figures 4 and 5.

![Expectancy violation effect between identity cue and message interactivity](image)

**Figure 4.** Expectancy violation effect between identity cue and message interactivity
Another expectancy violation effect: The eeriness effect

In considering the violation that occurs when low expectations combine with a high level of performance, another possible prediction can be made: the eeriness effect. In this study, the eeriness effect suggests that, because of the expectations regarding a chat-bot, people are more likely to perceive a chat-bot with a less contingent conversational style as much more natural. As a result, a chat-bot with a highly contingent conversational style results in a particular kind of violation resulting in a feeling of weirdness or eeriness. This is akin to the “uncanny valley” phenomenon in human-robot interaction. The uncanny valley proposition (Mori, 1970) postulates that the perceived pleasantness of a given robot varies as a function of the degree of the robot’s realism. However, at some point, if the robot is too human-like, the effects of realism on one’s perception of the robot’s pleasantness suddenly fall (see Figure 6). Therefore, the combination of a bot identity cue with high message interactivity elicits more negative or eerie feelings toward the bot. In Figure 7, the left
endpoint of the blue line is higher than the left endpoint of the red line, which represents the combination of low message interactivity and a bot identity.

Figure 6. Uncanny Valley Proposition

Figure 7. Eeriness effect between identity cue and message interactivity
In all, based on the discussions regarding the interaction effects of message interactivity and two types of cues (identity cues and visual cues), this study proposes the following research questions.

**Research Question 1**: What is the pattern of interaction effects between message interactivity and the anthropomorphic visual cues of an online chat agent?

**Research Question 2**: What is the pattern of interaction effects between message interactivity and the identity cues of an online chat agent?
Chapter 2

METHOD

Research Design

This study employed a 2 (source appearance: low anthropomorphic vs. high anthropomorphic) x 2 (source identity: chat-bot vs. human) x 2 (message interactivity: low vs. high) between-participants factorial experiment in order to test the effects of these three independent variables on a variety of dependent variables, including users’ attitudes toward the given website, behavioral intentions to use the site in the future, and relational quality outcomes (control mutuality, trust, satisfaction, and commitment), as well as other important psychological outcomes such as social presence, perceived homophily, perceived contingency, and perceived dialogue.

Participants

All study participants (N = 162) were recruited via Amazon’s Mechanical Turk, “a marketplace for work” where virtual workers perform “human intelligence tasks” (HITs). The Mechanical Turk is an open place in which individual labor-seekers post tasks that they want to outsource; then virtual workers (i.e., users) choose tasks that they want to complete from the list of HITs (unless a labor-seeker limits tasks to certain qualified people). Most tasks take between a few minutes and an hour to complete, and users can earn monetary rewards in exchange for their participation.

The participants recruited from Mechanical Turk were informed via an online consent form that participation in the study was voluntary, confidential, and anonymous, and were given a researcher’s contact information for reference. All participants were United States
residents with a HIT approval of over 90%, and each was paid $1 for participation. The demographics of the recruited participants were as follows: the majority of the participants were Caucasian (56%), the average age was 33.91 (SD = 10.09), and the ratio of males and females was almost equal (male: 50.4%, female: 49.6%). In terms of education, most of the participants (85.1%) had completed college.

Upon recruitment, each participant was randomly assigned to one of eight conditions. The conditions were varied systematically in order to investigate the three independent variables. Table 1 summarizes the distribution of participants across the experimental conditions. Among the recruited participants, 21 participants did not follow the chatting instructions (e.g., did not read through the scenarios or kept asking the agent irrelevant questions); these participants were excluded from the analysis. This meant that there were 141 participants who were included in the final analysis.

### Table 1. Distribution of participants across conditions (N = 141)

<table>
<thead>
<tr>
<th>Message Interactivity</th>
<th>High</th>
<th>Low</th>
<th>High</th>
<th>Low</th>
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</thead>
<tbody>
<tr>
<td>Anthropomorphism</td>
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<tr>
<td>Identity</td>
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<td></td>
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<tr>
<td>Human</td>
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<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Chat-bot</td>
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<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
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<td>35</td>
<td>35</td>
</tr>
</tbody>
</table>

**Stimulus Material**

A prototype of a commercial website called “Digital World” (see Figure 8) that sells digital cameras was constructed for the experiment. A digital camera was chosen as the target product because it has relatively complex product attributes and a large number of choices; therefore, individuals are likely to need help from an online chat agent in selecting the appropriate product. On the first page of the prototype website, a number of digital cameras were presented in the form of a list. Specifically, digital cameras were categorized into three
categories: DSLR, Compact digital camera and point-and-shoot digital camera. Also, there was a live-chat button at the top right corner of the first page. If a participant clicked on the live-chat button, s/he saw the chat window popped up. The online chat agent then appeared in the chat window. Participants’ input as well as responses from the system were displayed in the chat box.

![Screenshot of Digital World homepage]

**Figure 8.** Homepage of stimulus website

**Experimental Manipulation**

**Manipulation of identity cue.** For manipulating the identity cue, participants were informed whether the online chat agent is operated by a human or a chat-bot. Specifically,
such notification was made when an online chat agent introduced herself at the beginning of the chat. For example, in the human identity condition, the system said “A sales associate will be with you shortly.” Then, an online chat agent started chatting by saying, “Hi! I’m Alex, a sales associate.” On the other hand, in the chat-bot identity condition, the system said “An automated chat-bot will be with you shortly.” Then, the agent introduced herself by saying, “Hi! I’m Alex, an automated chat-bot.” In both groups, participants had a chat with the same human confederate. The confederate followed the same chatting protocol regardless of participant.

**Manipulation of visual cue.** Depending on the condition assigned to the participant, the morphology of the online chat agent was different. For those participants in the high anthropomorphic visual cue condition, the online chat agent that appeared in the right side of their chatting windows looked like the human in Figure 9, while for those participants in the low anthropomorphic visual cue condition, the online chat agent appeared more like that of Figure 10. Participants were continuously exposed to the manipulation of the online chat agent’s visual cue while chatting.
Manipulation of message interactivity. The experimental manipulation of two levels of message interactivity was situated in the chatting function offered by the site. While chatting, the online chat agent asked a series of questions in order to eventually make a recommendation; the participant answered the questions. Based on the explication of message interactivity provided earlier, as well as the methods of manipulation used in a previous study by Bellur (2012), this study had participants in its low message interactivity condition engaged in simple back-and-forth exchanges with an online chat agent. Specifically, while engaging in this Q&A type of conversation, the online chat agent did not acknowledge the participant’s responses. In this case, then, there was no threadedness occurring between the agent and participant. For example, if the online chat agent asked: “Is this purchase for you or
is this a gift?” and the participant answered: “This is for a gift,” the agent responded with: “Okay”

On the other hand, in the high message interactivity condition, a participant and an online chat agent engaged in more contingent message exchanges. The online chat agent was more responsive to the participant’s messages by acknowledging the participant’s responses to previous questions. For example, the online chat agent first asked whether this purchase is for themselves or a gift. Then, the participant answered that this is for a gift. In the next question, the agent asked what type of camera they are looking for. The participant answered a point-and-shoot camera. Then the agent responded like this: “Okay, so you are looking for a point-and-shoot camera as a gift. Let me ask another question.” As the above example suggests, in the high message interactivity condition, an online chat agent’s responses not only acknowledge the preceding question; they also show an awareness of the participant’s previous responses. A complete list of questions and manipulations is included in Appendix.

Procedure

After obtaining participants’ informed consent, they were asked to complete an online pre-questionnaire assessing their demographic information, interest in digital cameras and power usage. Then, they were asked to read a scenario in order to familiarize themselves with the situation in which they need to chat with an online chat agent on the site to choose the best digital camera depending on their assigned preferences. A sample scenario follows below:

“You would like to buy a digital camera as a birthday gift for your friend. She recently broke her camera, and you think that she might need a new one for her trip to Europe this summer. You know that your friend particularly likes Canon cameras. You also
know that she would like to buy a point-and-shoot camera, because she thinks it is relatively light to carry and easy to operate. Furthermore, this type of camera is likely to fit within your budget of $200. With these preferences in mind, you begin your search for a camera by visiting a Web site called Digital World that sells a wide variety of digital cameras. To determine which camera is the best to buy, you decide to chat with an online chat agent who can provide a recommendation.”

