Smart Speakers Require Smart Management: Two Routes From User Gratifications to Privacy Settings

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Smart speakers' voice recognition technology has not only advanced the efficiency of communication between users and machines, but also raised users' privacy concerns. As smart speakers listen to users' voice commands and collect audio data to improve algorithms, it is crucial to understand how users manage their privacy settings to protect personal information. Combining the uses and gratifications approach, the Media Equation, and communication privacy management theory, this study surveyed 991 participants' attitudes and behavior patterns related to smart speaker use. The study explored the unique gratifications that users seek, identified the main strategies that users adopt to manage their privacy, and suggested that users apply interpersonal privacy management rules to interactions with smart media. In addition, users' gratifications affect their privacy management via two routes: a protective route that highlights the role of perceived privacy risks, and a precautionary route that emphasizes the impact of users' social presence experiences.

Keywords: social presence, smart speaker, uses and gratifications, Media Equation, privacy management, voice assistant, artificial intelligence

The tension between smart speaker users' self-disclosure and privacy concerns has imposed challenges on both consumers and smart speaker designers. On one side, smart speaker developers rely on users' digital traces to improve the performance of voice assistants and improve user experience. On the other side, individuals may shy away from disclosing sensitive information or revealing private conversations to smart speakers because of their privacy concerns (Moorthy & Vu, 2015). Although smart speakers have brought convenience to users' daily lives, given their precise voice recognition and real-time interactivity, the retention and utilization of audio data may amplify users' distrust in smart speakers, which may further affect their acceptance of smart devices (Cho, Sundar, Abdullah, & Motalebi, 2020).

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In this study, smart speakers are defined as physically embodied home-based voice-control devices that are installed with software agents that can process, interpret, and respond to human speech via synthesized voices (Hoy, 2018; Lau, Zimmerman, & Schaub, 2018). These software agents are also known as voice assistants, which include Alexa, Google Assistant, and others. Users' interactions with smart speakers can be realized through three means: using voice commands to interact with the voice assistants, using the voice assistant mobile app to control the device, and manually operating the device (e.g., switching off the device, turning down the volume).

Insofar as smart speakers allow for multiple means of interactions, scholars have noticed the tension between user engagement and potential privacy threats. For example, both Amazon and Google have given access to third-party developers, encouraging them to build their own mini-apps. Known as "skills" for Alexa and "actions" for Google, these software extensions empower users to place orders online, make appointments, manage bank accounts, work out, meditate, and subscribe to a range of media channels. Meanwhile, the algorithms of the voice assistants have made it simple for users to receive personalized content, which may generate positive attitudes toward the software and the service (Sundar & Marathe, 2010). Nevertheless, although one in three people in the United States had access to smart speakers in their household in 2020 (O'Dea, 2020), about half of them did not know that their conversations with smart speakers were permanently recorded (Malkin et al., 2019). Additionally, seven of 10 participants reported privacy concerns over their voice-activated devices according to a report released by Hub Entertainment Research (Clementi, 2020). Considering that Amazon and Google have been reported to use human labor to analyze recorded voice commands (Malkin et al., 2019), there exists a gap between users' expectations of information security and the smart speakers' "always listening" default status.

The tension can partially be resolved when a company makes its privacy policy transparent or when a user proactively adjusts the privacy settings of the voice assistants. For instance, users have the options of muting their smart speakers, toggling off the function to push data to the server, or refusing to synchronize their contact information. However, these options are often placed at inconspicuous positions in the voice assistant app, which makes it hard for users to locate and make adjustments accordingly. Therefore, one approach to ameliorating user experience is to understand how various uses of smart speakers may elicit users' privacy concerns and, consequently, their privacy management behavior. If users report pronounced privacy risks when using the devices for a particular purpose, designers could devise and foreground correspondent privacy customization affordances to alleviate their concerns. Thus, this approach requires researchers to first parse out users' purposes for smart speaker use and analyze how these motives engender privacy concerns.

Additionally, there could exist another tension in users' interactions with smart speakers. Specifically, smart speakers have been designed with social cues to appear anthropomorphic. For example, their voices have been made natural, spontaneous, and lifelike. These anthropomorphic features of the voices are expected to lead users to perceive the speakers as social beings (Guzman, 2019). However, drawing on the prediction of the Media Equation (Reeves & Nass, 1996), the more humanlike a smart speaker sounds, the more likely a user will be to perceive the speaker as a social actor and consequently foresee privacy risks. Therefore, it is crucial to also assess the role of users' social presence experiences in the relationship between users' motivations for smart speaker use and their privacy concerns.

To obtain a better understanding of these tensions, this study combines the theoretical frameworks of the uses and gratifications approach, the Media Equation, and communication privacy management theory. This study first explores the gratifications people seek through smart speaker use. Next, it examines how different gratifications may evoke users' privacy concerns and social presence experiences. It then investigates the privacy management rules that users adopt in their smart speaker use and scrutinizes how users' social presence and privacy concerns trigger their privacy management.

Literature Review

Uses and Gratifications Approach

The uses and gratifications (U&G) approach is a user-centered framework in which scholars suggest that users are active and goal-oriented in using media to satisfy their needs. The approach focuses on

> the social and psychological origins of needs, which generate expectations of the mass media or other sources, which lead to differential patterns of media exposure (or engagement in other activities), resulting in need gratifications and other consequences, perhaps mostly unintended ones. (Katz, Blumler, & Gurevitch, 1974, p. 20)

The U&G approach has been considered highly suitable for exploring people's motives for emerging media such as online video streaming services, podcasts, virtual/augmented reality technologies, and voice assistants (Gallego, Bueno, & Noyes, 2016; Hamari, Malik, Koski, & Johri, 2019; Hilvert-Bruce, Neill, Sjöblom, & Hamari, 2018; Perks, Turner, & Tollison, 2019). The application of the U&G approach in the current context could bring about the following advantages. First, the U&G approach not only concentrates on users' motives for media use but also involves other psychological effects and media consumption behavior. It enables researchers to probe into users' media use experiences via analyses of multiple sets of psychological needs, channels, and gratifications (Lin, 1996). Second, the approach features the capacity to evolve into a more sophisticated model in which researchers can continuously attach updated findings about the effects of motives, individuals' social and psychological origins, and media use consequences (Ruggiero, 2000).

Despite these advantages, traditional U&G research has its limitations. For example, in prior survey-based research, many motives have been measured using preexisting scales for mass media channels, which may not be inclusive of all the motives that are central to users' emerging technology use (Steiner & Xu, 2020). Therefore, to obtain a full picture of users' motives for smart speaker use, this study includes not only the items related to traditional media channels, but also those specifically related to smart speakers. Here, we propose the first research question.

RQ1: What gratifications do users seek through their smart speaker use?

The U&G approach has also indicated that people's media use can result in "need gratifications and other consequences, perhaps mostly unintended consequences" (Katz et al., 1974, p. 20). To expound on these consequences, U&G scholars have distinguished *gratifications sought* from *gratifications obtained*, as these two types of gratifications may not always match each other (Cheng, Chen, Hung-Baesecke, & Jin, 2019; Palmgreen & Rayburn, 1985). Whereas gratifications sought are defined as motives or desired outcomes, gratifications obtained are sometimes evaluated as negative because of users' unexpected media use consequences. In this study, the rising privacy concerns over smart speaker use can be interpreted as an instance of negatively evaluated media use consequences.

