ALEXA, WHO TOLD YOU THIS? EXAMINING HOW MEDIA PLATFORM AND SOURCE TAILORING AFFECT USERS’ PERCEPTIONS OF INFORMATION DELIVERED BY A VIRTUAL ASSISTANT

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When we evaluate the credibility of various online information, one of the most basic yet important questions that we ask is “What is the source of information?” This question has never been successfully answered by virtual assistants such as Amazon’s Alexa that we commonly use to obtain information. This dissertation examines how users’ credibility of Alexa’s information and their psychological reactions to the virtual assistant (i.e., attitudes and behavioral intentions toward Alexa) change as a function of source attribution made by Alexa. Specifically, the current dissertation empirically tests whether different types of media platform (online news vs. forum sites) and source tailoring (customization vs. personalization) influence how users perceive Alexa’s information and the virtual assistant by using a lab experiment (N=178). Results show that users perceive Alexa’s information as more credible when she reveals the source. When users receive Alexa’s information from news websites, they are likely to perceive gatekeepers of the news websites as experts in the fields (i.e., high source expertise) than those from forum websites. Such different psychological reactions to Alexa’s sources in turn affect their perceived credibility of Alexa’s information. Moreover, users who customize Alexa’s sources perceive greater user control over their interaction with Alexa, self-identity projected on to the Alexa’s online interface, and involvement in Alexa’s information, compared to those who receive a personalized list of Alexa’s sources or those who do not experience any kind of source tailoring. These are in turn positively associated with their attitudes, behavioral intentions toward, and trust in Alexa. The key findings of this dissertation hold theoretical implications for research on source orientation in human-computer interaction, information credibility, and user psychology, as well as practical implications for product designers and researchers.
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Chapter 1

INTRODUCTION

Whenever we are on Google or Bing to search information, we always spend at least a few seconds thinking about what key words to enter to get the best result. After typing in the key words in the search engine, we spend a few more seconds browsing the search results and thinking about which site to visit to get more information by checking who authored the information, when the page was last updated, and whether the content is trustworthy or not (Eastin, 2001). Once the decision is made, we click on the link to the site and review the content to see if it is relevant to the question of our interest. If not, we go back to the result page and repeat the same decision-making process until we find the right one that suits our needs.

It is a time-consuming process that we go through each time we look for information online. Too many questions come into our head to make a decision in every step of search, rendering us confused as we visit more sites. What if there is a magic box that can make all the necessary decisions for us to get the right information we need? In fact, recent information technologies can help answer this question by using voice-based virtual assistants, such as Amazon Alexa. Thanks to virtual assistants, we no longer need to manually look for information using search engines but rather simply ask the questions to our personal assistant embedded in smart speakers, such as Alexa, and she immediately looks it up online and find the most relevant answer for us.

In fact, Alexa has gained huge popularity among Internet users because she can answer numerous questions about such topics as science, economics, sports, health, and entertainment. We can ask Alexa about the quickest route to take for a user’s daily commute, Dow Jones today,
the normal blood sugar range, the winners of Oscars, and more. She can instantly look up various websites, choose the most relevant information, and answer our questions in a few sentences. Such advanced capability to search information of Alexa has been appreciated by many users since it has resolved most of our concerns related to information search, except for one: the *source* of information that Alexa delivers.

The use of Alexa for information search has prompted concerns about the credibility of her answers because Alexa hardly reveals the source. In fact, if we ask Alexa where she gets her information from, she refuses to reveal it by saying “*It is tough to explain.*” The lack of source information is especially problematic when we want to look up more information in addition to Alexa’s answers to guide our decisions. For instance, if we ask Alexa the symptoms and treatments of acid reflux, it is important for her to provide us accurate information so that we can make the right treatment decision. This includes letting us know where we can find more information to follow up on her answers.

