Social Responses to Media Technologies in the 21st Century: The Media Are Social Actors Paradigm

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Abstract

Clifford Nass and his colleagues proposed the Computers Are Social Actors (CASA) paradigm in the 1990s and demonstrated that we treat computers in some of the ways we treat humans. To account for technological advances and to refine explanations for CASA results, this paper proposes the Media Are Social Actors (MASA) paradigm. We begin by distinguishing the roles of primary and secondary cues in evoking medium-as-social-actor presence and social responses. We then discuss the roles of individual differences and contextual factors in these responses and identify mindless and mindful anthropomorphism as two major complementary mechanisms for understanding MASA phenomena. Based on evolutionary psychology explanations for socialness, we conclude with nine formal propositions and suggestions for future research to test and apply MASA.

Keywords: computers are social actors, media are social actors, medium-as-social-actor presence, social presence, social cues, mindlessness, anthropomorphism

Introduction

Among the more surprising research results in the study of human-computer interaction are those of Clifford Nass and his colleagues demonstrating that computer users apply social rules from human-human interactions when they use computers. A series of experiments demonstrated that users follow social rules based on gender, team membership, politeness,

and more (Nass et al., 1994; Nass et al., 1996; Nass et al., 1997). Nass proposed the Computers are Social Actors (CASA) paradigm to describe the phenomenon and an approach to studying it and expanded on the idea with Byron Reeves in their book *The Media Equation* (Nass et al., 1994; Reeves & Nass, 1996).

The original CASA paradigm was proposed over a quarter century ago. Today we are surrounded by many more media technologies, including wearable devices, smartphones, digital assistants, and humanoid robots (Carolus et al., 2019; Kanda et al., 2009; Perry, 2014). While growing research has been applying the CASA paradigm to understand interactions with these emerging technologies, the general tenet that users respond to computers and other media technologies as if they were real people requires more subtle and detailed explications that account for media users' behavior. Although the CASA paradigm and the Media Equation describe a series of experimental findings about individuals' social reactions to technologies, one caveat to the theoretical framework is that it lacks explicit propositions that researchers can examine, test, and refine. Thus, to build a more refined framework, we propose the Media are Social Actors (MASA) paradigm as a structured extension of the CASA paradigm. We suggest that an enhanced framework that builds on the CASA paradigm, expounds the effects of social cues, describes the psychological mechanism of social responses, and provides propositions that scholars can test will not only direct future research on human-technology interaction but also meet the criteria of explanatory power, predictive power, falsifiability, heuristic value, and internal consistency that Chaffee and Berger (1987) outlined for a rigorous theoretical framework.

We expand the CASA paradigm from the perspective of social cues, as social cues are a key factor that leads to users' social responses. For example, Nass (2004) noted that social cues which may trigger applying etiquette rules to computers include language, voice, a face, emotion manifestation, interactivity, perceived engagement with the user, and filling of social roles. Another reason to approach the expansion of the paradigm through social cues is that cues can evoke medium-as-social-actor presence. Medium-as-social-actor presence refers to the idea that when a medium itself presents social cues, individuals perceive it (with or without conscious awareness) not as a medium but as an independent social entity (Lombard & Ditton, 1997). While sometimes researchers use social presence to describe medium-as-social-actor presence experiences, social presence may involve other meanings such as the "subjective quality of the medium" (Short et al., 1976, p. 66) or parasocial interaction (Horton & Wohl, 1956). Thus, in this paper, we will consistently use the term medium-as-social-actor presence to avoid misunderstandings (for definitions of other types of social presence, see Biocca et al., 2003; Lombard & Jones, 2015). Although not all CASA studies have examined medium-as-social-actor presence, and presence need not always lead to behavioral social responses, social responses can be considered as a reflection and indication of users' medium-as-social-actor presence experiences.

While much literature has examined the effects of social cues on users' social responses to technologies (e.g., Araujo, 2018; Nomura & Kanda, 2015; Terzioğlu et al., 2020), most research has focused on either the effects of single social cues or the cumulative effects of social cues. A large body of research suggests that technologies with more social cues can evoke stronger social responses than ones with fewer social cues (e.g., Burgoon et al., 2000; Ghazali et al., 2018; Tung & Deng, 2007). By contrast, limited research has clarified the distinctions among these social cues. It is likely that individual social cues can exert

different effects on users' responses (Abubshait & Wiese, 2017). Therefore, in this paper, we suggest that (1) the quality of social cues should receive more attention in future research, (2) the roles of individual differences and communication contexts should be considered in the paradigm, (3) the two prominent psychological explanations for social responses, mindlessness and anthropomorphism, can be unified and applied to explain a wide variety of human-machine communication (HMC) scenarios, and (4) specific propositions should be developed and refined to derive future research questions on HMC.

Expanding the CASA paradigm to the MASA paradigm through the examination of social cues has three major benefits. First, from a theory construction perspective, broadening the CASA paradigm will expand the value and applicability of an important theoretical framework. By refining and clarifying the concepts, assumptions, and propositions of the MASA paradigm, researchers can better understand, explain, predict the effects of, and generate new questions about our increasingly common communication experiences with diverse technologies.

Second, when interaction with technologies mimics natural human communication, people expend less cognitive effort (Gambino et al., 2020), making the experience more efficient and intuitive. And when interactions account for users' personalities, identities, and demographic characteristics along with the communication context, the experience is further enhanced. We can therefore apply the propositions of the MASA paradigm to improve the design, enhance the users' experience, and therefore increase the success, of a variety of media technologies (Bartneck et al., 2008; Biocca et al., 2003).

Third, expanding CASA to MASA highlights important ethical issues in technology development. As designers can more easily embed different social cues in technologies, we will need to consider the potential for unethical manipulation of user responses. Those who devise, promote, adopt, and study presence-evoking technologies should be mindful of their concomitant risks (Lombard, 2009).