After giving the participants time to read their scenarios, participants were asked to open the mock website called “Digital World” that sells various digital cameras. Then, after exploring the site, they were asked to interact with an online chat agent using the website’s chat function. Participants clicked the “Live Chat” icon displayed in the top-right corner of the website to start chatting. Once a participant initiated a chat, the system said “A sales associate [a chat-bot] will be with you shortly.” Then, the agent introduced itself, then asked some questions. Given that an online chat agent needed to know what a customer needed, the chat followed the format of Q&A. In other words, to identify the participant’s specific preferences, the agent asked several questions, and the participant answered the questions. These questions are about the purpose of buying a digital camera, his or her preferences regarding camera type, brand, and budget. After asking four questions, the agent made a recommendation about digital cameras based on the information that the participant provided. By instructing participants to use the information provided in the scenario when answering questions that the online chat agent asked, the study was able to ensure that the content of the chats was controlled.

At the end of the chat, the system provided a survey link that contained a post-experiment questionnaire. The length of the session for each participant was approximately 40 to 60 minutes.
Measures

All of the following measures, except the manipulation check measure for identity cue, were assessed on a 7-point Likert scale.

Manipulation checks for visual cue. For the visual cue manipulation check, the perceived anthropomorphism of the online chat agent was assessed using the following items: the agent’s profile picture “does not look human/looks very human,” “does not look realistic/looks very realistic” and “looks very cartoon-like/does not look like a cartoon” (Nowak & Rauh, 2005) (M= 4.37, SD= 1.92, Cronbach’s α= .84)

Manipulation checks for identity cue. For the identity manipulation check, participants were asked whether they had a chat with either “an automated chat-bot” or “a sales associate.”

Manipulation checks for message interactivity. In order to check for message interactivity manipulation, four items were used. The items are as follows: “The chat agent remembered my responses,” “The chat agent’s responses were related to my earlier responses,” “The agent took into account my previous interactions with it,” and “The chat agent gave some smart suggestions based on my responses” These items are modified from items used in a study by Bellur (2012) (M= 5.53, SD= 1.47, Cronbach’s α= .94).

Social presence. Social presence was measured with 5 items adopted from a study by Gefen and Straub (2003). They are as follows: “There is a sense of human contact on the site,” “There is a sense of personal communication on the site,” “There is a sense of sociability on the site,” “There is a sense of human warmth on the site,” “There is a sense of human sensitivity on the site” (M= 5.00, SD= 1.52, Cronbach’s α= .96).

Perceived homophily. Ratings of perceived homophily was measured with 4 items adopted from Nowak and Rauh (2005). The items ask whether the online chat agent “is very
different from me/ is very similar to me’’ and ‘‘doesn’t think like me at all/ thinks a lot like me’’ ‘‘very unlike me/ is very like me’’ and ‘‘doesn’t behave like me at all/ behave a lot like me” (M= 4.37, SD= 1.47, Cronbach’s α= .92).

**Perceived contingency.** Perceived contingency was assessed via five items adopted from Sundar et al. (in press). They are: “I felt that the chat agent carefully registered my responses and gave feedback based on the information I provided,” “The interaction between the chat agent and its customer felt like a continuous thread or a loop,” “The chat agent’s responses seemed interconnected with each other,” “The chat agent involved in several back and forth interactions with its customer,” and “The chat agent’s interaction with their customers felt like a logical progression” (M= 5.05, SD= 1.52, Cronbach’s α= .90).

**Perceived dialogue.** Perceived dialogue was assessed by asking participants to rate their agreement with following statements adopted from Sundar et al. (in press): “I felt the chat agent considered its customers’ unique requests,” “I felt like the chat agent was engaged in an active dialogue with their customers,” “The chat agent’s interaction with their customers felt like a back and forth conversation,” “The chat agent responded quickly to its customers’ questions and requests,” “The chat agent was efficient in responding to its customers’ questions” (M=.5.53, SD= 1.27, Cronbach’s α= .92).

**Attitude toward the chat agent.** Participants’ attitudes toward the chat agent were measured according to two factors: perceived expertise and perceived friendliness. The extent to which the participants perceived the agent as intelligent, knowledgeable, competent, and informed was measured as perceived expertise (M= 5.87, SD= 1.16, Cronbach’s α= .92). The extent to which the participants perceived the agent as empathetic, personal, warm, emotionally invested, willing to listen, careful, and open was measured as perceived friendliness (M= 4.72, SD= 1.50, Cronbach’s α= .94) (Koh & Sundar, 2010).
Attitudes toward the website. Attitude toward the website was measured on a 7-point scale (anchored between “describes very poorly” and “describes very well”) using 10 adjectives (appealing, useful, positive, good, attractive, exciting, pleasant, likeable, interesting and high-quality). This scale is adopted from Sundar et al. (2011). (M= 5.33, SD= 1.60, Cronbach’s α=.96).

Behavioral intention. To measure individuals’ behavioral intentions to return to the site, six Likert-type items, including “I would bookmark this website for future use,” “I would recommend this website to others,” “I would visit this website again in the future,” “I would forward this website to my acquaintances,” and “I would like to know more about this website” as taken from Hu and Sundar (2010), were used (M= 4.95, SD= 1.60, Cronbach’s α=.95).

Relational quality outcomes. The quality of relationship was measured through four aspects: control mutuality (“the degree to which parties agree on who has rightful power to influence one another”), satisfaction (“the extent to which one party feels favorably toward the other because positive expectations about the relationship are reinforced”), trust (“one party’s level of confidence in and willingness to open oneself to the other party”), and commitment (“the extent to which one party believes and feels that the relationship is worth spending energy to maintain and promote”) (Hon & Grunig, 1999, p.19-20). For this study, shorten version of the scale was used for measuring four dimensions of the quality of relationship.

Specifically, control mutuality was measured with by asking participants their agreement with “Digital World believes the opinions of customers are legitimate,” “Digital World neglects customers,” “Digital World gives customers enough say in decisions,” “Digital World really listens to what customers say,” “Digital World seems to ignore
customers’ opinions in the decisions,” and “When customers interact with Digital World, they feel that they have some sense of control” (M= 5.39, SD= .90, Cronbach’s α= .75).

Satisfaction was assessed by using following five items: “I am happy with Digital World,” “Both Digital World and customers benefit from their relationship with one another,” “I think customers are dissatisfied with their interactions with Digital World,” “Generally speaking, customers are unhappy with the relationship Digital World has established with them,” and “Customers enjoy dealing with Digital World. Digital World fails to satisfy customers’ needs” (M= 5.38, SD= 1.16, Cronbach’s α= .85).

Trust was measure with a scale consisting of five items: “I think Digital World treats customers fairly and justly,” “Whenever Digital World makes an important decision, I know it will consider the impact on customers,” “Digital World can be relied on to keep its promises to customers,” “Digital World misleads customers,” and “I feel very confident about Digital World’s abilities to accomplish its mission” (M= 5.55, SD= 1.02, Cronbach’s α= .89).

Last, commitment was assessed by asking participants their agreement with “I believe Digital World wants to maintain a positive relationship with its customers,” “I see Digital World as committed to its customers,” “Compared to other companies, customers value their relationship with Digital World the most,” “I would rather work with Digital World than another company,” and “Users feel a sense of loyalty to Digital World” (M= 5.27, SD= 1.03, Cronbach’s α= .83).

**Control variables.** Participants’ demographic information (e.g., age, gender, ethnicity, and education level) were measured. In addition, levels of interest in digital cameras as well as power usage which measures the skills and dependency levels on technologies were gathered and controlled. The items for measuring interest in digital cameras were “I am
generally interested in digital cameras,” “Digital cameras are personally relevant to me,” and “I actively seek information about digital cameras” (M= 5.17, SD= 1.37, Cronbach’s α= .88). These items were adopted from Sundar et al. (2015a). In addition, power usage was measured using 12 items derived from the literature (Sundar & Marathe, 2010): “I think most of the technological gadgets are complicated to use,” “I make good use of most of the features available in any technological device,” “I have to have the latest available upgrades for the technological devices that I use,” “Use of information technology has almost replaced my use of paper,” “I love exploring all the features that any technological gadget has to offer,” “I often find myself using many technological devices simultaneously,” “I prefer to ask friends how to use any new technological gadget instead of trying to figure it out myself,” “Using any technological device comes easy to me,” “I feel like information technology is a part of my daily life,” “Using information technology gives me greater control over my work environment,” “Using information technology makes it easier to do my work,” and “I would feel lost without information technology” (M= 5.49, SD= 1.37, Cronbach’s α= .87)
Chapter 3
RESULTS

Data Analyses

General Linear Model (GLM) analyses were performed to test the effects of the three independent variables on the mediating and dependent variables, as proposed in this study’s hypotheses. Gender, age, ethnicity, education level, power usage, and level of interest in digital cameras were all controlled for in each of the analyses. To examine the mediating effects suggested by the hypotheses, this study adopted the bootstrapping method proposed by Preacher & Hayes (2008; see also Hayes, 2013).