Indeed, source is an important part of human communication (Sundar & Nass, 2000); it is typically revealed when information is delivered to receivers (Eastin, 2001; Greer, 2003). Online search for news using Google News, for instance, turns up a wide variety of sources, ranging from CNN to Fox, and in many instances, *we* directly decide what story to read or skip based on the credibility of source. When Alexa searches information online, on the other hand, *computer algorithms* are used to verify various sources and they choose the most relevant information for delivery. The final outcome that is delivered to us, however, comes without the source, raising concerns about its veracity.
Despite the importance of source in evaluating the credibility of Alexa’s information, the latest version of Alexa still lacks a feature that reveals the source(s) of information. What is more interesting about the source attribution of Alexa is that most users do not even ask her where she obtains information from. It rather appears that the lack of source does not make us trust her answers any less since we tend to trust what she tells us. Such blind trust goes against common findings in the literature on source effects (e.g., Flanagin & Metzger, 2000; Greer, 2003; Gunther, 1988; Hovland & Weiss, 1951; Hu & Sundar, 2010; Kang & Sundar, 2016; Lee & Sundar, 2013; Sundar & Nass, 2000, 2001), which suggest that information source plays a key role in credibility judgements. The studies show that the credibility of source is critical for acceptance of the message and consequent attitudinal and behavioral changes.

Although there has been a proliferation of virtual assistants that deliver a myriad of information to us, little is known about how they impact our understanding of information they provide, especially when they deliver information without the source, the key component that aids our credibility judgements. Does the ability of virtual assistants to reveal their sources hold the key to enhancing our perceptions of information they deliver? If revealing the source is critical for users’ credibility assessments, how should the sources be presented? With the potential to affect users’ credibility judgements, does the presence of source even influence our evaluation of virtual assistants? The current research is designed to provide answers to these questions by manipulating the presentation of source by Alexa. It particularly tests whether revealing the source enhances users’ perceived trustworthiness of information delivered by Alexa. This research also explores the effect of source disclosure on users’ attitudes, behavioral intentions toward, and overall trust in Alexa.
Apart from the psychological effect of source disclosure, we know from our information search experience that not only whether the source of information is disclosed or not, but also what types of source are used to generate the information affect our credibility judgements. When we ask Alexa some factual questions, she sometimes alludes to pulling her answers from crowdsourced websites like Wikipedia by saying “According to Wikipedia,” which is not a traditional news website but a forum site with contributions by laypersons or general Internet users. Although not always, Alexa refers to Wikipedia to get her answers to our questions since Amazon has set it as one of the default sources for online search.

When we directly search information online, however, there are variety of other sources are available. There are two categories of media platform on the Internet that we often use for information search: 1) news websites such as CNN, NPR, and Fox and 2) forums such as Reddit, Quora, and Answers.com (Barthel, Stocking, Holcomb, & Mitchell, 2016). These platforms have different characteristics, which in turn affect receivers’ perceptions of information available on them. Specifically, information on news websites is mostly created and managed by professional journalists or experts, while contents of forum websites are mainly contributed by general Internet users or laypersons (Flanagin & Metzger, 2000; King, 2007). Due to the different styles of gatekeeping, it is likely that we have an impression that the latter (forum websites) is managed by individuals similar to ourselves, while the former (news sites) is run by those who are quite different from ourselves. Such different perceptions about gatekeepers may influence how we perceive information sourced from those platforms. Therefore, we may perceive Alexa and information she delivers differently based on the media platform she chooses to source, changing our attitudes and behavioral intentions toward the virtual assistant.
As it was seen in the case of Alexa’s reference to Wikipedia as source, Alexa draws information from a finite set of sources of its own choosing (Edwards, Edwards, Spence, & Shelton, 2014). When Alexa is prompted to give the latest news, for instance, it automatically plays a clip of NPR’s latest hourly update. Users who like the default source (i.e., NPR), the automatic selection of the source by Alexa may lead to a positive perception of the news she delivered. For users who prefer conservative news sources, however, the news update from NPR may lead to dissatisfaction. In such cases, Alexa provides users some options to change its default sources via the Alexa website and its mobile application. By using its source setting feature, users can change sources of Alexa’s information to match their personal preferences.