The Roles of Cues, Individual Differences, and Contextual Factors

To elaborate the mechanism of the MASA paradigm, below we first explicate the role of social cues. We demonstrate the intrinsic distinctions among social cues, the effects of social cues on medium-as-social-actor presence and social responses, and then briefly introduce the role of individual differences and contextual factors in our theoretical framework.

Social Cues

Although many researchers have studied the effects of social cues (Tanis & Postmes, 2003; Walther et al., 2005; Wang et al., 2010), few have explicitly defined the term. Social cues can serve as affordances (Sundar et al., 2015), reflect physical attractiveness (Antheunis & Schouten, 2011), or be conceived as contextual information (Sproull & Kiesler, 1986). Here we specifically adopt Fiore et al.'s (2013) definition of cues as "biologically and physically determined features salient to observers because of their potential as channels of useful information" (p. 2). Fiore and colleagues distinguished social cues and social signals, where social cues can be understood as physical or behavioral features displayed by a social actor

and social signals are the meaningful interpretations of these social cues by the perceivers. This is an important stepping-off point because social cues have been used interchangeably with social signals in some literature (Wiltshire et al., 2014). Examples of social cues include a social actor's voice, humanlike appearance, and eye gaze, whereas social signals include perceivers' translation of these and other cues into an understanding of the social actor's emotion (e.g., indicated by the actor's smiling face), attention (e.g., indicated by eye contact), empathy (e.g., indicated by hugs or language), and so on.

Based on this distinction, although the early CASA researchers manipulated computers to have personalities, genders, or conversation patterns, what they actually controlled were various sets of social cues. For instance, in their manipulation of gendered computers, Nass et al. (1997) assigned a female voice and a male voice to the computers and found that a female computer was perceived to be more familiar with love and relationships, whereas a male computer was more knowledgeable about technical subjects. Similarly, when operationalizing computer personalities, Nass and Lee (2001) controlled the levels of speech rate, volume, fundamental frequency, and pitch range to differentiate introverted and extroverted computers.

Although the role of social cues has been examined in much of the CASA literature, one question that Nass and Moon (2000) raised in their suggestions for future research is whether there exist some dimensions of a computer that are more likely to evoke social responses compared to others, and how different combinations of them would impose additive or synergetic influence on social responses. Although no sufficient findings have been established to advance a hierarchy of social cues which indicates the distinct power of each single cue over users' presence experiences and social responses, some scholarship at least organizes and compares various pairs of social cues. For example, Nass and Steuer (1993) examined the effects of different voices and of the same or different computer boxes producing the voices. They found that the voice manipulation had greater effects than the box one in predicting perceived accuracy and fairness of an evaluation session in human-computer interaction. Reeves and Nass (2000) also noted that sight and sound dominate human perception and play a more important role than other senses that can relay social cues like smell. Thus, it can be inferred that there should be a group of cues that are more likely to generate individuals' social perception than others. This postulation is consistent with the cognitive miser theory (Fiske & Taylor, 1991), based on which researchers suggest that how a person is construed is determined by the quality of available visual inputs. The cognitive process of person perception may occur automatically when critical cues such as facial features are available to the perceiver, but the same process may not be activated without the presence of these cues (Gauthier & Tarr, 1997; Martin & Macrae, 2007). Therefore, in the process of activating users' medium-as-social-actor presence and social responses, what matters is not only the quantity of social cues, but also the quality of social cues.

Based on prior research, we identify two groups of social cues, primary cues and secondary cues, to refer to their different effects on users' social reactions. Primary cues are those that are most salient and central to humans' perception of socialness. Responses to these primary cues are based on individuals' evolutionary bias toward humanlike (or animal-like) characteristics. Each primary social cue should be sufficient but not necessary to evoke social responses. By contrast, secondary cues are those that are less salient and less

central to humans' perception of socialness. They are neither sufficient nor necessary to evoke social responses.

Primary Cues

We include face, eye gaze, gesture, human-sounding voice, and humanlike or animal-like shape as major examples of primary cues. These cues have been found to evoke humans' evolutionarily based responses. For instance, researchers have found that infants are sensitive to fearful, surprising, and angry *facial expressions* (Kobiella, et al., 2008; Schmidt & Cohn, 2001; Serrano et al., 1992). Paredolia, which refers to the illusion in which people see faces in inanimate objects (e.g., taking a car's headlights as eyes and its bumper or grill as mouth) (Takahashi & Watanabe, 2013), also supports the idea that the face is a powerful cue in triggering social perception. Past research has corroborated that including a face as a social cue can lead participants to perceive computer agents as more trustworthy, persuasive, and positive (Gong, 2008; Shamekhi et al., 2018).

As an important social feature of a face, *eye gaze* is another evolutionarily significant characteristic of human beings. Eye gaze delivers the social signals of attention, emotion, or acknowledgment (Andrist et al., 2015; Fink & Penton-Voak, 2002). Past research has shown that even 12-month-old infants can follow the gaze direction of robots (Okumura et al., 2013).

Another social cue that serves as a basic element of our daily nonverbal interaction is *gestures* (Krauss et al., 1996). Johansson (1973) found that our visual perception of biological motion is keen enough to identify gestures that are made up of only 10 to 12 bright spots representing different human body joints. Prior literature has suggested that technologies designed with movable arms, hands, and/or bodies that imply intentions, motives, mental states, and social rituals can evoke our social perception (Salem et al., 2013). For instance, letting users shake hands with the robot *NAO* before negotiating with it led to more cooperation between users and robots (Bevan & Fraser, 2015).

The other two primary cues, *human-sounding voice* and *human- or animal-like shape*, have already received much attention in the field of HMC. Many studies have demonstrated that human-sounding voice, whether actual or synthetic, has greater effects than machine-sounding speech in evoking social responses (Chérif & Lemoine, 2019; Chiou et al., 2020; Xu, 2019). The human voice has especially been perceived as a natural and powerful cue and can more easily encourage individuals' learning performances compared to a machine voice (Mayer, 2014; Nass & Brave, 2005). Interacting with Siri is an example of how a technology paired with mere vocal cues can raise individuals' involuntary awareness of a social entity. Fortunati (2003) used the phrase "the body reaches where the voice does" to highlight the idea that voice serves as an extension of the body in our daily interaction (p. 62).