While users often seek to circumvent potential privacy risks, their privacy calculus may lead them to make cost–benefit calculations to determine their actual usage (Dienlin & Metzger, 2016). Past research on the privacy calculus has suggested that individuals are willing to release some personal information when they see more benefits than threats arising from media use (Dienlin & Metzger, 2016). Waters and Ackerman (2011) also noted that information sharing, entertainment seeking, keeping up with trends, and showing off their online popularity are the major factors that heighten Facebook users' willingness to disclose their information. Therefore, it can be postulated that some of the gratifications sought by smart speaker users may engender greater levels of privacy concerns while others may not; users may be willing to compromise some privacy in exchange for need gratifications. Therefore, we propose the following question.

RQ2: How will users' different gratifications sought influence their privacy concerns?

While some of the past U&G research has focused on how users form social connections with other human communication partners through media (Greenhow & Robelia, 2009), researchers have found that users may form a social attachment to the media per se (Rubin, 2002). For example, Weaver (2003) noted that perceiving television as a companion manifests viewers' social relationship with the television rather than the characters on television.

Just like the social attachment to televisions, users may also perceive smart speakers as social actors. Here, the concept of social presence is introduced to understand users' social perceptions of smart speakers. Social presence is defined as "a psychological state in which virtual (para-authentic or artificial) social actors are experienced as actual social actors in either sensory or non-sensory ways" (Lee, 2004, p. 45). Social presence can broadly be categorized into two types: social-actor-within-medium presence and medium-as-social-actor presence (Lombard & Ditton, 1997). The former refers to users' social responses to other people or agents through communication technologies such as virtual reality, video games, or teleconferencing tools such as Zoom. The latter describes users' direct responses to the cues provided by the technologies per se (e.g., automated teller machines, social robots). Because this study investigates users' direct interactions with smart speakers, we use medium-as-social-actor presence to precisely refer to users' perceptual experience in this human–machine communication context.

Medium-as-social-actor presence has played a central role in understanding users' social responses to emerging technologies (Lombard & Xu, 2021; Oh, Bailenson, & Welch, 2018). As was argued by Lee, Peng, Jin, and Yan (2006), without the feelings of social presence during human–computer interaction, users' experience of technologies would be nothing more than the physical experience of artificially embodied entities.

Although it was found in the computer-mediated communication contexts that seeking interpersonal utility in instant messaging, holding real-time conversations, and using emoticons all promoted users' sense of social presence (Hwang & Lombard, 2006), limited research has uncovered how discrete gratifications may affect users' social presence in human–machine communication. Therefore, to understand what motives may trigger users' perception of a smart speaker as a social actor, the following research question is proposed.

RQ3: How will users' different gratifications sought influence their medium-as-social-actor presence experience?

Privacy Management Rules and the Media Equation

To fathom how users control their privacy when using smart speakers, this study integrates communication privacy management (CPM) theory and the Media Equation. CPM theory provides an explanatory system that "identifies ways privacy boundaries are coordinated between and among individuals" (Petronio, 2002, p. 3). CPM identifies five assumptions that users make in interpersonal communication (Child & Petronio, 2011). First, individuals assume that private information equates to personal possessions. Second, because individuals believe that they own the private information, they presume that they have the right to determine the flow of the information. Third, individuals develop different privacy rules to control the flow of information based on their cultural expectations, individual preferences, and self-monitoring skills. Fourth, when private information is shared by others, individuals expect the co-owners to regulate the flow of the information (Petronio, 2006). Last, when the owners and co-owners of the private information lose control of the flow, individuals may experience boundary turbulence (Petronio & Durham, 2008), in which they feel frustrated about the invasion of privacy and thus review and adjust their privacy expectations with the co-owners to establish a new collective privacy boundary.

Prior research has identified three major interpersonal privacy management rules. Specifically, permeability rules refer to the extent to which individuals are protective of both the depth and breadth of their personal information (Child, Pearson, & Petronio, 2009). Ownership rules evaluate how much individuals believe that co-owners can independently release their private information. Linkage rules refer to how individuals set privacy boundaries based on their shared interests with others (Child & Petronio, 2011). This process enables the owners of the information to selectively include new co-owners in their privacy boundaries.

Although these privacy management rules were originally developed in face-to-face communication (Ramirez & Lane, 2019), research has suggested that people adopt similar privacy management practices in online contexts (Metzger, 2007). However, in an online context in which co-owners become difficult to define, users are also more likely to experience boundary turbulence; this may scale down their trust in the involved co-owners such as the social media company, the friends in their network, or the strangers who have seen their posts.

According to CPM theory, boundary turbulence may encourage users to revisit and adjust their privacy settings. Hence, online users may fabricate sensitive information, including their phone numbers or e-mail address, in exchange for benefits such as special offers, online discounts, or access to membership (Petronio, 2002). A study on bloggers' privacy management suggests that identity safety protection, impression management, conflict management, and emotional regulation are the major privacy coping strategies used by online bloggers (Child, Haridakis, & Petronio, 2012). Whereas privacy management rules have been explored in blogging, online news browsing, online social networks, and online shopping contexts (Beam, Child, Hutchens, & Hmielowski, 2018; Child et al., 2012; Metzger, 2007), little is known about what privacy management rules people adopt in their smart speaker use. Because systematically managing the privacy settings of smart speakers requires users to access and navigate the mobile app of the voice assistant, such management acts can be seen as conscious and purposeful. Thus, to capture these privacy management strategies, we seek to explore the rules that apply to users' smart speaker management. We propose the following research question.

RQ4: *What privacy management rules do users adopt in their smart speaker use?*

Based on CPM theory, because people who perceive privacy threats will take measures to protect their sensitive information and restrain their self-disclosure, privacy concerns may induce various privacy management strategies (De Wolf, 2019). Huang, Obada-Obieh, and Beznosov (2020) noted that Alexa users adopted coping strategies when they had security or privacy concerns. In an interview conducted by Abdi, Ramokapane, and Such (2019), participants were found to disable certain features, use other devices, and mute smart speakers to protect themselves from unwanted listening or hacking. Thus, based on the rules identified in RQ4, we propose the following hypothesis.

H1: *Smart speaker users' privacy concerns will positively predict their privacy management rules.*

Given that the privacy rules identified in CPM theory were originally developed in interpersonal communication contexts, whether users apply these interpersonal scripts to interaction with machines may depend on how much individuals perceive the machines as social actors. Therefore, the Media Equation is applied here to build the links between medium-as-social-actor presence and privacy management behavior. The Media Equation was proposed by Reeves and Nass (1996) to explain how users respond to media technologies as if they were real people. The framework further suggests that when media technologies demonstrate social cues, users' responses to them are "fundamentally social and natural" (Reeves & Nass, 1996, p. 5). In addition to the widely cited findings that media users apply politeness rules to desktop computers, assign genders to them, and sort television programs into specialists and generalists (Nass & Moon, 2000), the Media Equation has been applied to a range of emerging technologies, including computer agents, voice assistants, smartphones, and social robots (Lombard & Xu, 2021). In the current study, because smart speakers present social cues such as human-sounding speech and interactivity in their interactions with their users, it is possible that users will perceive them as social actors and hence apply their interpersonal communication rules to smart speakers. In other words, the more users perceive smart speakers as real people (i.e., the stronger the medium-as-social-actor presence), the more likely it is that they will foresee the menace of privacy violation and thus make adjustments to their privacy boundaries as they do in interpersonal communication contexts. Therefore, we propose the following hypotheses. Our research model is shown in Figure 1.