The ability to tailor the source setting is likely to have a powerful impact on users’ psychology because users are likely to feel that they control the nature of their interaction (Sundar, 2007) with virtual assistants. Specifically, the literature on the psychology of self-as-source has been found to affect users’ cognitions, attitudes, and behaviors (e.g., Banovic, Chevalie, Grossman, & Fitzmaurice, 2012; Kalyanaraman & Sundar, 2006; Kang & Sundar, 2016; Marathe & Sundar, 2011; Sundar, Bellur, Oh, Xu, & Jia, 2014; Sundar & Marathe, 2010; Sundar, Oh, Bellur, Jia, & Kim, 2012). Studies based on the agency model of communication (Sundar, 2008b) have found that customization features of interactive technology result in distinct psychological responses, including greater self-identity perceptions, user control, and involvement with the technology, which in turn shape users’ attitudinal and behavioral changes. Extending findings in the literature to the current study, it examines how users’ rather than the system’s choosing of source affects perceptions of Alexa and her answers. Specifically, this study tests psychological consequences of self-as-source in detail: Does users’ tailoring of source enhance 1) their perceived control over their interaction with Alexa, 2) self-identity projected on
to Alexa’s online interface, and 3) cognitive involvement in Alexa’s information? Does such a heightened sense of user control, self-identity, and involvement in turn positively affect the credibility of Alexa’s information? Do positive perceptions of Alexa’s information impact users’ attitudes, behavioral intentions toward, and trust in Alexa?

In sum, the goals of the current research are to empirically test how different types of media platform that Alexa uses for information search and users’ own tailoring of information sources have a psychological effect on perceptions of Alexa and her answers. To address these questions, this study first reviews the literature on relevant theories (Sundar, 2008a, 2008b; Sundar, Jia, Waddle, & Huang, 2015) and past work on source orientation in human-computer interaction (e.g., Reeves & Nass, 1996; Sundar & Nass, 2000, 2001), media platform (e.g., Flanagin & Metzger, 2000; King, 2007), and source tailoring (e.g., Kang & Sundar, 2016; Sundar & Nass, 2000), and proposes a set of hypotheses and a research question, followed by a lab experiment conducted to test them. The current study then presents the results of data analyses and discusses theoretical and practical implications of the key findings.
Chapter 2

LITERATURE REVIEW

Source is an important variable in communication research (Sundar & Nass, 2001), especially in understanding the psychology of message credibility assessment (Hovland & Weiss, 1951). The psychological importance of sources has been largely studied in the context of traditional mass media (Hass, 1988). Many empirical studies on source effects have tested the effect of source characteristics (e.g., source attractiveness and source-receiver similarity) on message credibility evaluation and message acceptance (e.g., Eagly & Chaiken, 1975; Joseph, 1982; Sundar, 1998; Wilson & Sherrell, 1993). The key conclusion from the literature is that message receivers not only notice the sources of messages but psychologically orient toward them. When individuals receive messages, they actively imagine the sources (e.g., a mediated representation of a character in a TV show) and behave as if they are interacting with them (Horton & Wohl, 1956). Such psychological orientation toward the sources has been found to affect the receivers’ attentional biases to the messages and their attitudes and behaviors (e.g., Belch, 1982; Petty & Cacioppo, 1984).

However, many studies performed under the social response to communication technologies (SRCT) paradigm and the media equation theory (Reeves & Nass, 1996) have shown that the psychological distinction between source and medium is murky in the context of human-computer interaction (Sundar & Nass, 2000). Past research has shown that certain characteristics unique to computers, such as interactivity and performance of roles traditionally played by humans (e.g., Nass & Moon, 2000), are likely to encourage receivers to consider the computer not just as a communication medium, but as an independent source of communication
(Reeves & Nass, 1996). Moreover, they suggest that receivers apply social expectations to and respond with social behaviors toward computers even though they are aware that they are interacting with machines (e.g., Nass & Moon, 2000; Reeves & Nass, 1996). In fact, we often say “Thank you” to a virtual assistant like Alexa, when she helps find the most relevant information we need even though we know that she is not a human being. Similarly, we express disappointment to Alexa when she fails to find the right answers to the questions we ask.

Why do humans treat virtual assistants as an autonomous source of communication? The answer to this question has been answered by many empirical studies conducted under the SRCT paradigm and the media equation theory by Nass and his colleagues (e.g., Nass & Moon, 2000; Reeves & Nass, 1996).