Designing humanlike or animal-like shape into technologies has been effective in forging an attractive appearance. For instance, Pixar's mascot Luxo is designed to have a head and a body to increase its popularity. Martini et al. (2016) found that the degree of robots' humanlike appearance has a positive relationship with individuals' attribution of intentionality to the robots. Hinds et al. (2004) found that participants felt less responsible for a

task when collaborating with a humanlike robot than with a machinelike robot partner, meaning that participants attributed more trust to the humanlike one than the machinelike one. Using fMRI, research has further suggested that even observing animal-like shadows created by finger movements on a screen activates the same brain activity as verbal communication, implying that perceiving animal shadows involves the same physiological reaction as decoding human speech (Fadiga et al., 2006).

One might argue that humans shifting from acceptance to revulsion when a technology appears highly humanlike but falls short of a perfect human replica (Mori et al., 2012) counters the classification of humanlike shape as a primary cue. While it is true that users' affinity for the machine may plunge at the occurrence of this "uncanny valley," experiencing eeriness itself is a manifestation of strong medium-as-social-actor presence, as it shows that humans develop strong emotional responses to a machine that approximates human appearances. Mori et al. (2012) postulated that the eerie sensation could be due to the human instinct that protects us from potential dangers, including members of different species appearing to be humanlike, which supports the idea that our responses to humanlike technologies are sensitive and intuitive.

Secondary Cues

Compared to primary cues that evoke evolutionary-based responses, secondary cues have less power in activating users' social perception and responses. Below we identify a few representative examples of secondary cues.

Whereas *human or animal size* could be a contributing factor to users' social responses to technologies (Duffy, 2003; Takayama & Pantofaru, 2009), it is not always evocative. Walters et al. (2009) found that while in single trials a short robot led participants to allow for a closer approach distance than a taller robot, the effect faded away in repeated trials over three weeks. Additionally, when explaining the uncanny valley effects, Mori et al. (2012) used the Bunraku puppet to indicate that audiences tend to ignore the size of the puppet but concentrate on its appearances.

As a basic human means of exchanging social information (Dunbar, 2004), *language use* has been found to trigger social perception and responses (Sah & Peng, 2015; Xu, 2020). However, it is classified as a secondary cue here because it does not always lead to strong social responses. For instance, a water bottle with the label "drink me" may induce greater levels of social reactions than one with the label "drink it." Thus, the effects depend on the variations in language. Informal language, warm (i.e., friendly and conversational) language, and language with vocal fillers and self-referential statements have been found to be more evocative than formal language, cold language, and language without paralinguistic cues (Goble & Edwards, 2018; Hoffmann et al., 2020; Sah & Peng, 2015).

Motion attracts our attention and may influence our social responses (Reeves & Nass, 2000). The Heider-Simmel (1944) experiment suggests that even simple dots that randomly move on a computer screen can be interpreted to have intentions. So can different forms of automatic doors that move with different speeds and trajectories (Ju & Takayama, 2009). However, movements have strong effects on social perception only when they become symbolic or conversational (Krauss et al., 1996). That is, movements that reveal communicators'

purposes, mental states, and adherence to social rituals are more likely to evoke social reactions than random movements (Hoffman & Ju, 2012; Xu, 2019). For instance, Fiore et al. (2013) found that an *iRobot Ava* that gave way to participants as it traveled across a hallway evoked stronger social presence than one that did not yield to participants. Thus, depending on their speed, trajectory, frequency, and social meanings, a technology's motion cues may trigger different levels of social perception (Mori et al., 2012).

Compared to a human-sounding voice, a *machine-sounding voice* is generally perceived as unnatural and unpleasant (Gong & Lai, 2003). A machine-sounding voice has generally been found to be inferior to a human voice in evoking medium-as-social-actor presence experience (Chérif & Lemoine, 2019). Moreover, the level of social responses evoked by a machine's voice, or other symbolic sounds, depends on the relationship between the technology and its users. In our daily interaction with technologies, alarm system voices; smartphone ringtones; SMS, calendar, and other alerts and reminders; the myriad sounds built into Windows, iOS, and other computer operating systems; and even the ticking and chiming of mechanical clocks all suggest the potential interpretation of a social actor for users who have come to understand, be comfortable with, and rely on them.

Social Signals

Beyond the primary and secondary cues, technologies can present social cues that can be interpreted as social signals in HMC (Fiore et al., 2013; Streater et al., 2012). That is, single or combinations of primary and/or secondary social cues can constitute abstract human characteristics including personalities, identities, and so on. Perceiving these social signals may require prolonged exposure to or interaction with the technologies. Contextual factors may also help individuals sense these abstract human characteristics. Below we provide some examples of social signals that are composed of social cues.

The ability of a media technology to be *responsive* or *interactive* should be sufficient on its own to trigger users' social perception and responses (Kim & Sundar, 2012). But presenting interactivity requires technologies to demonstrate a constellation of cues, which may include a physically embodied robot's eye contact, nodding, and smiling, or a chatbot's timing of response, message contingency, and so on (Jung et al., 2014; Lew et al., 2018).

Perceived personality and *social identity* of a media technology also requires a constellation of cues. A systematic review (Mou et al., 2020) suggests that personalities of machines can be operationalized via cues such as speech styles, vocal features, movements, and proximity. In addition, social identity can be easily perceived based on minimal, but meaningful, cues. For instance, Eyssel and Kuchenbrandt (2012) assigned different names to two robots, one German name and one Turkish name. Participants in the group with the same-nationality robot were more likely to evaluate the robot's performances as positive (Hogg & Abrams, 1988; Kuchenbrandt et al., 2013).

Some people (and animals) in our lives become our *companions*, and some media technologies (e.g., Tamagotchi, books, smartphones) can provide the same sense of social connection. Early uses and gratifications research suggested that people's ritualized use of television is related to higher affinity with the television itself rather than the content it presents (Rubin, 1983). The physical presence of a technology itself is an essential cue and

the additions of several others (e.g., sound, touch) can enhance the perceived social companionship.