Manipulation Check

**Anthropomorphism manipulation check.** To test whether the manipulations for visual cues were effective, the degree to which participants perceived the agent’s appearance as human-like was analyzed. The results of an independent sample t-test confirmed that participants in the high anthropomorphic condition perceived the agent to be more realistic, human-like, and not cartoon-like (M = 5.78, SD = 1.48) than those participants in the low anthropomorphic condition (M = 3.00, SD = 1.17), t(139) = -12.32, p < .001, Cohen’s d = 2.08. Cohen’s d represents the effect size for comparing two means, by indicating “the percent of nonoverlap of the treated group’s scores with those of the untreated group” (Becker, n.d.). The effect size is considered small if $d = .20$, medium if $d = .50$, and large if $d = .80$ (Cohen, 1988). Because the effect size exceeds Cohen’s convention for a large effect ($d = .80$), the result indicates a significant manipulation effect for the anthropomorphic visual cue.
Identity manipulation check. In order to check for identity cue manipulation, a chi-square test was used to determine whether participants perceived the agent as a human or a chat-bot. The analysis revealed that most of the participants in the human identity condition believed they had chatted with a human agent (88.7%), while most of the participants in the chat-bot condition thought they had chatted with a chat-bot (92.9%), $\chi^2 (1, N=141) = 93.98$, $p < .001$.

Interactivity manipulation check. Manipulation for message interactivity was checked by performing an independent sample t-test. The results showed that participants in the high message interactivity condition perceived higher levels of threadedness (M = 6.23, SD = .82) than those in the low message interactivity condition (M = 4.82, SD = 1.65), $t (139) = -6.38$, $p < .001$, Cohen’s $d = 1.08$. The effect size indicates a strong manipulation of message interactivity.

Part I: Effects of anthropomorphic visual cue of the agent on social presence, perceived homophily, attitudes, behavioral intention and relational outcomes

The first four hypotheses predicted (1) the positive effects of the online chat agent’s anthropomorphic visual cues on the degree of social presence (H1) and perceived homophily (H3), as well as (2) the mediating effects of social presence (H2) and perceived homophily (H4) on attitudes, behavioral intentions, and relational outcomes.

In order to test H1 and H3, a series of three-way ANCOVA tests was conducted that included gender, age, ethnicity, education level, power usage, and interest in digital cameras as covariates. The tests indicated no significant main effect of the anthropomorphic visual cues on social presence, $F (1, 127) = .03$, $p = .87$, $\eta^2 = .00$, and perceived homophily, $F (1, 127) = .00$, $p = .97$, $\eta^2 = .00$ (Table 3). Therefore, H1 and H3 were not supported.
Table 2. Mean and standard deviation of social presence and perceived homophily

<table>
<thead>
<tr>
<th>Psychological variables</th>
<th>Anthropomorphic Visual Cue</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Social presence</td>
<td></td>
<td>5.02</td>
<td>0.18</td>
</tr>
<tr>
<td>Perceived homophily</td>
<td></td>
<td>4.38</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Table 3. Main effects of anthropomorphic visual cue on psychological variables

<table>
<thead>
<tr>
<th>Psychological variables</th>
<th>F-value</th>
<th>p-value</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social presence</td>
<td>.03</td>
<td>p = .87</td>
<td>.000</td>
</tr>
<tr>
<td>Perceived homophily</td>
<td>.00</td>
<td>p = .97</td>
<td>.000</td>
</tr>
<tr>
<td>Attitudes toward the agent</td>
<td>1) Perceived expertise</td>
<td>.95</td>
<td>p = .33</td>
</tr>
<tr>
<td></td>
<td>2) Perceived friendliness</td>
<td>.81</td>
<td>p = .37</td>
</tr>
<tr>
<td>Attitudes toward the website</td>
<td></td>
<td>.28</td>
<td>p = .60</td>
</tr>
<tr>
<td>Behavioral intention</td>
<td>1.38</td>
<td>p = .24</td>
<td>.011</td>
</tr>
<tr>
<td>Relational outcomes</td>
<td>1) Control mutuality</td>
<td>.70</td>
<td>p = .40</td>
</tr>
<tr>
<td></td>
<td>2) Satisfaction</td>
<td>1.18</td>
<td>p = .28</td>
</tr>
<tr>
<td></td>
<td>3) Trust</td>
<td>.912</td>
<td>p = .34</td>
</tr>
<tr>
<td></td>
<td>4) Commitment</td>
<td>4.56</td>
<td>p &lt; .05</td>
</tr>
</tbody>
</table>

To test the mediating effects of social presence (H2) and perceived homophily (H4) on the relationship between the agent’s anthropomorphic visual cues and attitudes, behavioral intentions, and relational outcomes, a bootstrapping procedure using 5000 bootstrap samples (Hayes, 2013) was performed. Visual cues were entered as an independent variable, social presence and perceived homophily were entered as mediators, and each participant’s gender, age, education level, ethnicity, power usage, and interest in digital cameras were entered as control variables in the mediation analysis.

The results of the test found that there was no significant mediating effect of social presence on two aspects of attitudes toward the agent: 1) perceived expertise (B = .21, SE
= .06, 95% C.I. from -.13 to .07), 2) and perceived friendliness (B = .59, SE = .06, 95% C.I. from -.32 to .20), attitudes toward the website (B = .28, SE = .07, 95% C.I. from -.17 to .09), behavioral intentions (B = .41, SE = .08, 95% C.I. from .26 to .13), as well as four aspects of relational outcomes: control mutuality (B = .14, SE = .05, 95% C.I. from -.10 to .04), satisfaction (B = .20, SE = .07, 95% C.I. from -.14 to .07), trust (B = .24, SE = .06, 95% C.I. from -.15 to .09) and commitment (B = .30, SE = .06, 95% C.I. from -.19 to .09). Thus, H3 was not supported.

Similar mediation results were found for perceived homophily. More specifically, there was no significant mediating effect of perceived homophily on two aspects of attitudes toward the agent: 1) perceived expertise (B = .37, SE = .06, 95% C.I. from -.16 to .23) and 2) friendliness (B = .29, SE = .06, 95% C.I. from -.14 to .18), overall attitudes toward the website (B = .29, SE = .07, 95% C.I. from -.13 to .19), behavioral intentions (B = .41, SE = .08, 95% C.I. from -.21 to .25), as well as four aspects of relational outcomes: control mutuality (B = .20, SE = .05, 95% C.I. from -.09 to .12), satisfaction (B = .23, SE = .07, 95% C.I. from -.11 to .16), trust (B = .18, SE = .06, 95% C.I. from -.10 to .12) and commitment (B = .12, SE = .06, 95% C.I. from -.06 to .09). Thus, H4 was not supported.

Part II: Effects of identity cue of the agent on social presence, perceived contingency, attitudes, behavioral intention and relational outcomes

H5 and H6 predicted (1) the positive effects of the online chat agent’s identity cue on the degree of social presence (H5), and (2) the mediating effects of social presence (H6) on attitudes, behavioral intentions, and relational outcomes.

First, H5 hypothesized that the human identity cue would lead to greater feelings of social presence than the chat-bot identity cue. As hypothesized, participants in the human
identity cue condition reported greater feelings of social presence \((M = 5.24, \ SE = .17)\) compared to those in the chat-bot identity condition \((M = 4.73, \ SE = .17)\), \(F(1, 127) = 3.92, \ p = .05, \ \eta^2 = .03\). Thus, \(H5\) was supported (Table 4).

### Table 4. Main effects of identity cue on psychological variables

<table>
<thead>
<tr>
<th>Psychological variables</th>
<th>F-value</th>
<th>p-value</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social presence</td>
<td>3.92</td>
<td>(p = .05)</td>
<td>.030</td>
</tr>
<tr>
<td>Attitudes toward the agent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Perceived expertise</td>
<td>2.83</td>
<td>(p = .095)</td>
<td>.022</td>
</tr>
<tr>
<td>2) Perceived friendliness</td>
<td>.05</td>
<td>(p = .820)</td>
<td>.000</td>
</tr>
<tr>
<td>Attitudes toward the website</td>
<td>1.50</td>
<td>(p = .222)</td>
<td>.012</td>
</tr>
<tr>
<td>Behavioral intention</td>
<td>1.26</td>
<td>(p = .263)</td>
<td>.010</td>
</tr>
<tr>
<td>Relational outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Control mutuality</td>
<td>.31</td>
<td>(p = .580)</td>
<td>.002</td>
</tr>
<tr>
<td>2) Satisfaction</td>
<td>.01</td>
<td>(p = .942)</td>
<td>.000</td>
</tr>
<tr>
<td>3) Trust</td>
<td>.07</td>
<td>(p = .789)</td>
<td>.001</td>
</tr>
<tr>
<td>4) Commitment</td>
<td>.61</td>
<td>(p = .437)</td>
<td>.005</td>
</tr>
</tbody>
</table>

The indirect effect of the identity cue on attitudinal, behavioral and relational outcomes through social presence was also examined. The analysis revealed that social presence indeed mediated the effect of the agent’s identity cue on control mutuality, which is one aspect of relational outcomes \((B = .24, \ SE = .05, \ 95\% \ C.I. \ from \ .00 \ to \ .26)\) and expertise perception of the agent \((B = .43, \ SE = .06, \ 95\% \ C.I. \ from \ .00 \ to \ .49)\). This result suggests that individuals who perceived the agent as human were more likely to experience greater feelings of social presence, and these heightened feelings of social presence increased the perception that customers have power to influence the organization as well as the perception that the agent is intelligent, knowledgeable, competent, informed, and expert.