**Source Attribution in Human-Computer Interaction**

Past research under the SRCT paradigm has demonstrated that humans apply social rules and expectations that they use in human-*human* interaction when they interact with computers even though they are aware that they are not interacting with human beings (Sundar & Nass, 2000). Nass, Moon, and Carney (1999), for instance, found that users tended to apply politeness norms to computers, especially when they assessed performance of two computers. Specifically, when a self-praising computer asked participants to evaluate its performance, they gave much higher scores compared to those who were asked by a different computer. This result is consistent with politeness norms that when person X is asked by person Y to evaluate person Y, person X gives a positive response, rather than a more honest (often more negative) response, to avoid offending him or her.
Nass and Steur (1993) also revealed that computer users applied social rules from human-
*human* interaction when evaluating self-praise and other-praise made by computers. Their study showed that individuals tended to perceive the task performance of a computer as superior when it was praised by a different computer, rather than when it was praised by itself, as predicted by one of the common social rules in human-human interaction (i.e., “other praise is more valid than self-praise”). Moreover, the computer that praised itself was also perceived to be less friendly than a computer that praised other computers, showing the same pattern of the assessment of self-praise in human-*human* interaction. Further, Nass and his colleagues conducted more empirical studies demonstrating the SRCT paradigm by showing the application of social rules to computers in the context of personality assessment (e.g., Moon & Nass, 1996), reciprocal behavior change (e.g., Fogg & Nass, 1997), private information sharing (e.g., Moon, 1998), and personality consistency (e.g., Isbister & Nass, 2000).

In order to explain why humans apply social rules and social expectations while interacting with computers, past research provides two competing perspectives: the computer-as-
*medium* (CAM) model and the computer-as-*source* (CAS) model. These models are different in terms of understanding the psychological sources of information that users actively imagine and orient toward when interacting with computers (Sundar & Nass, 2000). According to the CAM model, computers are viewed as a mere communication channel or vehicle operating between receivers and sources. Under this view, when a user interacts with a computer, he or she attributes the source of information to the computer programmer (Sundar, 1993) and therefore human-computer interaction is construed as human-*programmer* interaction under this view (Sundar, 1994). Therefore, it is natural for users to apply social expectations to and respond with
social behaviors toward computers since their interaction with computers indeed deals with the programmer, not the computer (Reeves & Nass, 1996).

On the other hand, the CAS model explains that interaction between humans and computers is *not* mediated, rather direct and social (e.g., Nass & Moon, 2000; Reeves & Nass, 1996). In the unmediated relationship with computers, users perceive computers as the original source of information and treat them the same way they respond to other human beings. They do not psychologically orient to computer programmers or other human beings when they imagine the psychological locus of their interaction. This perspective also maintains that users are likely to treat computers as an autonomous source when they exhibit cues that represent human characteristics, such as human-like voice (Nass & Brave, 2005), language (Turkle, 1984) and interactivity (Rafaeli, 1988). Such cues automatically trigger schemata concerning human-*human* interaction, based on which users are likely to overlook the fact that computers are *not* human actors (Nass & Moon, 2000) and therefore respond to them as if they would to human beings.

Based on the theoretical perspectives, a multitude of empirical research that pits the CAS model against the CAM model has been conducted. For example, Sundar and Nass (2000) conducted two studies that tested these two theoretical frameworks. In Study 1, all participants were exposed to an identical interaction with computers, but half of the participants were told that they were interacting with computers, while the others were told that they were dealing with software programmers. In Study 2, the programmers were replaced with a hypothetical networker. Results showed that participants in the computer condition perceived their interaction with the computer as more friendly, playful, effective and similar to themselves compared to their programmer or networker counterparts, thus supporting the CAS model.
More empirical studies have added coherent evidence that humans respond to computers as a source in the same way they respond to other human social actors, as predicted by the CAS model. Researchers have also found that users perceive information delivered by computers as more trustworthy when the computers are described as specialists rather than generalists (e.g., Kim, 2016; Koh & Sundar, 2010), concede more to the computers that express emotions such as happiness and anger (e.g., De Melo, Carnevale, & Gratch, 2011), and respond more positively to the computers that manifest personality similar to users (e.g., Nass et al., 1999). These studies have particularly found that social cues that are typically associated with human characteristics encourage users to automatically apply social rules to their interaction with computers.