All human beings are unique; aside from genetic and physical differences we all have different life experiences (Orwig, 2014; Turkle, 2012). We associate *uniqueness* with other people and value it in our interpersonal relationships (Eastwick & Hunt, 2014). Many technologies can also be perceived as being unique, either because they come to us with these features or are designed or adapted for personalization. For example, many personal and mobile computers, virtual assistants, and other technologies ask users to provide a name for them; some people install custom ringtones and "skins" for electronic devices, and location-based mobile systems can provide customized context-aware information to assist users with decision-making (Choi et al., 2017). Even iRobot's Roomba vacuum cleaners can be personalized with a "skin toolkit" to increase users' acceptance of the device and their commitment to use it more (Sung et al., 2009).

A combination of social cues may cause individuals to infer the *health status* or the *life span* of technologies (Lechelt et al., 2020). When an old technology (e.g., mechanical clock, television, computer, smartphone, robot, etc.) begins to wear out or falter or is damaged in an accident, the owner may take it to a "doctor" (repair person) and wait with worry and impatience for a report on whether and how it will "recover." Even when technologies lose their functional value, or the developers stop supporting their use (e.g., the shutdown of servers that supported the Jibo Robot), the owners of the technologies may still find social value in keeping them as companions or for reimagined uses (see Lechelt et al., 2020).

Other cues and signals that could evoke medium-as-social-actor presence and social responses include olfactory cues (Chen, 2006), haptic cues (Blakemore, 2016; Li et al., 2017), interpersonal distance (Syrdal et al., 2006; Takayama & Pantofaru, 2009; Walters et al., 2009), and degree of flexibility (Duffy & Zawieska, 2012). It should be noted that even within a single cue, there exists significant components that evoke different effects. For example, vocal cues contain volume, pitch, tone, vocal outbursts, and so forth (Vinciarelli et al., 2009).

Individual Differences and Contextual Factors

We have suggested that social cues differ in their power over users' social responses. These social cues can further be converted into social signals that act as perceived human characteristics such as personalities, identities, and so on. As part of the MASA paradigm, here we further suggest the importance of individual differences and contextual factors that likely play a role in users' medium-as-social-actor presence and social responses.

Anthropocentrism is "the tendency of individuals to perceive the world from a human-centered perspective, in which humankind is the most significant of all entities" (Nass et al., 1995, p. 229). A person high in anthropocentrism is less likely to believe that technologies can, and should, take on physical and psychological attributes of people and occupy human social roles, which would likely suppress their medium-as-social-actor presence.

The CASA research has suggested that individuals' own *personalities* play a role when interacting with technologies; for example, a robot that demonstrated a complementary personality (Lee et al., 2006). Related to users' personalities, individuals with greater desire

for social interaction are more likely to modulate their presence experiences by looking for social cues (Gardner et al., 2005) and perceiving social actors when they use technologies (Epley et al., 2007).

Epley et al. (2007) argued that children are more likely than adults to ascribe human emotions to external entities (e.g., angry clouds, happy sun). Flavell et al. (1990) found that children are more likely to perceive mediated actors or objects as "real." The same logic applies to medium-as-social-actor presence. In her book *Alone Together,* Turkle (2012) observed children's interaction with the toy Furby and noticed that children believe that Furby can burp, understand language, and may one day "die." All these observations suggest that *age* is an influential factor in our responses to technologies (Edwards et al., 2019).

Beyond these factors, individuals differ in their *knowledge* about, *experience* with, and *ability to think critically* about technologies, which should lead to different levels of medium-as-social-actor presence. For example, Nass and Moon (2000) suggested there was no evidence that computer experts are immune to social responses to computers. Johnson and colleagues (2004) found that those with more computer use experiences reported more positive affect in response to a computer's flattery and more favorable judgments of the computer. In addition, Lee (2010) found that people who were more analytical and rational were less likely to respond to flattery effects of computers compared to those who were intuitive and experiential.

Prior literature has suggested the potential of many other individual differences in leveraging our medium-as-social-actor presence experiences. For example, Salem et al. (2013) found that participants preferred robots that occasionally performed incorrect gestures over those that always performed perfect ones, implying that our *tolerance of imperfection* may help determine our social attitudes toward technologies. For people who have unrealistically high *expectations* for the performance of technologies, every disappointment highlights the true nature of the technologies, so these people will be less likely to have strong social responses to them (Paepcke & Takayama, 2010; Waddell, 2018). Likewise, individuals' *willingness to suspend disbelief* may determine whether we treat a machine more as a tool or as a social entity (Duffy & Zawieska, 2012). Moreover, individuals with different *attachment styles* diverge in their intention to seek social cues and form social relationships with other social actors (Cole & Leets, 1999; Epley et al., 2007). Other relevant individual differences include gender, self-esteem, tolerance of uncertainty, tendency to make attribution errors, and so on (Epley et al., 2007; Nass et al., 1995; Rosen & Knäuper, 2009).

As with other types of presence (Slater & Wilbur, 1997; Won et al., 2015), a wide variety of factors related to the context of our exposure to and interactions with technologies may impact our experiences of medium-as-social-actor presence. These include, but are by no means limited to, the nature of the activity or task involved, the setting (e.g., public or private), the number of people present and our relationships with them, the amount and accuracy of information available to us regarding the nature of the technology, and even the time of day. More broadly, aspects of our culture are important factors (Bartneck et al., 2007). These include the prevailing attitudes toward technologies such as robots assuming social roles (Nass et al., 1995), the degree of industrialization that provides exposure to various technologies (Epley et al., 2007), the culture's tolerance of privacy invasion and data sharing (Nitto et al., 2017), and the subtle ways languages not only reflect but potentially guide our perceptions. To illustrate the power of language norms, note that in English at

least, clocks have "faces" and "hands," chairs have "arms," needles have "eyes," streets have "shoulders," and computers and many other technologies can "die" (if we don't "kill" them when they don't "cooperate").