Except in the case of control mutuality and expertise perception, social presence was not shown to mediate the relationship between the identity cue and individuals’ attitudes toward the agent, specifically, perceived friendliness \((B = .77, \ SE = .06, \ 95\% \ C.I. \ from \ -.01 \ to \ .01)\).
to .79), attitudes toward the website itself (B = .46, SE = .07, 95% C.I. from -.00 to .50), behavioral intention (B = .66, SE = .07, 95% C.I. from -.03 to .70), and three aspects of relational outcomes: satisfaction (B = .33, SE = .06, 95% C.I. from -.00 to .36), trust (B = .35, SE = .05, 95% C.I. from -.01 to .35), and commitment (B = .38, SE = .05, 95% C.I. from -.01 to .40). Therefore, H6 was only partially supported.

**Part III: Effects of message interactivity on perceived contingency, perceived dialogue, social presence, attitudes, behavioral intentions and relational outcomes**

H7 and H12 predicted (1) the positive effects of message interactivity on perceived contingency (H7), perceived dialogue (H9) and social presence (H11), and (2) the mediating effects of perceived contingency (H8), perceived dialogue (H10) and social presence (H12) on attitudes, behavioral intention and relational outcomes.

H7 predicted that high levels of message interactivity would lead to greater perceived contingency than low levels of message interactivity. The results revealed that interactivity had a significant main effect on perceived contingency. More specifically, participants in the high message interactivity condition reported greater perceived contingency (M = 5.49, SE = .16) in communication with the agent than those in the low message interactivity condition (M = 4.63, SE = .16), F (1, 127) = 13.25, p < .001, η² = .094. Moreover, as predicted in H9, there was a significant main effect of message interactivity on participants’ perceived dialogue, F (1, 127) = 17.95, p < .001, partial η² = .124, indicating that participants in the high message interactivity condition (M = 5.95, SE = .13) significantly perceived greater dialogue in their communication with the agent than those in the low message interactivity condition (M = 5.12, SE = .13), p < .001. Finally, those in the high message interactivity condition reported greater feelings of social presence (M = 5.25, SE = .17) than those in the
low message interactivity condition ($M = 4.72, SE = .17$), $F(1, 127) = 4.85, p < .05$, partial $\eta^2 = .037$. Thus, H7, H9, and H11 were supported.

**Table 5.** Mean and standard deviation of perceived contingency, perceived dialogue and social presence

<table>
<thead>
<tr>
<th>Psychological variables</th>
<th>Message Interactivity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Perceived contingency</td>
<td>5.49</td>
<td>0.16</td>
</tr>
<tr>
<td>Perceived dialogue</td>
<td>5.95</td>
<td>0.13</td>
</tr>
<tr>
<td>Social presence</td>
<td>5.25</td>
<td>0.17</td>
</tr>
</tbody>
</table>

**Table 6.** Main effects of message interactivity on psychological variables

<table>
<thead>
<tr>
<th>Psychological variables</th>
<th>F-value</th>
<th>p-value</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived contingency</td>
<td>13.24</td>
<td>$p &lt; .001$</td>
<td>.094</td>
</tr>
<tr>
<td>Perceived dialogue</td>
<td>17.95</td>
<td>$p &lt; .001$</td>
<td>.124</td>
</tr>
<tr>
<td>Social presence</td>
<td>4.85</td>
<td>$p &lt; .05$</td>
<td>.037</td>
</tr>
<tr>
<td>Attitudes toward the agent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Perceived expertise</td>
<td>11.73</td>
<td>$p &lt; .001$</td>
<td>.085</td>
</tr>
<tr>
<td>2) Perceived friendliness</td>
<td>14.52</td>
<td>$p &lt; .001$</td>
<td>.103</td>
</tr>
<tr>
<td>Attitudes toward the website</td>
<td>.74</td>
<td>$p = .392$</td>
<td>.006</td>
</tr>
<tr>
<td>Behavioral intention</td>
<td>3.86</td>
<td>$p = .052$</td>
<td>.029</td>
</tr>
<tr>
<td>Relational outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Control mutuality</td>
<td>.79</td>
<td>$p = .375$</td>
<td>.006</td>
</tr>
<tr>
<td>2) Satisfaction</td>
<td>4.55</td>
<td>$p &lt; .05$</td>
<td>.035</td>
</tr>
<tr>
<td>3) Trust</td>
<td>5.26</td>
<td>$p &lt; .05$</td>
<td>.040</td>
</tr>
<tr>
<td>4) Commitment</td>
<td>.58</td>
<td>$p = .447$</td>
<td>.005</td>
</tr>
</tbody>
</table>

Next, the indirect effects of perceived contingency (H8), perceived dialogue (H10), and social presence (H12) on attitudes, behavioral intentions, and relational outcomes were examined. As shown in Table 7, the indirect effects of message interactivity on these psychological outcomes variables were significant when perceived contingency and perceived dialogue were included in serial. Such results suggest that high message interactivity leads to greater perceived contingency, which in turn has a significantly positive
effect on perceived dialogue. Such greater perceptions of communication with the agent as dialogic subsequently result in better attitudinal, behavioral, and relational outcomes. These two-step mediation analyses results are illustrated in Figures 11 to 18.

**Table 7.** Significant indirect effects of message interactivity on attitudinal, behavioral and relational outcome via mediators

<table>
<thead>
<tr>
<th>Mediation Path</th>
<th>Indirect Effect Bootstrap Estimate ($b$)</th>
<th>Indirect Effect 95% Confidence Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>M $\rightarrow$ Contingency $\rightarrow$ Dialogue $\rightarrow$ Perceived expertise</td>
<td>.36</td>
<td>.17 \text{--} .65</td>
</tr>
<tr>
<td>M $\rightarrow$ Contingency $\rightarrow$ Dialogue $\rightarrow$ Perceived friendliness</td>
<td>.27</td>
<td>.11 \text{--} .54</td>
</tr>
<tr>
<td>M $\rightarrow$ Contingency $\rightarrow$ Dialogue $\rightarrow$ Website</td>
<td>.46</td>
<td>.20 \text{--} .85</td>
</tr>
<tr>
<td>M $\rightarrow$ Contingency $\rightarrow$ Dialogue $\rightarrow$ BI</td>
<td>.39</td>
<td>.15 \text{--} .83</td>
</tr>
<tr>
<td>M $\rightarrow$ Contingency $\rightarrow$ Dialogue $\rightarrow$ Control</td>
<td>.25</td>
<td>.10 \text{--} .51</td>
</tr>
<tr>
<td>M $\rightarrow$ Contingency $\rightarrow$ Dialogue $\rightarrow$ Satisfaction</td>
<td>.38</td>
<td>.16 \text{--} .74</td>
</tr>
<tr>
<td>M $\rightarrow$ Contingency $\rightarrow$ Dialogue $\rightarrow$ Trust</td>
<td>.37</td>
<td>.16 \text{--} .71</td>
</tr>
<tr>
<td>M $\rightarrow$ Contingency $\rightarrow$ Dialogue $\rightarrow$ Commitment</td>
<td>.25</td>
<td>.10 \text{--} .53</td>
</tr>
</tbody>
</table>

**Figure 11.** Indirect effects of message interactivity on perceived expertise

**Figure 12.** Indirect effects of message interactivity on perceived friendliness
Figure 13. Indirect effects of message interactivity on attitudes toward the website

Figure 14. Indirect effects of message interactivity on behavioral intention

Figure 15. Indirect effects of message interactivity on control mutuality

Figure 16. Indirect effects of message interactivity on satisfaction
Part IV: Compensation vs. expectancy violation effects of anthropomorphic visual cue, identity cue, and message interactivity on psychological outcomes

In order to test two competing theoretical assumptions as they pertain to the interaction effects among the three factors, a series of ANCOVA tests was conducted that included gender, age, ethnicity, education level, power usage, and interest in digital cameras as covariates. The tests revealed significant interaction effects that indicate the presence of the compensation effect and the expectancy violation effect.