Extending the CAS model to the current research, a virtual assistant such as Alexa that manifests human-like characteristics (e.g., voice and interactivity) and performs tasks that are traditionally conducted by humans (e.g., attributing the sources of information) is likely to be perceived as a social actor like other human beings and a reliable source of information, just like a human delivering information and disclosing its source is considered trustworthy (see Pornpitakpan, 2004 for a review). This is because Alexa’s human-like voice and her own checking of the sources of information serve as strong cues or heuristics that elicit relevant social schemata and rules unique in human-human interaction: the presence of source helps evaluate the credibility of information positively compared to the same content that lacks a source (Fox & Rainie, 2002). In fact, the literature on source effects has consistently demonstrated that information provided with its source is rated as higher in quality and more trustworthy than the same information without its source (e.g., Kumkale, Albrracin, & Seignourel, 2010; Metzger, 2007; Wogalter, Kalsher, & Rashid, 1999). This suggests that when Alexa provides the source of her answers, she is likely to elicit greater social responses from users and therefore boost the
credibility of the information she delivers, even though it is obvious that she cannot be a source herself and is indeed obtaining it from the Internet. Therefore, the first hypothesis of the current study is proposed.

H1: Revelation of the source of information by Alexa will lead users to perceive greater credibility of Alexa’s information compared to the same information delivered without the source.

Effect of Media Platform

One of the ways that we assess the credibility of online information is to rely on our personal knowledge and vicarious information (e.g., authority of a source) or simply base our judgements on traditional information providers such as journalists and experts (Flanagin & Metzger, 2000). But it is often the case that source information is provided but difficult to disambiguate because online content is often co-produced, edited, and migrated from one website to another such that multiple sources are involved in the information delivery process (Fritch & Cromwell, 2002; Metzger, 2007). Therefore, we often evaluate the trustworthiness of information by checking whether media platforms that provide the information in a central location are trustworthy or not (e.g., Morris, Counts, Roseway, Hoff, & Schwarz, 2012).

Applied to the context of the current research, it is predicted that the credibility of Alexa’s information may differ based on which media platform is attributed as the source. Specifically, this study examines whether users’ perceived credibility of Alexa’s information varies as a function of two types of media platform – online news vs. online forum sites – that substantially differ in terms of 1) expertise of gatekeepers and 2) similarity between gatekeepers and receivers. Among various types of media platforms available online, online news and forums
are particularly tested in this study not only because they are commonly used for our everyday information search online (Funk, Gottfried, & Mitchell, 2017) but they are substantially different in terms of source expertise and source-receiver homophily, both of which are critical for our information credibility assessments (McCroskey & Richmond, 1996).

**Online News vs. Online Forum**

When we search information using search engines such as Google or Bing, a vast majority of search results are sourced from news and forum websites. In fact, if you search whether drinking clear soda can ease an upset stomach on Google, you can easily find that the first few top search results are online news articles published by journalists in popular news companies such as CNN. The rest of the search result pages are often blog posts uploaded by health experts and online discussion threads created by general Internet users or laypersons. If you search different topics on other search engines, you can find a similar pattern that a majority of search results are online news stories posted by news companies, such as CNN and the New York Times, and discussion threads in online forum sites, such as Quora and Reddit.

Both of these information platforms alike serve as popular sources of information for the public and are maintained by a large group of gatekeeping forces, such as professional journalists, experts, and community members (Bruns 2005; Thurman, 2008). They cover information on a wide range of topics and the content is consumed by the mass audience (Shoemaker, Eicholz, Kim, & Wringley, 2001). However, characteristics of gatekeepers are substantially different. While information delivered through news websites is mostly created and edited by multiple professional journalists and experts in various fields, information posted on forum websites is mostly managed by general Internet users or laypeople who do not have much
professional or specialized knowledge (e.g., Cassidy, 2007; Mitchelstein, & Boczkowski, 2009; Shaw, 2012; Singer, 2006). Hence, gatekeepers who publish information on these two platforms vary in expertise (Eastin, 2001), which is one of the key predictors for perceived credibility of online information (e.g., Shoemaker, Johnson, Seo, & Wang, 2010; Slater & Rouner, 1996).

Specifically, when information is sourced from a high-expertise source such as a reputable news web site, the content is likely to be perceived as more trustworthy than the same information attributed to a low-expertise platform, such as a forum site, since gatekeepers of the expert-edited platform are considered more professional and well-informed (e.g., Eastin, 2001; Johnson & Kaye, 1998).