MASA Mechanisms: Unifying Two Explanations

So far we have presented the roles of primary cues, secondary cues, and social signals in the MASA paradigm. And we've discussed how, along with these factors, individual differences and contextual elements may further moderate the breadth and depth of users' social responses. Below we discuss two major explanatory mechanisms that have been supported in prior literature on CASA: mindlessness and anthropomorphism. Instead of viewing the two mechanisms as competing explanations for users' social perceptions and responses, we suggest in the MASA paradigm that these two mechanisms can be unified and account for different social response scenarios.

Mindlessness refers to the explanation that people are naturally oriented to the social rather than the asocial cues of technologies (Langer, 2000; Nass & Moon, 2000). This may be based on evolutionarily based cognitive traits or learned from cues having been demonstrated repetitively in interpersonal communication, so that individuals "mindlessly (and) prematurely commit to overly simplistic scripts drawn in the past" (Nass & Moon, 2000, p. 83). In contrast, anthropomorphism refers to a more active phenomenon, "the tendency to imbue the real or imagined behavior of nonhuman agents (e.g., animals, nature, gods, and mechanical or electronic devices) with humanlike characteristics, motivations, intentions, or emotions" (Epley et al., 2007, p. 864).

While both mindlessness and anthropomorphism seem to be logical explanations for people's social perception and responses, both of them have been found to have limitations. Regarding mindlessness for instance, Fischer and colleagues (2011) noticed that some participants laughed when receiving a robot's greetings, indicating that they found something odd and amusing about the interaction with the robot. Mou and Xu (2017) found that participants demonstrated two different personalities in interactions with chatbots versus humans. These studies suggest that users' responses to machines are not as mindless and spontaneous as to humans. Anthropomorphism cannot account for all CASA findings either. For example, Lee (2010) found that compared to text-only conditions, computer interfaces with anthropomorphic cartoon characters enhanced the social attractiveness and the trustworthiness of the computer, but they did not amplify flattery effects, which challenges the prediction that more anthropomorphic characters would facilitate stronger social responses (Lee, 2010).

The two explanatory mechanisms are seemingly antagonistic, as mindlessness occurs "without extensive thought or deliberation" (Moon, 2000, p. 325), and anthropomorphism "involves the thoughtful, sincere belief that the object has human characteristics" (Nass & Moon, 2000, p. 93). However, a closer investigation into the role of technology cues may parse out the interrelationship between them. Specifically, Nass and Moon (2000) argued that to elicit mindlessness, an object must exhibit "enough cues" to bring forth social responses (p. 83), which implies that mindlessness may not occur when the cues are not evident or sufficient. On the other hand, anthropomorphism emphasizes the ascription of human mental or emotional states to nonhuman agents ranging from imagined ghosts to

computer-generated dots (Duffy, 2003; Morewedge et al., 2007), which implies that even when objects are not designed with social cues (e.g., dots, clouds), anthropomorphism may occur as humans can mindfully assign human attributes to these nonhuman agents. Considering that Kim and Sundar (2012) noted that anthropomorphism can occur mindlessly or mindfully, we use mindless anthropomorphism and mindful anthropomorphism to unify the explanations for medium-as-social-actor presence and social responses. Specifically, mindless anthropomorphism should have more explanatory power when media technologies display cues that are of high quantity and high quality. In other words, if technologies demonstrate a group of primary social cues at the same time (e.g., Ishiguro's Gemonoid [Nishio et al., 2007] or Samsung's virtual human Neon [Vincent, 2020)]), users may not help having mindless, intuitive, and spontaneous responses to the technologies as these cues are natural, nuanced, and powerful. By contrast, when people experience strong medium-as-social-actor presence with technologies that are sufficient in neither the quality nor the quantity of cues, mindful anthropomorphism should be better at explaining the experience, as such scenarios indicate that individuals deliberately and thoughtfully attribute human characteristics to these technologies with limited cues (e.g., children imagining that their toys can speak to each other, drivers assigning names to their cherished cars) (see Figure 1).
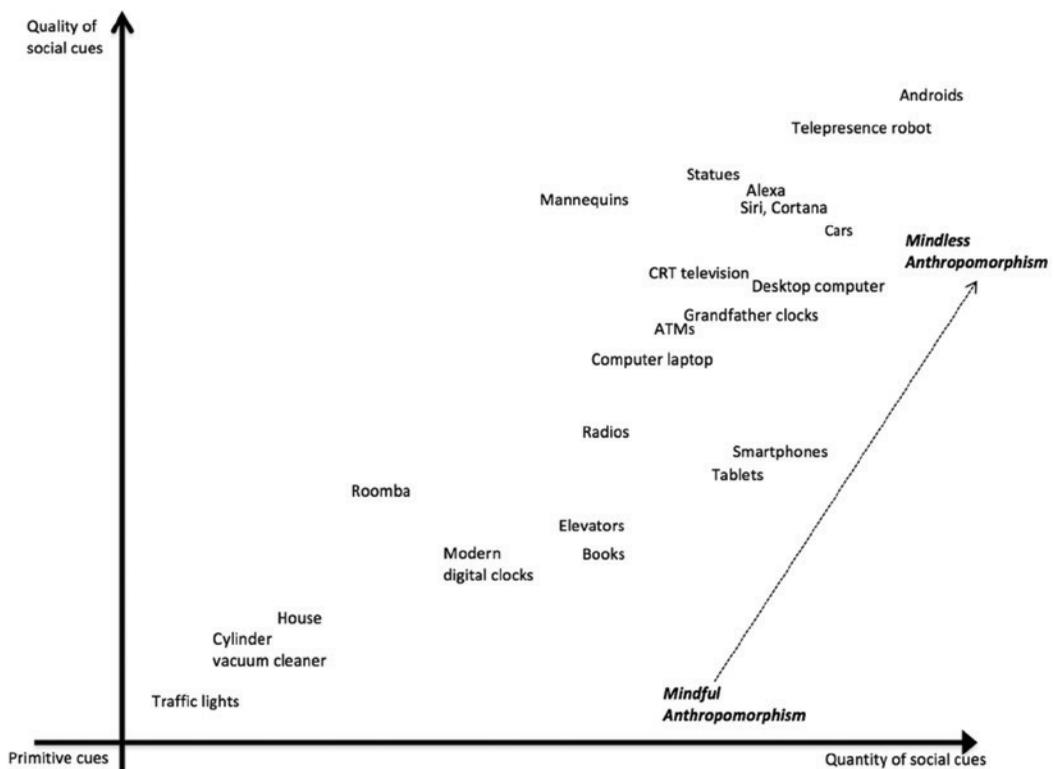