H2: Medium-as-social-actor presence will positively predict users' privacy concerns.

H3: Medium-as-social-actor presence will positively predict users' privacy management rules.

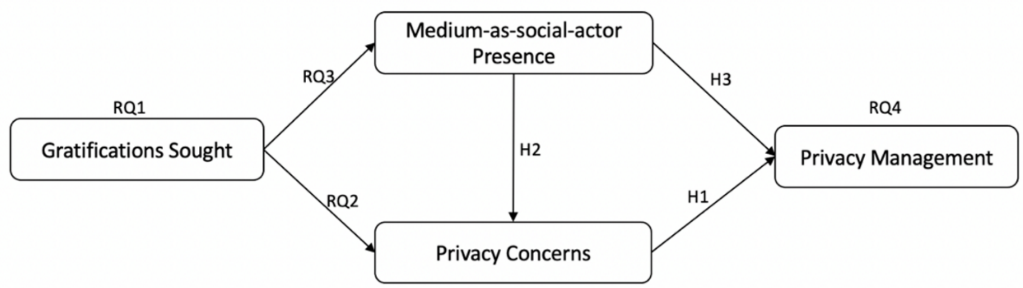

Figure 1. Research model.

Method

Participants and Data Collection

An online survey was administered via the Qualtrics panel. Only those who were smart speaker owners or had previously used smart speakers qualified for the study. A total of 1,052 participants were recruited to complete the survey. Because interacting with smart speakers may involve the usage of the hardware, the software agent, and the app, we carefully designed our questionnaire language to capture users' overall smart speaker use experiences. Specifically, when responding to the online questionnaires, participants were told that a smart speaker was a type of home-based voice command device with an integrated voice assistant that offers hands-free actions like playing music, answering questions, and controlling home electric appliances. A voice assistant is a digital assistant that uses voice recognition, natural language processing, and speech synthesis to help people with various tasks through the smart speaker. Participants were asked to reflect on their experiences of using the voice assistant via the smart speaker.

After eliminating the invalid cases (e.g., those who failed attention check or had severe straight-lining responses), 991 cases were included in the analyses. Among them, 500 were males and 491 were females. The average age was 43.61 years old. A total of 619 participants reported using Amazon Echo or Dot (62.5%), 242 used Google Nest Mini or Google Home (24.4%), 60 used Apple HomePod (6.1%), 16 used Mi AI Speaker (1.6%), 35 used JBL Link (3.5%), 10 used Sonos One (1%), and nine reported using other devices. The average time participants spent on these smart speakers was 46.52 minutes on a typical day.

Measures

Gratifications Sought

Gratifications sought were measured using the items collected from interviews, pilot tests, and previous U&G measures. Participants responded to a 5-point Likert-type scale with a total of 57 items (1 = *not at all*; 5 = *very much*). Specifically, we first conducted semi-structured interviews with 10 smart speaker owners to ask about their motives for home-based voice assistant use. Then we identified the functions, skills, and extensions that could be enabled in various smart speakers (e.g., subscribing to news channels, sending e-mails). We recruited 105 MTurkers in a pilot test to (1) examine the degree to which participants like to use these functions and (2) ask about their motives for smart speaker use. Based on the synthesis of interviewees and MTurkers' responses, 23 items related to motives were included in the measure. Exemplar items include "I like using the voice assistant to discover new music" and "I like using the voice assistant to check my financials."

Next, we included items from prior U&G research, especially those about emerging technology use. The measure included three items about multitasking in podcast use (Perks et al., 2019), six items about self-status seeking in AI and social media use (McLean & Osei-Frimpong, 2019; Park, Kee, & Valenzuela, 2009), three items about convenience in Internet and AI use (McLean & Osei-Frimpong, 2019; Papacharissi & Rubin, 2000), five items about information seeking (Papacharissi & Rubin, 2000), two items about habitual use of media (Rubin, 1983), three items about companionship in social media use (Quinn, 2016), three items about passing time (Haridakis & Rubin, 2003), four items about relaxation (Kim & Rubin, 1997), and five items about entertainment (Haridakis & Rubin, 2003). Here, a total of 34 items were adapted and added to the measure, which amounted to 57 items. Exploratory factor analysis (EFA) was conducted to extract users' gratifications sought.

Privacy Management Rules

The measure of privacy management comprised the items from both previous online privacy management measure and industry reports on privacy protection for smart speaker use. Specifically, 10 items regarding permeability rules, ownership rules, and linkage rules were adapted from previous research (Child et al., 2009). Four items from industry reports were included to capture users' privacy management experiences with home-based voice assistants (John & Germain, 2019; Norton, 2020). Participants responded to a Likert-type scale with 14 seven-point items (1 = *never true*; 7 = *always true*). EFA was conducted to extract users' privacy management rules.

Medium-as-Social-Actor Presence

The measure of medium-as-social-actor presence (M = 4.26; SD = 1.28; α = .82) was adapted from the social presence measure in the context of human–computer interaction (Lee et al., 2006). Participants reported on a Likert-type scale with six 7-point items (1 = *not at all*; 7 = *very much*). Scale items are listed in Section 4 of the supplementary materials (https://tinyurl.com/ijocspeaker).

Privacy Concerns

The measure of privacy concerns (*M* = 3.08; *SD* = 1.05; α = .95) was adapted from two previous measures (Metzger, 2007; Quinn, 2016). Participants reported on a Likert-type scale with 11 five-point items (1 = *not at all concerned*; 5 = *very concerned*). Scale items are listed in Section 5 of the supplementary materials (https://tinyurl.com/ijocspeaker).

Data Management and Analyses

Univariate and multivariate outliers were checked using box plots and Mahalanobis distance. Collinearity was examined using correlations, tolerance level, and VIF value. Variables that were positively skewed were transformed using log transformation. Those negatively skewed were transformed using a power algorithm for normal distribution. EFA was conducted in SPSS to answer RQ1 and RQ4. Structural equation modeling (SEM) was conducted using Mplus to examine RQ2 and RQ3 and H1–H3. Age, gender, smart speaker use experience, and internal locus of control were used as control variables in the model (Discussion about the control variables is in Section 1 of the supplementary materials: https://tinyurl.com/ijocspeaker).

Results

To identify what gratifications individuals seek through their smart speaker use (RQ1), after checking the Kaiser–Meyer–Olkin measure of sampling adequacy and the Bartlett's test of sphericity to ensure that the correlations among the variables were sufficient for EFA, all the items were subjected to principal axis factoring with oblique rotation to uncover the underlying gratifications sought. Factors with an eigenvalue larger than 1.0, primarily loadings larger than .50, and with no items cross-loading on other factors were retained. The 50/30 loading criterion was used to extract the factors. Primary loadings were at least one third larger than the secondary loadings.