In addition to gatekeeper expertise, news and forum sites are also different in terms of the degree to which receivers feel psychologically close or similar to gatekeepers (e.g., Marsden, 1988; McPherson & Smith-Lovin, 1987). Specifically, we are likely to perceive gatekeepers of a layperson- or novice-edited platform (e.g., forum) as more similar to ourselves than those of a professional- or expert-edited platform (e.g., news) (Walther, Wag, & Loh, 2004) because any Internet users like ourselves can freely contribute to online forums and communicate with other users (e.g., Bickart & Schindler, 2001; Wojcieszak, 2009). Due to the open nature of online forum, it is possible that Alexa’s information brought from forum websites is likely to be considered more credible than the same information attributed to news websites since information receivers are likely to feel similar to gatekeepers of the layperson-edited platform.

**Source Expertise and Source-Receiver Homophily**

In the social psychology literature (e.g., McGinnies & Ward, 1980; Wiener & Mowen, 1986), a well-known finding is that information from a high-expertise source is often perceived
as more trustworthy and believable compared to the same information from a low-expertise source. This suggests that the credibility of information is highly affected by expertise of source, which has been also documented in many empirical studies in the domains of advertising (e.g., Amos, Holmes, & Strutton, 2008; Choi & Rifon, 2007), health communication (e.g., Eastin, 2001; Hu & Sundar, 2010; Kang & Sundar, 2016; Lee & Sundar, 2013), and online journalism (e.g., Go, Jung, & Wu, 2014; Kang, Bae, Zhang, & Sundar, 2011; Sundar & Nass, 2001).

Eastin (2001), for instance, tested whether perceptions of online health information vary as a function of source expertise by manipulating expertise into three levels: low (a high-school freshman) vs. medium (a widow of an AIDS victim) vs. high (a medical doctor, HIV specialist). Results showed that participants perceived the health information more credible when the source had high expertise about the topic than the same information provided by those who had relatively less or no expertise about the topic. Similarly, Go and her colleagues (2014) found a positive effect of source expertise on online news perceptions. They varied source expertise into two levels (low vs. high) by manipulating names of news companies (the National Enquirer vs. the Chicago Tribune). The study showed that participants rated a news story from the high-expertise source (the Chicago Tribune) as higher in quality than the same story from the low-expertise source (the National Enquirer). Extending the positive effect of source expertise to the current research, Alexa’s information is likely to be perceived as more trustworthy when it is attributed to a high-expertise platform (news) rather than a low-expertise platform (forum).

H2: Alexa’s information from news web sites will lead to greater perceptions of source expertise than the same information from forum web sites.
Interestingly, there is another body of research showing that the effect of low-expertise sources can be as good as or even better than high-expertise sources in enhancing the credibility of information (e.g., Cho, Chung, King, & Shunn, 2006; Johnson & Wiedenbeck, 2009; Nah & Chung, 2012; Wang, Walther, Pingree, & Hawkins, 2008; Wright, 2000). For instance, Wright (2000) found that perceived similarity between gatekeepers and users of an online support group increased the credibility of message. Similarly, Wang et al. (2008) reported that perceived homophily of novice users toward gatekeepers of an online forum led to greater credibility of information. Cognitive psychologists (e.g., Johnson & Wiedenbeck, 2009; King, 2007) explain that the power of non-expert source is attributed to perceived homophily between sources and receivers. When it comes to the user-Alexa interaction, it is possible that users may perceive gatekeepers of forum websites as more similar to themselves than those who run news websites.

**H3:** Alexa’s information from forum websites will lead to greater perceptions of source-receiver homophily than the same information from news websites.

In accordance with the literature discussed thus far, this study proposes that greater source expertise induced by an expert-edited platform (i.e., news) will be associated with greater perceived credibility of Alexa’s answers. Moreover, greater source-receiver homophily elicited by a layperson-edited platform (i.e., forum) will be related to greater credibility of Alexa’s information.

**H4:** Perceived a) source expertise and 2) source-receiver homophily will be positively associated with users’ perceived credibility of Alexa’s information.
Tailoring of Information Sources

Users’ source preference is different from one another. Some users may want to get news briefs from local newspapers, while others may prefer national newspapers. Although Alexa’s algorithm prioritizes popular and verified sources on the Internet for search, sources selected by Alexa may not always meet users’ needs and reflect their personal interests. For example, Alexa is programmed in a way that she uses some default sources, including Wikipedia, to search information (Edwards et al., 2014).