FIGURE 1 The Relationships Among Social Cues, Technologies, and Explanatory Mechanisms

Note: The placement of technologies in this figure represents only an approximation of the characteristics of prototypical examples of each technology.

The distinction between mindless and mindful anthropomorphism may be useful in understanding two related questions raised in CASA. The first question stems from the fact that although Nass and Moon (2000) endorsed the mindlessness explanation, CASA "fails to pinpoint precisely when and why mindless behavior will occur" (Nass & Moon, 2000, p. 96). Our mapping of mindless anthropomorphism and mindful anthropomorphism provides a reasonable, literature-based, and testable contention about which mechanism may be more explanatory depending on the nature and number of technology cues available to users.

The second question is related to the CASA assumption that technologies must demonstrate *enough* cues to elicit mindless social responses (Nass & Moon, 2000). What qualifies as enough, or in other words, how *social* the cues need to be to induce mindless responses, is unclear. Our categorization of cues as primary and secondary, along with the scope of application of mindless versus mindful anthropomorphism, provides a testable suggestion that in order to evoke mindless responses, the cues should ideally be sufficient in both quality and quantity. While research will need to establish the relative impacts of different combinations of high quality (primary) cues and secondary cues, the definition of primary cues suggests that quality is of paramount importance.

As with the effects of cues on medium-as-social-actor presence and social responses, the activation of mindless versus mindful processing is contingent upon a series of factors including the specific combination of cues, individual differences, and contextual factors. Thus, it is possible that some individuals may mindlessly respond to media with fewer social cues or mindfully respond to media that demonstrate more social cues. This is consistent with Fischer's (2011) speculation that individuals differ in their inclination to be mindless and Fussel and colleagues' (2008) finding that users demonstrate different degrees of anthropomorphism in their spontaneous responses to actual robots versus their carefully considered conceptions of robots.

We also readily acknowledge that other possible explanations for social responses that have received less attention in the CASA literature may become more useful in explaining our increasingly complicated and diverse media use practices. These include the source orientation explanation (Solomon & Wash, 2014), cognitive load explanation (Lee, 2008), and folk explanations of behavior (Malle, 1999).

Evolutionary Foundation and Propositions of the MASA Paradigm

Above we have differentiated primary cues from secondary cues and parsed out the relationship between mindless and mindful anthropomorphism. Below we first suggest how the MASA paradigm and the social perceptions and responses it seeks to predict and explain are established upon three inter-related interpretations of socialness. Then we formally list the propositions of the MASA paradigm based on the arguments presented here and above.

In the CASA literature and so far in this paper the term social is treated as a "primitive" term (Chaffee, 2009) with a meaning that is widely understood; essentially something is social if it involves human perceptions and behaviors in response to other humans. But given its role in CASA and MASA, it is important to be clear about what is meant by this term. Here we provide three related conceptualizations of socialness. All three are consistent

with the precepts of evolutionary psychology that suggest we have developed our cognitive, affective, and behavioral abilities via natural selection (Brewer, 2004; Sokol & Strout, 2007).

First, our brain is social. Theory of mind suggests that we can infer others' intentions, desires, and motivations based on their social cues (Adolphs, 2009; Banks, 2020; Frith & Frith, 2005). By predicting others' intention and actions, humans can adjust their own actions accordingly, and more effectively communicate and collaborate with others (Hare, 2007). Research has shown that in this inference process, the amygdala, an important structure in the medial temporal lobe of our brain, is activated to regulate our social perception and behavior (Adolphs, 2009). The tenet of theory of mind is consistent with the idea of egocentric modeling (Epley et al., 2007), which suggests that humans can only experience the world from their own perspective. Although we can speculate about others' intentions, we may make false predictions and cannot know exactly what it is like to be another animate or inanimate entity. Given the importance of interpreting social cues and the inherent challenges we face in doing so, the notion of the social brain means that no matter with what object we interact, we are at least somewhat oriented to perceive the object as social.

The second interpretation of being social indicates that our way of living is social. Here, social means being interdependent and cooperative (Brewer, 2004; Tomasello, 2014). Based on the perspective of adaptation, to resist environmental risks and avoid potential threats, primitives select to live in groups, make tools, and collaborate with each other. These means of coordination and collaboration have acted as a buffer between the individuals and actual and potential ecological changes (Caporael & Brewer, 1995). The instinct to avoid dangers is so imprinted in our adaptation that today we are still "hardwired" to monitor the world around us for threats (Shoemaker, 1996). It is consistent with Reeves and Nass's (1996) explanation that our brain has not evolved to distinguish mediated objects and non-mediated objects. It is also aligned with the findings regarding arousal and attention patterns in television viewers (Reeves & Thorson, 1986)—at some level viewers respond to movement and change even if the potential threat is only shown on an electronic display screen.

These two interpretations of humans' social orientation can help us understand how users can perceive technologies with even limited cues, including technologies not created or used for communication (i.e., not media technologies), as social. For example, imagine a person who sees a hammer for the first time and needs to figure out how to use it. Although a hammer serves primarily a simple, functional purpose, it can be perceived as social in that first, observing the shape of the hammer, feeling the weight of the head, and finding out that the handle is designed to be held by one hand, is a process of using minimal visual and haptic cues to predict the potential use of the technology. And second, using the hammer to strike other objects or pull out nails can be viewed as an interdependence between the user and the tool to accomplish a goal. Using technology is a form of collaboration that in our long history humans have enacted to attempt to improve our living conditions. So even though a technology may present limited cues and be designed for a simple purpose, it retains a subtle social element that we are hardwired to perceive.