After an iterative screening process based on communalities, reliability, and item coherence, seven factors with 38 items were yielded from the EFA. The seven factors accounted for 53.84% of the variance of all the items after rotation. Factor 1, personal utility (eigenvalue = 18.77; *M* = 2.76; *SD* = 1.07; α = .93), accounted for 32.18% of the variance after rotation. Factor 2, information seeking (eigenvalue = 4.91; *M* = 3.81; *SD* = .84; α = .81), accounted for 7.84% of the variance after rotation. Factor 3, relaxation (eigenvalue = 3.19; *M* = 3.09; *SD* = 1.08; α = .91), accounted for 3.19% of the variance after rotation. Factor 4, enjoyment (eigenvalue = 2.10; *M* = 3.67; *SD* = .78; α = .82), accounted for 2.85% of the variance after rotation. Factor 5, status (eigenvalue = 1.80; *M* = 2.23; *SD* = 1.18; α = .93), accounted for 2.29% of the variance after rotation. Factor 6, music exploration (eigenvalue = 1.57; *M* = 3.97; *SD* = .88; α = .71), accounted for 2% of the variance after rotation. Factor 7, multitasking (eigenvalue = 1.50; *M* = 3.67; *SD* = .99; α = .86), accounted for 1.88% of the variance after rotation. The results of EFA are shown in Table 1.

Table 1. Pattern Matrix of Factor Loadings on Gratifications Sought.

	Factor Loadings						
Items	PU	IN	RE	EN	ST	ME	MT
Personal Utility (PU)							
Online shopping	.70						
E-mailing others	.68						
Real-time translation	.67						
Phone calls	.64						
Traffic checking	.63						
Organizing ideas and thoughts	.61						
Getting fit	.61						
Receiving notifications	.60						
Calendar/schedule reminder	.58						
Home security	.58						
Checking my financials	.57						
Reading audiobooks	.54						
Information (IN)							
To look for information		.74					
To get information for free		.72					
To see what news is out there		.61					
Because it's a new way to learn things		.58					
Relaxation (RE)							
It allows me to forget about work or things			.73				
It's a pleasant rest			.73				
It relaxes me			.70				
It allows me to unwind			.68				
It allows me to get away from the rest of the family or others			.61				
Enjoyment (EN)							
It passes time				.61			
It entertains me				.59			
It amuses me				.58			
It's enjoyable				.54			
It occupies my time				.51			
It's exciting.				.51			
Status (ST)							
Because it makes me look cool					.86		
Because it enhances my image among my peers					.85		
Because I want to impress others					.84		
To look stylish					.81		

Because I feel peer pressure to use it					.61		
Music Exploration (ME)							
Listening to stream music services like Spotify or Amazon Music						.66	
Playing music						.64	
Discovering new music						.46[a]	
Multitasking (MT)							
To do more than one thing at a time							.80
Because I am usually occupied with several things at the same time							.76
To accomplish other tasks simultaneously							.73
Eigenvalue	18.77	4.91	3.19	2.10	1.80	1.57	1.50
M	2.76	3.81	3.09	3.67	2.23	3.97	3.67
Variance explained after rotation (%)	32.18	7.84	4.80	2.85	2.29	2.00	1.88

[a]Although the factor loading was smaller than .50, the loadings of that item on the other factors were all smaller than .11, which met the criteria for retaining the item for that factor. This item also had coherent meanings with other items underlying the factor.

To explore what privacy management rules people adopt in smart speaker use (RQ4), after checking the Kaiser-Meyer-Olkin measure of sampling adequacy and the Bartlett's test of sphericity, a total of 14 items were subjected to principal axis factoring with oblique rotation to uncover possible underlying factors about privacy management. The same criteria described earlier were used to retain the factors.

Two factors with nine items were yielded from the EFA. The two factors accounted for 51.75% of all the items after rotation. Factor 1, privacy setting review (eigenvalue = 6.00; *M* = 3.67; *SD* = 1.64; α = .90), accounted for 42.65% of the variance. Factor 2, ownership protection (eigenvalue = 1.65; *M* = 4.19; *SD* = 1.65; α = .71), accounted for 9.10% of the variance after rotation. The results of EFA about users' privacy management are shown in Table 2.

Table 2. Pattern Matrix of Factor Loadings on Privacy Management Behavior.

	Factor Loadings	
Items	Factor 1	Factor 2
Privacy Setting Review (Factor 1)		
I update the privacy settings of my voice assistant via its associated app frequently.	.93	
I review every privacy setting function of the voice assistant via its associated app regularly.	.91	
I regularly manage the access of the extensions or the skills of the voice assistant.	.78	
I regularly check the history of my commands via the voice assistant's associated app.	.75	
I regularly delete my conversation history with the voice assistant via its associated app.	.63	
I use pseudonyms when setting the owners of the device.	.55	
Ownership Protection (Factor 2)		
I prefer not to synchronize my friends' contact information with the voice assistant because I worry who would have access.		.75
I prefer not to add my mobile phone number to the voice assistant and its associated app.		.72
I do not allow the voice assistant to use my voice messages to improve transcriptions.		.52
Eigenvalue	6.00	1.65
M	3.67	4.19
Variance explained after extraction (%)	42.65	9.10

After identifying the gratifications sought and privacy management rules, SEM was employed to run the model. Analyses of the initial proposed model did not show a goodness of fit for the data, $X^2(14, N = 991) = 402.10$; $p < .001$; CFI = .82; RMSEA = .17; SRMR = .04. Thus, indices modification was used to improve the model. Based on prior theory-driven findings (see Section 2 of the supplementary materials: https://tinyurl.com/ijocspeaker), one path from personal utility to privacy setting review was added to the model. The improved model showed a goodness of fit for the data, $X^2(13, N = 991) = 103.43$; $p < .001$; CFI = .96; RMSEA = .08; SRMR = .02.

To answer how users' different gratifications affect their privacy concerns (RQ2) and medium-as-social-actor presence (RQ3), the model suggested that personal utility had positive effects on medium-as-social-actor presence, B = .25; $p < .001$, and privacy concerns, B = .14; $p = .002$. Information seeking had positive effects on medium-as-social-actor presence, B = .01; $p < .001$. Relaxation had positive effects on medium-as-social-actor presence, B = .32; $p < .001$, and privacy concerns, B = .09; $p = .047$. Enjoyment had positive effects on medium-as-social-actor presence, B = .01; $p < .001$, and negative effects on privacy concerns, B = -.004; $p = .005$. Status had positive effects on medium-as-social-actor presence, B = .53; *p*

= .003, and privacy concerns, B = 1.03; *p* < .001. The path added to the model indicated that personal utility had positive effects on privacy setting review, B = .80; *p* < .001.

Privacy concerns had positive effects on privacy setting review, B = .34; *p* < .001, and ownership protection, B = .51; *p* < .001, which supported H1. Although medium-as-social-actor presence did not have significant effects on privacy concerns, which rejects H2, it had positive effects on privacy setting review, B = .18; *p* < .001, and ownership protection, B = .10; *p* = .016. Thus, H3 was supported. The model result is shown in Figure 2.