Although the automatic tailoring of source based on computer algorithms appears to be convenient and useful for some users, it is also possible that other users perceive that she takes away their own control over choosing the sources they prefer. Specifically, the lack of users’ input in choosing the sources of Alexa’s information is likely to create a negative perception of her answers. A possible way to mitigate such a negative perception would be to restore and boost their agency through a customization feature (Marathe & Sundar, 2010) such that users can play a proactive role in deciding the sources to use for search. Being able to change the source settings to reflect their personal interests, users may feel greater control over their interaction with Alexa and even trust her information more. In fact, the agency model of customization (AMC; Sundar, 2008b) explains that a simple act of tailoring is psychologically powerful in breeding a sense of agency or self-as-source among users. Many empirical studies have also demonstrated that greater agency resulted from user’s own tailoring of digital interfaces of interactive media is positively related to users’ psychological empowerment (Stavrositu & Sundar, 2008) and their positive attitudes toward the media and their content (e.g., Anhøj & Møldrup, 2004; Marathe & Sundar, 2011; Van Straten, Cuijpers, & Smits, 2008).
Using a tailoring feature, users can easily change not only information categories but the
sources of information she delivers (i.e., user-initiated tailoring; customization) (Sundar &
Marathe, 2010), and such a simple act of customization does affect users’ motivations, attitudes,
and future actions as well (e.g., Jia, Wu, Jung, Shapiro, & Sundar, 2012; Sundar & Marathe,
2010). As Adomavicius and Tuzhilin (2005) noted, customization brings great value to users
since they can continually input their changing preferences since the system offers more tailored
services to better serve their needs. It may also lead to users’ positive attitudes toward the system
as it helps them represent their core values (e.g., Kalyanaraman & Sundar, 2006; Kang &
Sundar, 2016; Sundar & Marathe, 2010). Past research on user agency attributed users’ positive
experience with customizable interfaces to the capability of users to exercise their own control
over the information-filtering process (e.g., Bandura, 2001; Jia et al., 2012; Sundar, 2008b). If
customization indeed positively affects users’ perceptions of the system and its content, then
does the ability of users to choose the sources of Alexa’s information improve their perceived
credibility of her answers and their perceptions of Alexa itself?

Guided by theory and findings from past work, this study proposes to examine how users
perceive the credibility of Alexa’s information differently as a function of source tailoring.
Specifically, keeping Alexa’s information constant, it compares two types of source tailoring –
personalization vs. customization – that are different in terms of who or what exercises control
over the source tailoring process. If Alexa takes control over choosing sources, such a system-
initiated process of tailoring is called personalization, while the other type of tailoring process
initiated by users is called customization in the literature (Sundar & Marathe, 2010). The
following section discusses conceptual distinctions between personalization and customization
along with their psychological effects on users.
**Personalization vs. Customization**

Personalization is “a process that changes the functionality, interface, information content, or distinctiveness of a system to increase its personal relevance to an individual” (Blom, 2000, p. 313). Ho and Tam (2005) described it as a tailoring process that adapts online content and layout “to deliver the right content to the right person in the right format at the right time” (p. 96). Both of these definitions highlight that personalization is initiated by the system, which is designed to adapt the content to each user’s needs and interests (Saari, Ravaja, Laarni, Turpeinen, & Kallinen, 2004). Similarly, Serino and his colleagues (2005) describe that personalization automatically changes web pages “to accommodate individual user’s needs, interests, knowledge, goals, or tasks” (p. 1). In all, personalization focuses on the system’s role in adapting the digital interface and information, thereby emphasizing control on the part of the system.

On the other hand, user-initiated customization is conducted on the basis of users’ active inputs. Unlike personalization, users actively make changes to the content and digital interfaces according to their preferences. As AMC (Sundar, 2008b) suggests, customization enables users to explicitly express their needs and make themselves the sources of communication. That is, users initiate tailoring and actively dictate how the interfaces work and what kinds of information is delivered to them (Nielsen, 1998; Treiblmaier, Madlerger, Knotzer, & Pollach, 2004). In all, customization entails greater user agency in creating more personally relevant and useful content (Sundar & Marathe, 2010).