**Perceived homophily.** First, there was a significant disordinal interaction effect of anthropomorphic visual cues and identity on perceived homophily, $F(1, 127) = 17.75$, $p < .001$, partial $\eta^2 = .123$. (A disordinal interaction occurs if “a factor has one kind of an effect...
in one condition and a different kind of effect in another condition”; see Tsang, n.d.). In this study, when the chat agent demonstrated the low anthropomorphic visual cue participants in the chat-bot identity condition reported greater perceptions of homophily (M = 4.88, SE = .24) than those in the human identity condition (M = 3.84, SE = .23). On the other hand, when the chat agent had the high anthropomorphic visual cue, participants in the human identity condition showed greater perceived homophily (M = 4.50, SE = .24) than those in the chat-bot identity condition (M = 3.85, SE = .24). This interaction effect indicates the expectancy violation effect of the two factors on perceived homophily (Figure 19).

![Figure 19. Interaction effect of visual cue and identity cue](image)

**Perceived contingency.** There were significant ordinal interactions between anthropomorphic visual cues and message interactivity as well as between the identity cue and message interactivity on perceived contingency. (An ordinal interaction occurs when “an independent variable seems to have more of an effect under one level of a second independent variable than another level,” as per Tsang, n.d.). Specifically, in combining visual cues and message interactivity, a compensation effect of message interactivity on
perceived contingency was seen. More specifically, when the chat agent’s visual cue was low anthropomorphic, participants in the high message interactivity condition showed greater perceived contingency (M = 5.64, SE = .23) than those in the low message interactivity condition (M = 4.22, SE = .23). However, when the agent’s visual cue was highly anthropomorphic, participants in both the high message interactivity (M = 5.34, SE = .24) and low message interactivity conditions (M = 5.03, SE = .24) showed relatively greater perceived contingency, F (1, 127) = 5.44, p < .05, partial η² = .041 (Figure 20).

![Figure 20. Interaction effect of visual cue and message interactivity](image)

However, in considering the interaction between the identity cue and message interactivity, a pattern of expectancy violations was evident. In other words, when participants perceived the identity of the chat agent as a chat-bot, the levels of message interactivity did not influence the participants’ perceptions of contingency (High: M = 5.43, SE = .24, Low: M = 5.22, SE = .23). When participants identified the chat agent as a human, however, then levels of message interactivity determined the participants’ perceptions of
contingency, suggesting that low message interactivity made participants perceive their communication with a person as much lower in contingency (M = 4.03, SE = .23) than did high message interactivity (M = 5.55, SE = .23), F (1, 127) = 7.64, p < .05, partial η² = .057 (Figure 21).

![Perceived Contingency](image)

**Figure 21.** Interaction effect between identity cue and message interactivity

**Perceived dialogue.** This study also revealed significant ordinal interaction effects between the identity cue and message interactivity on perceived dialogue, F (1, 127) = 13.55, p < .001, partial η² = .096, thus revealing another expectancy violation effect. Like perceived contingency, the participants in the chat-bot identity and high message interactivity combination condition were not significantly different in perceived dialogue from those in the chat-bot identity and low message interactivity combination condition (M = 5.69, SE = .19). However, participants in the human identity and low interactivity combination condition (M = 4.55, SE = .19) significantly reported lower levels of dialogue than those in the human identity and high interactivity combination condition (M = 6.08, SE = .19) (Figure 22).
**Attitudes toward the agent.** Interesting interaction effects were also for participants’ attitudes toward the agent, which was assessed with two perceptions: perceived expertise and perceived friendliness. This study found a significant disordinal interaction effect only on expertise perceptions (F (1, 127) = 14.76, p < .001, partial η² = .104). Specifically, when the identity of chat agent was a chat-bot, participants reported similar expertise perceptions, regardless of the level of message interactivity (High: M = 5.95, SE = .19, Low: M = 6.02, SE = .18). When the identity of chat agent was a human, participants perceived it as expert, intelligent, and competent if it delivered highly interactive conversation (M = 6.35, SE = .19). However, when it delivered less interactive communication, participants had lower perceptions of its expertise (M = 4.97, SE = .18) (Figure 23).
Attitudes toward the website. The study revealed a disordinal interaction effect between visual cues and message interactivity on attitudes toward the website, F (1, 127) = 4.29, p < .05, partial η² = .033, such that in the low anthropomorphic condition, participants who had highly contingent message exchanges with the agent were more likely to have favorable attitudes toward the website (M = 5.59, SE = .21) than those who had less contingent message exchanges (M = 4.95, SE = .21). For those who were in high anthropomorphic condition, there was small difference between high message interactivity condition (M = 5.26, SE = .21) and low message interactivity condition (M = 5.52, SE = .22) which indicates a compensation effect of message interactivity (Figure 24).

In addition, a disordinal interaction between the identity cue and message interactivity was also observed, F (1, 127) = 5.61, p < .05, partial η² = .042. More specifically, when participants perceived the agent as a chat-bot, participants’ attitudes did not differ between the high message interactivity condition (M = 5.49, SE = .16) and the low
message interactivity condition (M = 5.43, SE = .17). When they were in a chat-bot condition, high message interactivity led participants to have more favorable attitudes toward the agent (M = 5.98, SE = .16) than low message interactivity did (M = 5.27, SE = .16) (Figure 25).

![Attitudes Toward The Website](image1)

**Figure 24.** Interaction between visual cue and message interactivity

![Interaction between identity cue and message interactivity](image2)

**Figure 25.** Interaction between identity cue and message interactivity
**Behavioral intentions.** There was a disordinal interaction effect between the identity cue and message interactivity on behavioral intentions, $F(1, 127) = 5.14$, $p < .05$, partial $\eta^2 = .039$, such that when the identity of the agent was a chat-bot, there was no significant difference between the low ($M = 5.13$, SE = .25) and high message interactivity conditions ($M = 5.06$, SE = .26). However, when the identity of the agent was a human, participants in the high message interactivity condition were more likely to have behavioral intentions to visit the website ($M = 5.35$, SE = .25) than those in the low message interactivity condition ($M = 4.25$, SE = .26) (Figure 26).

![Behavioral Intention](image)

**Figure 26.** Interaction effect between identity cue and message interactivity

**Relational outcomes.** In regard to relational outcomes, a significant disordinal interaction effect was revealed in two dimensions of relational outcomes: satisfaction and trust. The interaction patterns of the two dimensions were similar. More specifically, when the agent’s identity was a chat-bot, there was no difference between the high and low
message interactivity conditions on satisfaction (High: M = 5.36, SE = .18, Low: M = 5.41, SE = .18) and trust (High: M = 5.56, SE = .16, Low: M = 5.57, SE = .17), while when the identity was human, participants who had highly contingent message exchanges showed greater satisfaction (M = 5.79, SE = .18) and trust (M = 5.91, SE = .17) toward the organization than those who had less contingent message exchanges (Satisfaction: M = 4.94, SE = .18, Trust: M = 5.13, SE = .17) (Figure 27).

![Figure 27. Interaction effects between identity cue and message interactivity](image_url)
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<th>Visual x Message</th>
<th>Identity x message</th>
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*Note. The effects of demographics (gender, age, ethnicity, and education level), power usage, and involvement in digital cameras were controlled.

*p<.05; **p<.01
Summary of Findings

This study offers interesting findings regarding how the three factors of visual cues, identity cue, and message interactivity influence psychological outcomes, as well as how their combinatory effects influence those same psychological outcomes.

The results of this study have particular theoretical importance for understanding the combinatory influence of these three factors in regards to the compensation effect and the expectancy violation effect. More specifically, the presence of interaction effects indicates that the separate independent effect of each variable, namely each variable’s main effect, may not be statistically significant because each variable’s main effect may cancel out the other variables’ main effects. For example, we found that the visual cues of the chat agent did not have any significant main effect on the proposed mediating variables of perceived homophily and social presence. Nonetheless, the identity cue of the chat agent (whether chat-bot or a human) showed a significant main effect on social presence. Yet such heightened social presence did not mediate the relationships between the identity cue of the agent and the majority of the proposed attitudinal, behavioral, and relational outcomes variables; it only mediated control mutuality, which is one aspect of relational outcomes, and perceived expertise.

Message interactivity was proven to be the most influential predictor of proposed mediating and dependent variables. As hypothesized, message interactivity had significant and positive main effects on perceived contingency, perceived dialogue, and social presence, thereby demonstrating that high message interactivity is able to improve psychological outcomes. Furthermore, increased perceptions of contingency and dialogue led to greater attitudinal, behavioral, and relational outcomes. In particular, the analysis revealed contingency and dialogue to combine for two-step mediations of attitudinal, behavioral and
relational outcomes. Specifically, a high level of message interactivity led to greater perceptions of contingency (i.e., greater perceptions of threadedness and interconnectedness in message exchanges), which in turn resulted in higher levels of perceived dialogue (i.e., greater perceptions of dialogic conversations). These higher levels of perceived dialogue then significantly predicted attitudes toward the agent and website, as well as behavioral intentions and relational outcomes.