The third interpretation of being social refers to our being adaptive and flexible. Research has found that although humans are not the only animals that infer each other's mental states, humans have evolved to develop the propensity for flexibility in using social cues during communication and cooperation with others, which is less evident for animals

like chimpanzees (Hare, 2007). Demonstrating flexibility across different scenarios is likely to precipitate humans' cooperation process. This evolutionary characteristic is also inherent in our interaction with technologies. Some may argue if a study discovers that humans do not treat machines as humans, the study refutes the CASA proposition. However, the MASA paradigm holds that our social responses to technologies vary just as our social responses vary when we encounter and interact with children, foreigners, strangers, and friends (and among individuals within these categories) (Katagiri et al., 2001). As technologies transform to become multi-modal, ubiquitous, context-aware, and even invisible (Campbell, 2020; Fortunati, 1995; Ling, 2012), humans apply our ability to develop flexible and even unique social rules for interactions in all kinds of HMC scenarios. As an example, typing letters using a keyboard is a skill we learn so that we can interact with computers, but the behavior itself is ultimately a form of interdependence, which is considered the essence of being a social species (Caporael & Brewer, 1995; Tomasello, 2014).

We have explicated what *social* means in the MASA paradigm. We have also advocated for distinguishing the quantity of social cues and the quality of social cues presented by technologies. In addition, we explained how mindless and mindful responses can be dialectically applied to different technology use scenarios. Below we present a set of propositions based on the theoretical and empirical evidence discussed above. Specifically, Proposition 1 is related to the evolutionary foundation of the MASA paradigm. Propositions 2 to 6 are related to the different effects of social cues. Propositions 7 to 9 are based on the relationship between mindless and mindful anthropomorphism.

> **P1:** Every media technology has at least some potential to evoke medium-as-social-actor presence and corresponding social responses.

> **P2:** It is not only the social cues but also the combination of social cues, social signals, individual factors, and contextual factors that lead to medium-as-social-actor presence and corresponding social responses.

> **P3:** Some social cues are primary: Each is sufficient but not necessary to evoke medium-as-social-actor presence.

> **P4:** Some social cues are secondary: Each is neither sufficient nor necessary to evoke medium-as-social-actor presence.

> **P5a:** All other conditions being equal, individuals are more likely to experience medium-as-social-actor presence and socially respond to media technologies that display cues with more human characteristics (quality of cues).

> **P5b:** All other conditions being equal, individuals are more likely to experience medium-as-social-actor presence and socially respond to media technologies that display more social cues (quantity of cues).

P6: All other conditions being equal, the quality of cues (primary vs. secondary) has a greater role in evoking medium-as-social-actor presence and corresponding social responses than the quantity (number) of cues.

P7: Individuals vary in their tendency to perceive and respond to media technologies as social actors.

P8: Individuals' social responses to media technologies can occur with either mindless or mindful processing.

P9a: All other conditions being equal, media technologies that display more cues (quantity of cues) are more likely to lead individuals to *mindlessly* perceive them as social actors. Conversely, all other conditions being equal and *given the same level of social responses*, media technologies that display fewer cues (quantity of cues) are more likely to lead individuals to *mindfully* perceive them as social actors.

P9b: All other conditions being equal, media technologies that display cues with more human characteristics (quality of cues) are more likely to lead individuals to *mindlessly* perceive them as social actors. Conversely, all other conditions being equal and *given the same level of social responses*, media technologies that display cues with fewer human characteristics (quality of cues) are more likely to lead individuals to *mindfully* perceive them as social actors.

Contributions, Scope, and Future Research

The MASA paradigm follows the major tenet of the CASA paradigm and expands it to more media technologies, including emerging and future technologies. The MASA paradigm can make the following contributions. First, the original CASA paradigm and the Media Equation described a series of experiments on users' social responses to computers and televisions. They did not explicitly list what propositions scholars could rely on to derive additional research questions. The MASA paradigm lists nine propositions here so that future research can test, refine, and enhance the theoretical framework in its predictive power, explanatory power, falsifiability, heuristic value, and so on (Chaffee & Berger, 1987).

Second, most prior research has primarily focused on the effects of single social cues or the cumulative effects of social cues, while the quality of social cues—whether they are central to our perception of socialness—has not been systematically examined. The MASA paradigm suggests that there exists a hierarchy of social cues that represents their potential to evoke social perceptions and responses. With knowledge about the quality of social cues, designers and developers may scrutinize different effects of social cues and find the optimal combination of cues to create positive use experiences.

Third, the paradigm identifies the roles of individual differences and contextual factors in generating users' medium-as-social-actor presence and social responses. It provides an analysis of the whole communication scenario in which individuals are perceivers, technologies are manifestations of social cues, and contexts guide perceptions and responses, with

all of these elements influential in evoking medium-as-social-actor presence and social responses (see Figure 2). Future research can test the moderating roles of particular individual differences and contextual factors while investigating users' social reaction to different sets of technology cues.

Fourth, the paradigm has articulated an evolutionary base and explained what it means to have "social" perceptions and responses. Social responses do not necessarily equate to human responses. Social perceptions and social responses occur because we have a social brain, live a social life, and are used to making adaptations to be cooperative and interdependent. Based on this theoretical foundation, we have attempted to provide answers to Nass and Moon's (2000) questions about (1) what dimensions of technologies are more powerful in evoking social responses, (2) when mindless processing is more likely to occur, and (3) how "social" a technology should be to bring forth mindless social responses. We believe that the current MASA paradigm can be useful in future research on social responses to technologies and we encourage theoretical refinements in the paradigm that can bring greater understanding of human behaviors with respect to technology and make possible the practical benefits of improved product design and user experience.