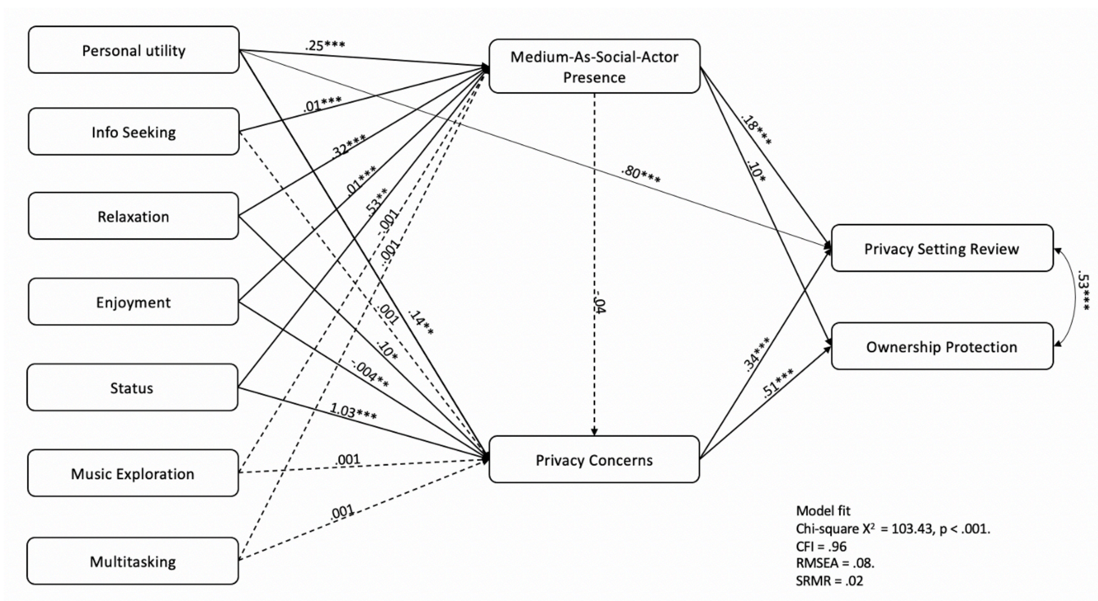

Figure 2. Final model results.

Note. Information seeking, enjoyment, status, music, and multitasking were transformed for normal distribution. Age, gender, smart speaker use experience, and locus of control were control variables.

Discussion

This study seeks to build links between users' gratifications sought and their privacy management strategies. Based on EFA, the results suggest that music exploration and information seeking are the top two gratifications people seek through smart speaker use, followed by multitasking, enjoyment, relaxation, personal utility, and status seeking (see Figure 3). The study also identifies two strategies that users adopt to manage their privacy: privacy setting review and ownership protection. The study further investigates users' privacy concerns and medium-as-social-actor presence and suggests that users' privacy management occurs via two routes: a protective route and a precautionary route.

Gratifications Sought and Privacy Management Rules

The study first identifies the gratifications people seek through smart speaker use. Among them, information seeking, relaxation, and enjoyment had been identified in prior research on television viewing, Internet surfing, social media use, and online self-presentation (Weaver, 2003). Comparatively, personal utility, status seeking, music exploration, and multitasking have been less discussed in prior research. Specifically, personal utility represents the most unique motives related to smart speaker use. Items such as checking financials, real-time traffic tracking, getting fit, and receiving notifications reflect the utilitarian benefits of smart speaker use (McLean & Osei-Frimpong, 2019). The status motive stands for people's pursuit of a positive self-image. It shows that some people use smart speakers to look up-to-date and to be socially included among peers. The status motive aligns with McLean and Osei-Frimpong's (2019) finding that people use voice assistants for symbolic benefits. However, it should be noted that the overall mean value of the status factor implies that users' motive for using smart speakers to enhance self-image is not as strong as other motives.

Music exploration appears to be the top gratification that users seek for smart speaker use. It reflects the affordance of the device to enable users to discover new music through either the voice assistant per se or connected streaming services such as Spotify. This motive suggests that smart speakers serve as a conduit to other media platforms, which demonstrates their multilayered nature. The finding is also consistent with prior research on users' voice logs of interactions with smart speakers, which suggested that individuals' music-related queries accounted for almost 40% of the voice commands (Bentley et al., 2018), indicating that music exploration is one of the primary goals of smart speaker use.

The motive of multitasking tends to reflect the phenomenon by which users split and switch attention between smart speaker use and other tasks. That is, users may turn on their smart speakers merely for background noise or as auxiliary tools (e.g., checking a recipe when preparing food). The finding corroborates that individuals' media exposure depends on their attentiveness spectrum (Steiner & Xu, 2020). During media exposure, people's attentiveness may vary depending on the context of the media content. In this study, the hands-free control of the smart speakers allows users to draw their attention to other duties.

The current findings about users' preferences for music exploration and multitasking during smart speaker use are congruous with Ammari, Kaye, Tsai, and Bentley's (2019) finding that music and hands-free control are the two most used commands in users' voice assistant use. Compared with music exploration and multitasking, which were among the top gratifications that participants sought for smart speaker use, users' personal utility motive was found to be weaker. This may be the case because users either explore smart speakers based on their functionality on their initial use, but gradually stop trying the new functions (Sciuto, Saini, Forlizzi, & Hong, 2018), or they become more cautious when trying out smart speakers for personal tasks such as checking financials, accessing e-mails, and setting up reminders.

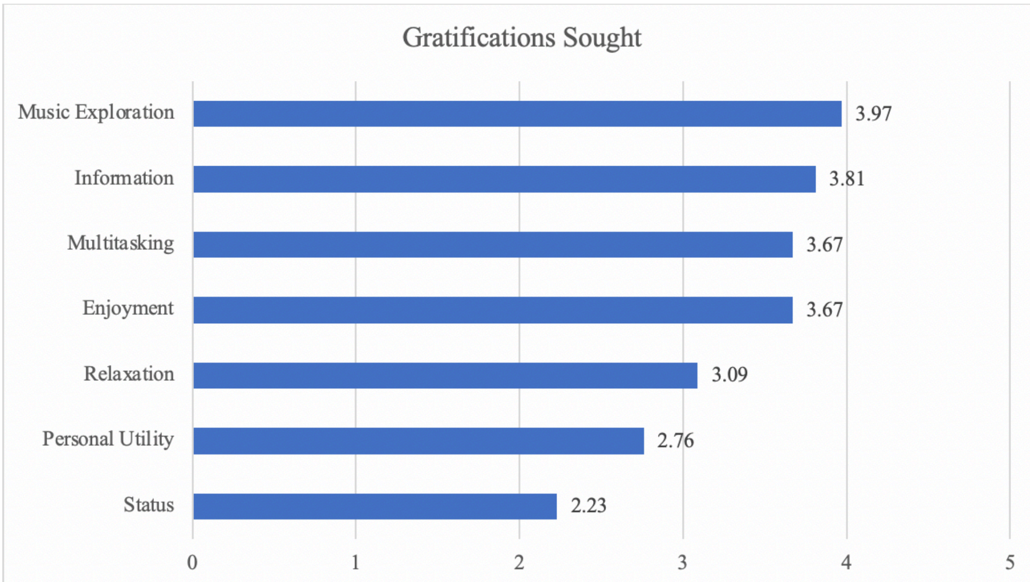

Figure 3. Users' gratifications sought based on mean values of each factor.