In regard to interaction effects among visual cue, identity cue, and message interactivity, this study found patterns to support compensation effect and expectancy violation effect. More specifically, in considering perceived contingency and attitudes toward the given website, our results revealed a pattern of compensation effects between an anthropomorphic visual cue and message interactivity. More specifically, when the agent’s visual cue was a low anthropomorphic cue, participants in the high message interactivity condition showed greater perceived contingency than those in the low message interactivity condition. However, when the agent’s visual was highly anthropomorphic, participants in both the high message interactivity and low message interactivity conditions showed relatively greater perceived contingency.

In addition, regarding perceived homophily, the results showed a pattern consistent with the eeriness effect between the identity cue and anthropomorphic visual cues such that when the chat agent displayed a low anthropomorphic visual cue, participants in the chatbot identity condition reported greater perceptions of homophily than those in the human identity condition. On the other hand, when the chat agent displayed the high anthropomorphic visual cue, participants in the human identity condition showed greater perceptions of homophily than those in the chatbot identity condition.
Finally, a pattern of expectancy violation effect was shown in the combination of the identity cue and message interactivity on perceived contingency, perceived dialogue, attitude toward the agent (expertise perception), attitude toward the website, behavioral intentions, and relational outcomes (satisfaction and trust). Specifically, when the identity of chat agent was a human, participants showed better outcomes if it delivered highly interactive conversation. However, when it delivered less interactive communication, participants had negative evaluations.
Chapter 4

DISCUSSION

In the following sections, the theoretical and practical implications of findings are discussed. The limitations of this study as well as future research directions are also discussed.

Effects of message interactivity on psychological, attitudinal, behavioral, and relational outcomes

The results of this study indicate that an agent’s ability to deliver contingent messages (i.e., to provide message interactivity) is an important factor in determining psychological, attitudinal, behavioral, and relational outcomes. Participants in the high message interactivity condition, which included threaded conversations between the participants and the chat agent via the live-chatting function on the organization’s website, showed greater perceived contingency, dialogue, and social presence than those in the low message interactivity condition. They also reported more favorable attitudes toward the agent, greater satisfaction, and more trust than those in the low message interactivity condition. These results are in line with previous studies on the role of message interactivity (e.g., Bellur, 2012; Sundar et al., in press).

First, more importantly, a series of mediation analyses indicates that message interactivity influences participants’ evaluations of the agent, attitude toward the website, and behavioral intentions by way of perceived contingency and perceived dialogue. These results corroborate earlier work (e.g., Dou, 2013; Sundar et al., in press). Furthermore, the mediation analyses show that higher levels of message interactivity successfully increase perceived
contingency, which is associated with attitudinal and behavioral outcomes. These results provide additional empirical support to the interactivity effects model (Sundar, 2007).

Secondly, another theoretical contribution of this study is to the public relations literature, especially in the context of interactive websites. This study not only provides greater understanding of the concept of contingency and dialogue in the context of public relations, but it also underscores their importance in relational outcomes. The results of this study suggest that perceived contingency and perceived dialogue contribute to all four aspects of relational outcomes (i.e., control mutuality, satisfaction, trust, and commitment). By emphasizing the mediating role of contingency and dialogue in the effects of message interactivity on relational outcomes, these findings help to explain the theoretical mechanisms by which message interactivity influences relational outcomes. Even though previous studies in public relations (e.g., Cho & Huh, 2010) have investigated the effects of interactivity features used on organizations’ websites in promoting better relational outcomes by emphasizing the ability of certain features to promote two-way or dialogic communication, such studies are somewhat limited, however, in that they have typically endeavored to describe how organizations are currently using dialogic tools on their websites by conducting content analysis rather than empirically testing the direct effects of those tools on relational outcomes. Thus, by empirically examining the effects of dialogic tools on relational outcomes through experimentation, this study reveals the primary underlying mechanism responsible for the effects of contingent or dialogic message exchanges on relationship-building between organizations and their publics.

Thirdly, although this study does not propose a direct effect of message interactivity on relational outcomes (satisfaction, trust, commitment, and control mutuality), it does reveal that message interactivity exerts main effects on satisfaction and trust, while it does not have
main effects on control mutuality and commitment. However, it is worth noting that individuals are able to experience higher levels of commitment and control mutuality as long as they perceive greater contingency and dialogue through higher levels of message interactivity in message exchanges with agents, as shown in mediation analyses. These results signify the critical role of perceived contingency and perceived dialogue in achieving relational outcomes. In particular, this study demonstrates that perceived dialogue can be enhanced through perceived contingency, which has not been actively discussed in the public relations literature. Perceived contingency and dialogue are inextricably related to each other, given that they can both be achieved through active messaging; they are conceptually different from each other, however. Perceived contingency is associated with the degree to which message exchanges are threaded and interconnected, thereby imbuing them with “a sense of back and forth and interconnected interaction” (Sundar et al., in press, p. 5). Perceived dialogue, on the other hand, is about how responsive an agent is to a customer’s requests and questions. Thus, perceived contingency (or perceptions of threaded communication) is a pre-requisite for achieving perceived dialogue, and both of these two psychological outcomes help boost relational outcomes even in single interactions. Indeed, given the theoretical importance of message contingency in defining message interactivity, in order to create dialogue with customers, it is important to establish the presence of not only a live-chat function on an organizational website, but also to consider the extent to which the live-chat function facilitates threaded message exchanges that enable greater levels of contingency.

**Interaction effects among visual cues, the identity cue, and message interactivity: the compensation effect vs. the expectancy violation effect vs. the eeriness effect**
One of the main goals of this study was to discover how the three factors of visual cue, identity cue, and message interactivity interact with each other. This study specifically demonstrated possible theoretical explanations (i.e., compensation effect and expectancy violation effect) for the interaction effects among the three proposed factors. In particular, it is noteworthy that the compensation effect was seen only in the interaction between visual cues and message interactivity, while the expectancy violation effect was demonstrated only in the interaction between identity cues and message interactivity. First, regarding the compensation effect, from this pattern, we can infer that visual cues help compensate for the impersonal nature of communication due to low levels of message interactivity more than identity cues. This means that the visual cue of the chat agent seems more vivid and immediate to users than the identity cue of the agent. Indeed, in this study, users were continuously exposed to visual cues while they were chatting with agents, given that the chat windows showed the agents’ representations (either a human figure or bubble figure), as long as the window was open. The identity cue information, on the other hand, was provided only at the beginning of the chat. This suggests that a visual cue can help compensate whenever users experience low levels of humanness or if the communication is impersonal in nature due to low message interactivity while chatting.

Secondly, from the findings regarding the interaction between identity cues and message interactivity, we can speculate that an identity cue contributes more strongly to building expectations than the visual cue. In this study, both cues were assumed to help build expectations among users before the users had actual communication with agents. However, it turned out that only identity cues significantly influenced the formation of expectation. This indicates that stereotypical judgments or perceptions are more easily activated by an assigned label (i.e., identity cue) than by a visual representation.
Last, as another pattern of expectancy violation, the study suggests the eeriness effect, especially to explain the interaction between a chat-bot identity cue and high message interactivity. However, the pattern of eeriness effect was shown in the interaction between an anthropomorphic visual cue and identity cue on perceived homophily. Interestingly, this eeriness effect was noted only for perceived homophily. This result indicates that perceived homophily seems to be particularly influenced by individuals’ perceptions of normality. The following sections discuss each pattern in detail.

1) The importance of message interactivity on compensation effects

This study revealed compensation effects in the interaction between visual cues and message interactivity in relation to perceived contingency and attitudes towards a website. In particular, it is clear that a compensation effect of high anthropomorphic visual cues on low message interactivity and a compensation effect of high message interactivity on low anthropomorphic visual cues occurred. The two scenarios described above were equally strong in their effects.

However, the compensation effect of high message interactivity seemed to be stronger than that of high anthropomorphic visual cues on perceived contingency, given that the combination of high message interactivity and low anthropomorphic visual cues led to the highest score on perceived contingency. This makes sense, given that perceived contingency can be more easily achieved through high levels of message interactivity than through anthropomorphic visual cues.

This is confirmed by the participants’ self-reported scores regarding perceived compensation effects. This study measured the perceived compensation effects of each factor using six items. The specific items were as follows: (1) “The agent’s communication style
compensates for the lack of face-to-face interaction”; (2) “The interaction with an agent makes up for the impersonal nature of the medium”; (3) “The agent’s profile picture in the chat window compensates for the lack of face-to-face interaction”; (4) “The agent’s profile picture in the chat window makes up for the impersonal nature of the medium”; (5) “Knowing the chat agent’s identity compensates for the lack of face-to-face interaction”; and (6) “Knowing the chat agent’s identity makes up for the impersonal nature of the medium.”