Despite these contributions, some may wonder about the technologies to which the MASA paradigm applies and whether the term MASA could be replaced by TASA (i.e., Technologies are Social Actors). Here we refer to a technology as a "machine, device, or other application of human industrial arts" (ISPR, 2000, presence defined). We refer to media technologies as "artifacts or devices used to communicate or convey information" (Lievrouw & Livingstone, 2006, p. 23). In explaining that the MASA paradigm is rooted in evolutionary psychology we noted that humans are at least somewhat oriented to perceive technologies as social. Therefore, as part of the MASA paradigm, we acknowledge that people's social responses may occur to all technologies (sometimes even beyond technologies), especially when people mindfully and consciously anthropomorphize those technologies that are not designed to be used for social purposes. As media and communication scholars, however, we concentrate more on media technologies, including both traditional and emerging ones such as books, televisions, computers, smartphones, tablets, and so on. More importantly, we call it the MASA paradigm because this term reflects a shift of focus
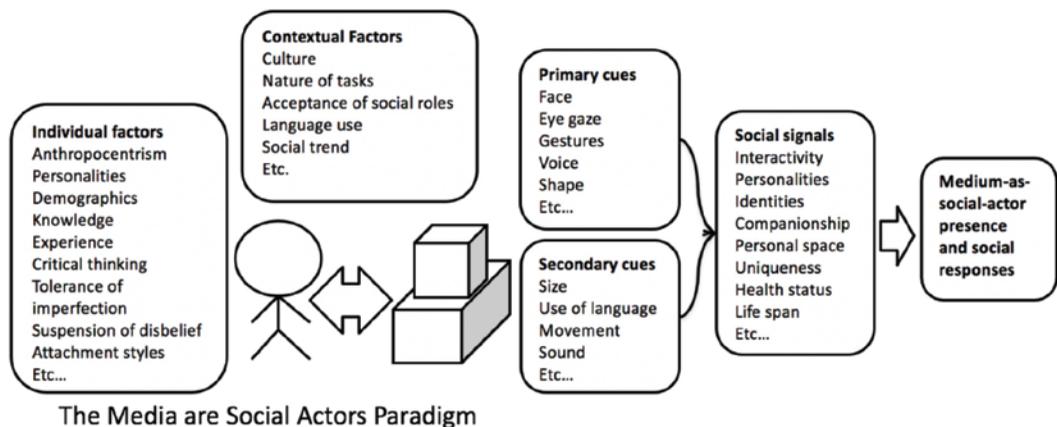

Individual factors
Anthropocentrism
Personalities
Demographics
Knowledge
Experience
Critical thinking
Tolerance of
imperfection
Suspension of disbelief
Attachment styles
Etc...

Contextual Factors
Culture
Nature of tasks
Acceptance of social roles
Language use
Social trend
Etc.

Primary cues
Face
Eye gaze
Gestures
Voice
Shape
Etc...

Secondary cues
Size
Use of language
Movement
Sound
Etc...

Social signals
Interactivity
Personalities
Identities
Companionship
Personal space
Uniqueness
Health status
Life span
Etc...

Medium-as-social-actor presence and social responses

The Media are Social Actors Paradigm

FIGURE 2   The Media Are Social Actors paradigm

from media as channels for message transmission to media as interlocutors or communicators (Gunkel, 2012). Although the role of media technologies may neither be entirely of a communication channel nor of a communication terminal in the current media landscape (Guzman, 2018), the MASA paradigm is targeted at the phenomena in which users perceive media technologies to be independent social entities, and partially or sometimes fully overlook their nature as mere machines or communication channels.

Several paths are available for researchers to investigate the validity of the MASA paradigm and refine and expand it. First, researchers should conduct empirical studies to verify the nine preliminary propositions. Studies can explore whether there exists a hierarchy of social cues that reliably elicit different degrees and/or particular types of social responses. Although few methods can provide direct evidence to investigate propositions that require differentiating users' mindless and mindful processing, researchers can use a combination of methods and measures, including both objective and subjective ones (e.g., fMRI and EEG versus interviews) and real-time and retrospective ones (e.g., secondary task reaction time and think aloud protocols versus post-exposure memory tests and questionnaires), to look for the convergence of results.

Second, researchers should look beyond CASA studies to test whether and how findings and predictions from other interpersonal communication theories and computer-mediated communication (CMC) theories can be adapted to the MASA paradigm. Some interpersonal communication theories researchers might examine include Communication Accommodation Theory (Giles, 2008), Communication Privacy Management Theory (Petronio & Durham, 2008), Expectancy Violation Theory (Burgoon & Hale, 1988), Uncertainty Management Theory (Bradac, 2001), Interpersonal Deception Theory (Burgoon et al., 2008), and the Theory of Imagined Interaction (Honeycutt, 2002). Some CMC theories or models that have been applied but could be explored further include the Social Identity model of De-individuation Effects (SIDE) (Reicher et al., 1995) and Social Information Processing Theory (Walther, 1996).

Third, researchers can further examine and add details to the psychological processes described in the MASA paradigm. For example, how do attention and memory influence medium-as-social-actor presence? What determines whether presence will lead to behavioral social responses? As researchers have not achieved consensus on the explanations for the phenomena captured in the CASA paradigm, more research should be conducted to account for the mental processes that underlie people's social perceptions of and responses to today's and tomorrow's diverse and evolving technologies.

Finally, researchers should explore and discuss with designers how they can apply the MASA paradigm and findings. Though most of the time richer media presentations can bring about better experiences, higher medium-as-social-actor presence (as with any type of presence) does not necessarily produce higher efficacy or popularity. Thus, designers should be fully aware of the advantages and disadvantages of their choices in applying the paradigm. They should also consider the larger ethical issues involved in creating technologies that lead users to perceive and treat media as social actors. As it is possible to view users of these technologies as victims of deception, unconscious responses, and the manipulation of presence (Biocca et al., 2003; Lombard, 2009), designing and marketing technologies that evoke medium-as-social-actor-presence and social responses should be based on thoughtful, informed, and ethical analyses.

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