Note. The mean values were calculated based on participants' responses to the items underlying each other.

This study further explores people's privacy management rules. Privacy setting review and ownership protection emerged as the two major rules that people adopt to manage their privacy with their smart speaker use. Compared with the permeability rules, ownership rules, and linkage rules identified in CPM theory (Child & Petronio, 2011), privacy setting review and ownership protection reflect how people selectively transfer interpersonal privacy management scripts to human–machine communication. Specifically, the first strategy, privacy setting review, is a manifestation of ownership rules in CPM theory, given that behavior such as updating privacy settings, reviewing privacy setting functions, and checking the history of voice commands reflects people's concerns about how much the co-owners of their privacy (i.e., the smart speaker) can independently control the flow of their private information. The findings suggest that the more frequently the users check the privacy settings and the more regularly they delete their conversations with the smart speakers, the more stringent their ownership rules are and the more restricted their collective privacy boundary is.

Compared with privacy setting review (M = 3.67), the second strategy, ownership protection (M = 4.19), reflects the permeability rules in CPM theory and tends to be a more preferred management strategy. Ownership protection suggests that smart speaker users are sensitive to their own information, their friends' information, and their voice commands, which serves as evidence for the degree to which users seek to protect both the depth and the width of their information (Child et al., 2009). Although both privacy setting review and ownership protection can be considered an extension of CPM theory in the human–machine communication context, it should be noted that linkage rules did not appear to be a major factor in users' interactions with smart speakers. A possible reason for this is that users cannot develop shared interests or networks with the machines per se.

Two Routes to Privacy Management

Our findings suggest that the effects of users' gratifications sought on their privacy management occur via two routes. A protective route suggests that some of the users' motives directly elicited their concerns about privacy risks, which further led them to adjust their privacy settings. These gratifications include personal utility, relaxation, and status. It can be extrapolated that when users ask the smart speaker to e-mail others, do online shopping, send notifications, and check financials, they need to link their personal information, such as their e-mail address, online account, daily schedule, and bank information to the voice assistant. The machines' access to users' sensitive information will evoke their perceived privacy threats. Prior research has suggested that perception of privacy risks has dampening effects on the relationship between the utilitarian benefits of smart speaker use and actual smart speaker usage (McLean & Osei-Frimpong, 2019), and this study confirms the tension between users' functional use of the speaker and their privacy concerns.

It is also here where smart speaker owners start to conduct privacy management and readjust their privacy boundaries to appease the concerns and potentially release the tension between their engagement and sense of insecurity. This route from user gratifications to privacy management highlights that one of the reasons users manage privacy is to appease privacy concerns.

Compared with the protective route that ameliorates users' privacy concerns, the other route from user gratifications to privacy management reflects the significance of medium-as-social-actor presence and the preventive nature of users' privacy management behavior. Specifically, personal utility, information seeking, relaxation, enjoyment, and status all predicted users' experience of medium-as-social-actor presence. In other words, users may feel as if they are interacting with a social entity when they turn to the speaker to complete tasks, look for information, relax, have fun, or seek social inclusion. The results can contribute to prior U&G research on the distinction between instrumental and ritual use of media. Researchers have argued that instrumental use of media refers to users' active involvement with the content of media, such as information seeking and entertainment seeking, while ritual use of media is related to users' attachment to the medium itself (Rubin, 2002). Adding to prior findings, this study reveals that what has been traditionally perceived as instrumental use of media could also predict users' affinity with the medium per se.

Considering that medium-as-social-actor presence had positive effects on both privacy setting review and ownership protection, the findings have confirmed the Media Equation in that users apply interpersonal communication scripts to human–machine communication when they perceive machines to be social entities (Reeves & Nass, 1996). The model further revealed that medium-as-social-actor presence did not predict privacy concerns, meaning that privacy management may not occur merely as a result of users' fear of privacy violation. Rather, users may see privacy management as a precautionary measure when they perceive smart devices as social entities, which confirms Petronio and Sargent's (2011) finding that privacy management can be a preemptive practice that functions to establish privacy boundaries among people. In other words, this model suggests that users' privacy management behavior can be both protective and preventive. See Section 3 of the supplementary materials (https://tinyurl.com/ijocspeaker) for more discussion.

Theoretical and Practical Significance

This study has both theoretical and practical implications. First, this study identifies the unique needs that people have for smart speaker consumption. This study avoids merely relying on preexisting measures and encompasses the motives that are unique to smart speaker use. For instance, the personal utility dimension distinguishes itself from prior U&G research on mass media or social media; this dimension reflects the multiple affordances that people can use to complete personal tasks through smart speakers. The findings about user motives may also serve as a reference for future studies that investigate smart media infused with cognitive techniques such as speech recognition and deep learning.

Second, while the U&G approach has traditionally been criticized for lack of coherence and falsifiability (Miller, 2005), prior research has addressed this criticism and called for a more predictive framework that takes into account individual differences, psychological mechanisms, and both intended and unintended consequences of media consumption (Ruggiero, 2000). This study follows the call, combines the U&G approach with the Media Equation and the CPM theory, and discovers two routes from users' gratification sought to their privacy management: a protective route derived from perceived privacy risks, and a precautionary route derived from users' social perceptions of the smart speakers. The former route demonstrates a more reactive process, in which users take actions to respond to potential privacy threats, whereas the latter one exhibits a more proactive process, in which users control their privacy based on the degree to which they perceive the smart speakers as intelligent social beings. The findings present the predictive power of an updated U&G approach in understanding users' privacy management practices.

Third, prior research on the Media Equation has noted that users apply interpersonal communication rules to human–machine communication (Reeves & Nass, 1996). However, to our knowledge, no prior studies have specifically examined whether users transfer interpersonal privacy management rules to interactions with home-based smart devices. This study not only supports the basic tenet of the Media Equation, but also expands its scope to users' interactions with smart devices. It highlights that when users perceive smart devices as social actors, they will revisit and adjust their privacy boundaries as they do in face-to-face communication. The role of medium-as-social-actor presence provides explanatory power in identifying the psychological mechanism of transferring interpersonal communication rules to human–machine communication.

Fourth, this study expands the scope of CPM theory from interpersonal communication and mediated communication to human–machine communication. The study takes into consideration the possible actions that smart speaker users can take to protect their privacy and reveals that ownership rules and permeability rules are still effective in users' privacy management of AI technologies.

This study can further provide practical guidelines. First, as smart speaker users transfer permeability rules and ownership rules from human–human communication to human–machine communication, designers can make the privacy setting interface more akin to interpersonal communication. For example, they could first let the mobile app or the voice assistant express empathy for users' privacy concerns and then use personal language and interactive conversations to help users understand how they can manage their privacy as easily as they do in human communication. Second, considering that users' gratifications can be elicited by technology affordances (Sundar & Limperos, 2013), designers can implant more perceptible privacy setting elements into the affordances that generate the particular motives leading to users' privacy concerns. For instance, when users set up their bank accounts using a voice assistant, they can be reminded about how their information will be processed and what options they have for managing their sensitive information.