The first two items aimed to assess the perceived compensation effect of the agent’s conversation style. The next two items were designed to measure the perceived compensation effect of the agent’s anthropomorphic visual cues, and the final two items estimated the perceived compensation effect of the agent’s identity cue. A series of independent sample t-tests showed that participants in the high message interactivity condition perceived the agent’s communication style as compensating for a lack of face-to-face interaction, thereby making up for the impersonal nature of the medium (M = 5.35, SE=.15), more often than those in the low message interactivity condition did (M = 4.69, SE=.21), t(139)= -2.478, p < .05. As these results clearly show, message interactivity works to compensate for the impersonal nature of the medium. In other words, when interpreting the interaction effects between message interactivity and the other two types of cues (i.e., visual cues and the identity cue), it is necessary to realize that message interactivity likely compensates for the impersonality stemming from the low anthropomorphic visual cues of the agent or its chatbot identity.

2) The importance of the identity cue in building expectations

This study has revealed the occurrence of expectancy violation effects as well, particularly when the identity cue is combined with message interactivity. Such effects were
shown on perceived contingency, perceived dialogue, attitudes regarding the perceived expertise of the agent, behavioral intentions, and two aspects of relational outcomes: satisfaction and trust.

More specifically, the identity cue seems to set expectations for the actual performance of the agent. In particular, given the proposed outcomes, a negative expectancy violation seems to occur more clearly than a positive violation. According to expectancy violation theory (Burgoon, 1992), a negative violation occurs when an outcome does not meet an individual’s expectation.

Participants’ self-reported scores regarding their perceptions of the actual quality of the agent’s performance versus their expectations were measured using three items: (1) “My experience with using the chat function was better than what I expected”; (2) “The service level provided by the agent was better than what I expected”; and (3) “Overall, most of my expectations about using a chat function were confirmed.” The interaction pattern between message interactivity and the identity cue regarding the confirmation of perceived expectations was exactly the same as that of the interaction between message interactivity and the identity cue, as shown in Figure 28 below. More specifically, when the agent was identified as a chat-bot, the level of message interactivity did not influence participants’ evaluations of the quality of the website, the live-chatting function, or the chat agent, regardless of whether the performance met their expectations or not. However, when the agent was identified as a human, the level of message interactivity did matter, as a low level of message interactivity made participants perceive the agent’s actual performance as worse than what they had expected, F (1, 127) = 5.31, p < .05. This means that only when participants were in possession of the information that the agent was a human agent, were they likely to expect back-and-forth communication or contingent dialogue. Thus, individuals
actually evaluate the agent’s performance against their expectations toward it, and such expectations are generally formed by the individuals’ knowledge of whether the agent is a human or a chat-bot.

![Figure 28. Interaction effects between identity cue and message interactivity](image)

These findings imply that, as the MAIN model (Sundar, 2008) suggests, a human identity cue may trigger a cognitive heuristic about the essential characteristics of humanness (i.e., anthropomorphism or human-associated perceptions). This subsequently causes individuals to expect more contingent conversation with the chat agent, as contingency is a core characteristic of human-to-human communication. Such high expectations extended to human agents: indeed, in this case, these expectations caused participants to evaluate human agents’ low contingent conversational style much more negatively than they might otherwise. Given that the negative violation associated with the human identity cue condition was more salient in the results, it may be speculated that individuals have much clearer heuristics
regarding human-associated characteristics than they do of heuristics regarding chat-bot- or machine-associated characteristics.

3) The effect of the identity cue and visual cues on the eeriness effect and perceived homophily

In considering perceived homophily, this study found an expectancy violation effect between anthropomorphic visual cues and the identity cue; this expectancy violation effect was specifically the eeriness effect. When a chat-bot identity cue is combined with low anthropomorphic visual cues or, conversely, when a human identity cue is combined with high anthropomorphic visual cues, there is no violation in expectancy. This, in turn, leads to relatively high levels of perceived homophily. When a human identity cue is combined with low anthropomorphic visual cues, a negative expectancy violation occurs, therefore leading to a lower score on perceived homophily. Yet if the outcome is better than expected, a positive violation is likely to occur. For example, if a chat-bot identity is combined with high anthropomorphic visual cues, then the human morphology of the agent is considered to be better than what the user expected for a chat-bot; therefore, a positive violation occurs.

However, when a chat-bot identity cue combines with high anthropomorphic visual cues, the eeriness effect may also occur, which suggests that such human visual cues are not natural to a chat-bot, making a user likely to experience weird or eerie feelings toward the bot.

Interestingly, this eeriness effect was noted only for perceived homophily. This is because perceived homophily seems to be particularly influenced by individuals’ perceptions of normality. In other words, individuals only perceive similarity when they perceive consistency among the agent’s characteristics. If they perceive any degree of inconsistency, then they are less likely to perceive the agent as similar to them. Indeed, even though it is not
statistically significant, the scores on eeriness perception, as assessed with two items (eerie – reassuring; freaky – natural) were equally high when the chat-bot identity cue combined with low anthropomorphic visual cues (M= 5.75, SD=.98) or when the human identity cue combined with high anthropomorphic visual cues (M= 5.74, SD= 1.63). The condition in which a chat-bot identity cue combined with high anthropomorphic visual cues registered the lowest score (M= 5.23, SD= 1.44). Furthermore, given that perceived eeriness predicted perceived homophily, β=.594, p <.001, it may be presumed that individuals’ perceptions of what is natural, which can be influenced by the specific combination of the agent’s identity cue and visual cues, may be somewhat related to the variations in perceived homophily.

**Practical Implications**

This study has valuable practical implications for communication researchers, as well as organizational website designers seeking to incorporate into or improve the live-chatting function within their new media strategies. First, the results regarding manipulation demonstrates that the ways of operationalization of three factors on websites are effective. An online agent’s visual cues, identity cue, and message interactivity can all be psychologically distinguishable among individuals who interact with the agent, thereby leading to certain effects on outcome variables. Given the recent proliferation of chat-bots in domains ranging from customer service to e-health, these relatively simple manipulations may be used by researchers to operationalize the two types of source cues (i.e., anthropomorphic visual cues and the identity cue), as well as message interactivity, in different domains. For example, in the e-health domain, the role of the live-chatting function for counseling purposes can be studied by differentiating the levels of three factors. These manipulations can also be used for the development of other types of conversational agents, such as Apple’s Siri.
The results of this study also point to the need for organizational caution when employing chat-bots. Given the series of interaction effect results documented here, especially the results regarding expectancy violation effects, we suggest that users tend to have different expectations of agents’ performances, depending on whether the agents are human or chat-bots. Therefore, agents’ actual communication styles should align with users’ expectations. In other words, if users are interacting with a human agent, one-way or reactive responses are insufficient; rather, the interactive exchanges in chatting need to take into account users’ prior response in order to create an active dialogue, as in knowing that they are interacting with a human agent, users may have higher expectations. However, if the organization does not have enough resources to use human sales representatives for customer services, the study’s findings suggest using an automated chat-bot, given that when individuals form attitudes, behavioral intentions, or build relationships, a chat-bot is less likely to be viewed negatively due to the low expectations users place upon it. Therefore, if the organization is not profitable enough to engage in active dialogue with users with human agents, it would be better for it to implement automated chat-bots.

Similarly, this study provides some insight into designing effective live-chatting interfaces. The study’s findings provide evidence that the agent’s visual cues may compensate for the impersonal nature of the medium. This indicates that website designers and public relations executives may be easily able to enhance desirable psychological outcomes by simply using human morphology when designing the chat agent. Of course, the results also suggest that the best way to compensate for the lack of face-to-face communication might be to make the agent’s communication as contingent as possible, but if this proves too difficult, designers and executives may consider the use of human morphology for the agent as an alternative for yielding better interactions with users.
Ultimately, the dynamic patterns of interaction effects found among three factors suggest the implementation of chat-bots via the live-chatting function is quite complex. While message interactivity and anthropomorphic visual cues may help to compensate for the impersonal nature of the medium, the identity cue of the agent seems to influence the effects of message interactivity and such visual cues.

**Limitations and Future Research**

This study has several limitations. First, in addition to considering psychological, attitudinal, and behavioral outcomes, this study measured relational outcomes. In general, relational outcomes are believed to be achieved through organizations’ long-term relationships with customers (Morgan & Hunt, 1994). Given that this study is a cross-sectional experiment examining the effects of one instance of chatting, some may argue that it is not appropriate to measure relational outcomes as outcome variables, because this short-term experiment cannot capture the long-term effects of message interactivity. Yet the fact that this study has shown that participants who had just one experience of highly contingent chatting with an agent subsequently had significantly greater relational outcomes implies that even a short-term experience such as this one has the potential for aiding in relationship maintenance. Future research should, of course, address the long-term effects of message interactivity on relationships.

In addition, this study used digital cameras as the product type for the stimulus website. While this study measured and controlled for participants’ interest in digital cameras throughout the experiment, using a different type of product may result in a different role for the chatting agent. For example, if a product type that requires more detailed information before purchasing due to its high cost were chosen, or if it a product type that does not
require a recommendation from the chatting agent due to the customer’s preexisting knowledge were used, then the study results might shift. Likewise, it would be interesting to examine different situations such as one in which participants complain about the product they have already purchased to see the effects of visual cues, the identity cue, and message interactivity in a different light.

Furthermore, using Amazon’s Mechanical Turk has been found to produce more generalizable and reliable results than using college samples because participants recruited from Amazon’s Mechanical Turk are more demographically diverse (Buhrmester, Kwang, & Gosling, 2011; Goodman, Cryder, & Cheema, 2012) than typical college samples. Yet the use of Amazon’s Mechanical Turk requires researchers to conduct their studies online, with each participant completing the study in his or her own preferred environment. This is in contrast to laboratories, which are the usual settings for experiments and are fairly quiet environments. As a result of this distinctive set-up, our data may include some noise.

To simulate the experience of chatting and to control for content effects, thereby identifying the effects of different levels of message contingency, this study used a scenario that served to make participants follow a certain chatting procedure. While the use of such a scenario allowed the study to control unwanted effects that may emerge in an online experiment, it also introduced low ecological validity into the study. For example, in order to recommend the same digital camera to participants at the end of the chat based on the preferences that the participants specified, participants were instructed to indicate some specific preferences as requested in the scenario. However, by limiting the participants’ choices, the scenario may have preordained low levels of involvement or relevance to participants during the experiment. Thus, this study suggests that in future research, a similar experiment should be conducted without a scripted scenario. If a scenario is not used and
users are instead able to freely initiate chats with agents, researchers will be able to identify whether the compensation effect or the expectancy violation effect are influenced by types of chat situations, including situations in which users are complaining, asking questions, and seeking recommendations. For example, if a user is complaining, a combination of low message interactivity and the human identity cue may lead to a much more negative outcome than usual because the user’s preexisting dissatisfaction makes him or her predisposed to a much harsher evaluation of the agent if the chatbot’s performance does not meet his or her expectations for a human agent, given the human identity cue.

Future research should also explore how results patterns differ when the interaction is between users and a robot, rather than between users and a chat agent. In other words, when people interact with (or chat with) a robot programmed to project different levels of anthropomorphic visual cues and message interactivity, how might the results change? Communication with a chat agent (especially an actual human agent) is viewed as computer-mediated communication (CMC), while communication with a robot or a chatbot is viewed as human-computer interaction (HCI). In CMC, message interactivity refers to an interaction between people via a particular medium (i.e., technology). The interactivity rests on the contingent and responsive (back-and-forth) transactions between two interactants through a given medium. On the other hand, in HCI, message interactivity refers to the “ease with which people can control the medium to make it provide the information they want” (Stromer-Galley, 2000, p. 118). Therefore, message interactivity is typically operationalized as the degree to which the system works in accordance with its inputs. Though message interactivity is operationalized differently in the CMC and HCI contexts, users are ultimately able to experience higher levels of contingency if the communication between interactants via
a given medium is back-and-forth (in CMC) and if the system affords contingent interactions (in HCI).

While contingent interactions can be achieved even in HCI settings, the process of contingency seems more clearly achievable in CMC settings, because, in CMC settings, message threads in a chat can be easily visualized, while contingent interaction (or dialogue) occurring between users and robots in HCI is less visually recognizable. Acknowledging this challenge, scholars in the field of HCI have sought to build contingency into the HCI setting by visually displaying the interaction history between a given system and its user (Pelaprat & Shapiro, 2002). For example, breadcrumbs that display a cumulative navigational history can serve to build a sense of contingency for a user in his or her interaction with the system. Likewise, during the interaction with a robot, contingency can be built through showing a history of how a robot provides interconnected feedback based upon a user’s actions. Even though contingency is not achieved by message threads in these cases, how message interactivity nevertheless works to imbue users with a sense of contingency among users through the interconnected feedback robots provide in the HCI sense.

While threaded “message” exchanges are less easily visualized in the interaction between a robot and a user, anthropomorphic visual cues may work better in an HCI setting, given that a robot is an actual (physical) entity; therefore, the robot’s visual representation may be more vivid and immediate to users than a chatbot’s visual representation. In this study, the anthropomorphic visual cue was manipulated using a human picture. However, the anthropomorphic cue of a robot can be manipulated in diverse ways. For example, it is possible to use a robot that has exact human likeness. If we use a humanoid robot, two possible results can be expected. First, we may find a greater compensation effect for such an anthropomorphic visual cue when it combines with low message interactivity. Or, as the
Uncanny valley theory suggests, a more obvious eeriness effect may emerge due to too much humanness associated with the robot’s visual representation. Another way to manipulate a robot’s visual is to add anthropomorphic cues to a robot that is not humanoid, such as in the use of a human avatar on the screen of a robot. If we do so, the eeriness effect is unlikely to happen; however, the compensation effect of the anthropomorphic visual cue may not be salient if users perceive the human avatar on the screen as arising from a source other than the robot. These two possible ways of manipulating the anthropomorphic visual cue of robots have pros and cons. Future research should consider how these two types of visual cue manipulations alter result patterns.

**Conclusion**

In conclusion, the current study contributes to researchers’ knowledge about how the conversation style of chat agents intersects with two types of source cues (visual cues and the identity cue), and how the interactions among these three factors influence psychological, attitudinal, behavioral, and relational outcomes. This study paid particular attention to three possible theoretical assumptions (the compensation effect, the expectancy violation effect and eeriness effect) to explain such interactions, as well as their effects on proposed final outcomes. As the results show, message interactivity works to compensate for the impersonal nature associated with low anthropomorphic visual cue and chat-bot identity cue. Moreover, the identity cue turned out to be a key factor in eliciting certain expectations regarding the agent’s performance in conversation. Therefore, depending on the identity cue, the effects of message interactivity, or the agent’s performance, may vary. Given the theoretical complexity of individuals’ psychological, attitudinal, behavioral, and relational responses to the agent as discovered in this study, this study suggests that website designers and public relations
executives carefully implement the live-chatting function using chat agents in order to help mitigate users’ negative evaluations or experiences due to high expectations.
References


Bellur, S., & Sundar, S. S. (2014). How can we tell when a heuristic has been used? Design and analysis strategies for capturing the operation of heuristics. *Communication Methods and Measures, 8*(2), 116-137.


APPENDIX. Chatting Script

Before beginning your chat with an agent, please provide your ID number.

1) Human condition: Thank you. Alex, a sales associate, will be with you shortly.
2) Chat-bot condition: Thank you. Alex, an automated chat-bot, will be with you shortly.

1) Human condition: Hi! I’m Alex, a sales associate.
2) Chat-bot condition: Hi! I’m Alex, an automated chat-bot.

I’m happy to help you with your purchase. We have all different types of cameras, from inexpensive digital compacts to high-end DSLRs.

In order to ensure that I make the most suitable recommendations for you, I’d like to ask you some questions.

Q1: Is this purchase for you or is this a gift?

1) High message interactivity condition: Okay, so, you’d like to buy a camera for a gift. I’d be glad to help you find a camera.
2) Low message interactivity condition: Okay, I’d be glad to help you find a camera.

Q2: What type of camera are you looking for? Are you looking for a DSLR, a compact digital camera, or a point-and-shoot camera?

1) High message interactivity condition: Okay, so you are looking for a point-and-shoot camera as a gift. Okay, let me ask another question.
2) Low message interactivity condition: Okay, let me ask another question.

Q3: Which brand do you prefer?

1) High message interactivity condition: Okay, you’d like to buy a Canon point-and-shoot digital camera for a gift. Great choice!
2) Low message interactivity condition: Okay. Great choice!

Q4: What is your price range?

1) High message interactivity condition: Okay, you’d like to buy a Canon point-and-shoot digital camera that costs less than $200 as a gift.
2) Low message interactivity condition: Okay.

Please give me a moment, and I’ll look for the best digital camera for you. Based on your preferences, I’ve located the best digital camera. Please see the following details about the digital camera.
Canon - PowerShot SX400 IS 16.0-Megapixel Digital Camera
- Color: Black
- Price: $199
- 30x optical/4x digital zoom
- 720p HD video
- Optical image stabilization

We at Digital World hope you'll like this recommendation and that our advice will help you make an informed decision about which camera best fits your needs.

Thank you!
VITA
EUN GO

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