Conclusions

This study combines the U&G approach, the Media Equation, and CPM theory to understand the major motives that users have for smart speaker use and the strategies they use to manage privacy. Given that privacy threats are the major downside to smart speaker use, privacy management has become one of the most important issues in user interactions with smart speakers. This study presents two routes that partially explain how some of the users' gratifications impose effects on their privacy management behaviors. Although the tension between user gratifications and privacy concerns may not be easily reconciled, parsing out users' core needs for smart speaker use and their approaches to privacy boundary adjustment could be the starting point for understanding users' attitudes toward home-based smart media.

References

Abdi, N., Ramokapane, K. M., & Such, J. M. (2019, August). More than smart speakers: Security and privacy perceptions of smart home personal assistants. In *15th Symposium on Usable Privacy and Security* (pp. 451–466). Berkeley, CA: USENIX Association.

Ammari, T., Kaye, J., Tsai, J., & Bentley, F. (2019). Music, search, and IoT: How people really use voice assistants. *ACM Transactions on Computer-Human Interaction, 26*(3), 1–24. doi:10.1145/3311956

Beam, M. A., Child, J. T., Hutchens, M. J., & Hmielowski, J. D. (2018). Context collapse and privacy management: Diversity in Facebook friends increases online news reading and sharing. *New Media & Society, 20*(7), 2296–2314. doi:10.1177/1461444817714790

Bentley, F., Luvogt, C., Silverman, M., Wirasinghe, R., White, B., & Lottridge, D. (2018). Understanding the long-term use of smart speaker assistants. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, 2*(3), 1–24. doi:10.1145/3264901

Cheng, Y., Chen, Y. R., Hung-Baesecke, C. F., & Jin, Y. (2019). When CSR meets mobile SNA users in mainland China: An examination of gratifications sought, CSR motives, and relational outcomes in natural disasters. *International Journal of Communication, 13*, 319–341.

Child, J. T., Haridakis, P. M., & Petronio, S. (2012). Blogging privacy rule orientations, privacy management, and content deletion practices: The variability of online privacy management activity at different stages of social media use. *Computers in Human Behavior, 28*(5), 1859–1872. doi:10.1016/j.chb.2012.05.004

Child, J. T., Pearson, J. C., & Petronio, S. (2009). Blogging, communication, and privacy management: Development of the blogging privacy management measure. *Journal of the American Society for Information Science and Technology, 60*(10), 2079–2094. doi:10.1002/asi.21122

Child, J. T., & Petronio, S. (2011). Unpacking the paradoxes of privacy in CMC relationships: The challenges of blogging and relational communication on the Internet. In K. B. Wright & M. W. Lynne (Eds.), *Computer-mediated communication in personal relationships* (pp. 21–40). New York, NY: Peter Lang.

Cho, E., Sundar, S. S., Abdullah, S., & Motalebi, N. (2020, April). Will deleting history make Alexa more trustworthy? Effects of privacy and content customization on user experience of smart speakers. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (pp. 1–13). New York, NY: Association for Computing Machinery. doi:10.1145/3313831.3376551

Clementi, A. (2020, January 21). *59 percent of smart speaker users have privacy concerns*. Mobile Marketing. Retrieved from https://mobilemarketingmagazine.com/59-per-cent-of-smart-speaker-users-have-privacy-concerns-report-

De Wolf, R. (2019). Contextualizing how teens manage personal and interpersonal privacy on social media. *New Media & Society, 22*(6), 1058–1075. doi:10.1177/1461444819876570

Dienlin, T., & Metzger, M. J. (2016). An extended privacy calculus model for SNSs: Analyzing self-disclosure and self-withdrawal in a representative U.S. sample. *Journal of Computer-Mediated Communication, 21*(5), 368–383. doi:10.1111/jcc4.12163

Gallego, M. D., Bueno, S., & Noyes, J. (2016). Second Life adoption in education: A motivational model based on Uses and Gratifications theory. *Computers & Education, 100*, 81–93. doi:10.1016/j.compedu.2016.05.001

Greenhow, C., & Robelia, B. (2009). Old communication, new literacies: Social network sites as social learning resources. *Journal of Computer-Mediated Communication, 14*(4), 1130–1161. doi:10.1111/j.1083-6101.2009.01484.x

Guzman, A. L. (2019). Voices *in* and *of* the machine: Source orientation toward mobile virtual assistants. *Computers in Human Behavior, 90*, 343–350. doi:10.1016/j.chb.2018.08.009

Hamari, J., Malik, A., Koski, J., & Johri, A. (2019). Uses and gratifications of Pokémon Go: Why do people play mobile location-based augmented reality games? *International Journal of Human-Computer Interaction, 35*(9), 804–819. doi:10.1080/10447318.2018.1497115

Haridakis, P. M., & Rubin, A. M. (2003). Motivation for watching television violence and viewer aggression. *Mass Communication and Society, 6*(1), 29–56. doi:10.1207/S15327825MCS0601_4

Hilvert-Bruce, Z., Neill, J. T., Sjöblom, M., & Hamari, J. (2018). Social motivations of live-streaming viewer engagement on Twitch. *Computers in Human Behavior, 84*, 58–67. doi:10.1016/j.chb.2018.02.013

Hoy, M. B. (2018). Alexa, Siri, Cortana, and more: An introduction to voice assistants. *Medical Reference Services Quarterly, 37*(1), 81–88. doi:10.1080/02763869.2018.1404391

Huang, Y., Obada-Obieh, B., & Beznosov, K. (2020, April). Amazon vs. my brother: How users of shared smart speakers perceive and cope with privacy risks. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (pp. 1–13). New York, NY: Association for Computing Machinery. doi:10.1145/3313831.3376529

Hwang, H., & Lombard, M. (2006). Understanding instant messaging: Gratifications and social presence. In *Proceedings of the 9th Annual Presence Conference* (pp. 50–56). Cleveland, OH: ISPR.

John, A. S., & Germain, T. (2019, February 5). How to set up a smart speaker for privacy. *Consumer Reports*. Retrieved from https://www.consumerreports.org/privacy/smart-speaker-privacy-settings/

Katz, E., Blumler, J. G., & Gurevitch, M. (1974). *The uses and gratifications approach to mass communication.* Beverly Hills, CA: SAGE Publications.

Kim, J., & Rubin, A. M. (1997). The variable influence of audience activity on media effects. *Communication Research, 24*(2), 107–135. doi:10.1177/009365097024002001

Lau, J., Zimmerman, B., & Schaub, F. (2018). Alexa, are you listening? Privacy perceptions, concerns and privacy-seeking behaviors with smart speakers. *Proceedings of the ACM on Human-Computer Interaction, 2*(CSCW), 1–31. doi:10.1145/3274371

Lee, K. M. (2004). Presence, explicated. *Communication Theory, 14*(1), 27–50. doi:10.1111/j.1468-2885.2004.tb00302.x

Lee, K. M., Peng, W., Jin, S., & Yan, C. (2006). Can robots manifest personality? An empirical test of personality recognition, social responses, and social presence in human-robot interaction. *Journal of Communication, 56*(4), 754–772. doi:10.1111/j.1460-2466.2006.00318.x

Lin, C. A. (1996). Looking Back: The contribution of Blumler and Katz's uses of mass communication to communication research. *Journal of Broadcasting & Electronic Media, 40*(4), 574–581. doi:10.1080/08838159609364379

Lombard, M., & Ditton, T. (1997). At the heart of it all: The concept of presence. *Journal of Computer-Mediated Communication, 3*(2). doi:10.1111/j.1083-6101.1997.tb00072.x

Lombard, M., & Xu, K. (2021). Social responses to media technologies in the 21st century: The Media are Social Actors paradigm. *Human-Machine Communication, 2*(1), 29–55. doi:10.30658/hmc.2.2

Malkin, N., Deatrick, J., Tong, A., Wijesekera, P., Egelman, S., & Wagner, D. (2019). Privacy attitudes of smart speaker users. *Proceedings on Privacy Enhancing Technologies, 2019*(4), 250–271. doi:10.2478/popets-2019-0068

McLean, G., & Osei-Frimpong, K. (2019). Hey Alexa . . . examine the variables influencing the use of artificial intelligent in-home voice assistants. *Computers in Human Behavior, 99*, 28–37. doi:10.1016/j.chb.2019.05.009

Metzger, M. J. (2007). Making sense of credibility on the Web: Models for evaluating online information and recommendations for future research. *Journal of the American Society for Information Science and Technology, 58*(13), 2078–2091. doi:10.1002/asi.20672

Miller, K. (2005). *Communication theories: Perspectives, processes, and contexts* (2nd ed.). Boston, MA: McGraw-Hill.

Moorthy, E. A., & Vu, K. L. (2015). Privacy concerns for use of voice activated personal assistant in the public space. *International Journal of Human-Computer Interaction, 31*(4), 307–335. doi:10.1080/10447318.2014.986642

Nass, C., & Moon, Y. (2000). Machines and mindlessness: Social responses to computers. *Journal of Social Issues, 56*(1), 81–103. doi:10.1111/0022-4537.00153

Norton. (2020). *Can smart speakers be hacked? 10 tips to stay secure.* Retrieved from https://us.norton.com/internetsecurity-iot-can-smart-speakers-be-hacked.html

O'Dea, S. (2020, May 7). *Access to a smart speaker in households worldwide 2020.* Statista. Retrieved from https://www.statista.com/statistics/1107880/access-to-smart-speaker-in-households-worldwide/

Oh, C. S., Bailenson, J. N., & Welch, G. F. (2018). A systematic review of social presence: Definition, antecedents, and implications. *Frontiers in Robotics and AI, 5*, 1–35. doi:10.3389/frobt.2018.00114

Palmgreen, P., & Rayburn, J. D., II. (1985). A comparison of gratification models of media satisfaction. *Communications Monographs, 52*(4), 334–346. doi:10.1080/03637758509376116

Papacharissi, Z., & Rubin, A. M. (2000). Predictors of Internet use. *Journal of Broadcasting & Electronic Media, 44*(2), 175–196. doi:10.1207/s15506878jobem4402_2

Park, N., Kee, K. F., & Valenzuela, S. (2009). Being immersed in social networking environment: Facebook groups, uses and gratifications, and social outcomes. *CyberPsychology & Behavior, 12*(6), 729–733. doi:10.1089/cpb.2009.0003

Perks, L. G., Turner, J. S., & Tollison, A. C. (2019). Podcast uses and gratifications scale development. *Journal of Broadcasting & Electronic Media, 63*(4), 617–634. doi:10.1080/08838151.2019.1688817

Petronio, S. (2002). *Boundaries of privacy: Dialectics of disclosure.* Albany, NY: SUNY Press.

Petronio, S. (2006). Impact of medical mistakes: Navigating work-family boundaries for physicians and their families. *Communication Monographs, 73*(4), 462–467. doi:10.1080/03637750601061174

Petronio, S., & Durham, W. (2008). Understanding and applying communication privacy management theory. In L. A. Baxter & D. O. Braithwaite (Eds.), *Engaging theories in interpersonal communication: Multiple perspectives* (pp. 309–322). Thousand Oaks, CA: SAGE Publications.

Petronio, S., & Sargent, J. (2011). Disclosure predicaments arising during the course of patient care: Nurses' privacy management. *Health Communication, 26*, 255–266. doi:10.1080/10410236.2010.549812

Quinn, K. (2016). Why we share: A uses and gratifications approach to privacy regulation in social media use. *Journal of Broadcasting & Electronic Media, 60*(1), 61–86. doi:10.1080/08838151.2015.1127245

Ramirez, F. A., & Lane, J. (2019). Communication privacy management and digital evidence in an intimate partner violence case. *International Journal of Communication, 13,* 5140–5157.

Reeves, B., & Nass, C. I. (1996). *The media equation: How people treat computers, television, and new media like real people and places.* Stanford, CA: CSLI.

Rubin, A. M. (1983). Television uses and gratifications: The interactions of viewing patterns and motivations. *Journal of Broadcasting & Electronic Media, 27*(1), 37–51. doi:10.1080/08838158309386471

Rubin, A. M. (2002). The uses-and-gratifications perspective of media effects. In J. Bryant & D. Zillmann (Eds.), *Media effects: Advances in theory and research* (pp. 525–548). Mahwah, NJ: Erlbaum.

Ruggiero, T. E. (2000). Uses and gratifications theory in the 21st century. *Mass Communication & Society, 3*(1), 3–37. doi:10.1207/S15327825MCS0301_02

Sciuto, A., Saini, A., Forlizzi, J., & Hong, J. I. (2018, June). "Hey Alexa, what's up?": A mixed-methods studies of in-home conversational agent usage. In *Proceedings of the 2018 Designing Interactive Systems Conference* (pp. 857–868). New York, NY: Association for Computing Machinery. doi:10.1145/3196709.3196772

Steiner, E., & Xu, K. (2020). Binge-watching motivates change: Uses and gratifications of streaming video viewers challenge traditional TV research. *Convergence, 26*(1), 82–101. doi:10.1177/1354856517750365

Sundar, S. S., & Limperos, A. M. (2013). Uses and grats 2.0: New gratifications for new media. *Journal of Broadcasting & Electronic Media, 57*(4), 504–525. doi:10.1080/08838151.2013.845827

Sundar, S. S., & Marathe, S. (2010). Personalization vs. customization: The importance of agency, privacy, and power usage. *Human Communication Research, 36*(3), 298–322. doi:10.1111/j.1468-2958.2010.01377.x

Waters, S., & Ackerman, J. (2011). Exploring privacy management on Facebook: Motivations and perceived consequences of voluntary disclosure. *Journal of Computer-Mediated Communication, 17*(1), 101–115. doi:10.1111/j.1083-6101.2011.01559.x

Weaver, J. B. (2003). Individual differences in television viewing motives. *Personality and Individual Differences, 35*(6), 1427–1437. doi:10.1016/S0191-8869(02)00360-4