Extending this conceptualization, AMC (Sundar, 2008b) suggests that customization imbues among users a sense of self-as-source of their information universe, which positively
affects their psychological responses to the system in the form of greater user control over the interaction with the system, self-identity projected on to the customizable interface, and involvement in the customized content. The following section discusses each of these psychological mechanisms in detail and its mediating role in the relationship between source tailoring and perceived credibility of Alexa’s information.

**User Control, Self-identity, and Involvement**

AMC (Sundar, 2008b) explains that when users can customize digital interfaces, they are likely to perceive that they are in control of how the interfaces work. User control is one of the key aspects of interactive media that allow users to shape the nature of their interaction with the media, positively affecting their psychology (Marathe & Sundar, 2011). For example, users are likely to perceive a sense of agency when they can create a set of new voice commands for Alexa, which is called “Alexa Routines” feature. Using the Routines feature, users can create a new command like “Alexa, I am heading out,” which automatically dictates Alexa to turn off the connected smart home devices such as plugs, remote controls, locks, and lightbulbs.

One of the reasons why users perceive great control when they can customize digital interfaces is that they can dictate, predict, and modify how the interfaces operate (Marathe & Sundar, 2011). Predictability and controllability are key predictors for user control (Witmer & Singer, 1998). If users can foresee how the interfaces work, then they are likely to think that their interaction with the interfaces is under their control. Hence, if users can directly choose where Alexa brings her information from (i.e., customization), it is also likely that users feel a sense of agency over the process how Alexa operates to search information compared to those who receive Alexa’s information from the sources automatically selected by Alexa’s algorithms (i.e.,
personalization) or those who think that the sources consulted by Alexa are generic and identical to all users (i.e., no source tailoring).

Another psychological mechanism that may underlie the effect of customization is related to the basic human belief that the ego is the center, object, and norm of all experience (i.e., ego-centricity) (Zuckerman, Kernis, Guarnera, Murphy, & Rapporport, 1983). Such belief motivates humans to enhance their self-identity and express themselves in various forms (Silani, Lamm, Ruff, & Singer, 2013). As Sundar (2008b) noted, it is common these days that Internet users express their identity using customizable digital interfaces. For instance, users can easily change a background image of their Twitter feed and create a 3D avatar of themselves.

Newer customization features of virtual assistants, such as Alexa’s Routines and Music Service Preference options, have been developed to help users connect their personal preferences and needs to various components of the customizable interfaces, satisfying their inherent needs to verify their own identity (Sundar, 2008b). Alexa’s Routines feature, for example, enables users to create a variety of original voice commands on their own (e.g., “Alexa, good morning!”) and have Alexa respond to those customized commands in the way they design, such as performing a series of tailored actions for the user (e.g., an alarm goes off and the lights and TV are turned on when the user says “Alexa, good morning!”). Using this customization feature, users can craft unique ways in which Alexa responds to voice commands, which can help them project their own personality.

Moreover, users can choose what streaming services Alexa uses to play music and create their own music library that Alexa plays via the Alexa website and the mobile application. Further, the music service preference setting allows users to block Alexa from playing music
with explicit lyrics (which is called “explicit filter”) by saying “Alexa, block explicit songs.” When users are provided with the customization features, they are likely to use them to change Alexa’s interfaces in the ways that match their preferences and feel unique and distinct from other users (e.g., Kang & Sundar, 2016). Similarly, actions of projecting their own identity or persona to the interfaces of Alexa website are likely to encourage users to feel that they are the sources of interaction with the virtual assistant, thereby enhancing perceived self-identity articulated on the interface.

When users are able to express themselves on digital interfaces through customization, they are also likely to perceive their interaction with the interfaces as more gratifying than the generic ones that do not support any tailoring feature (e.g., Kang, Sundar, Kim, & Bae, 2009). As modern digital devices offer more options for customization, users are likely to easily find their self-identity reflected on the customized interfaces (Sundar, 2008b). Applied to the context of the current study, user-initiated source customization feature of Alexa may help users better present themselves in a unique manner from other users, encouraging them to perceive greater identity expressed on the customized interface of the Alexa website compared to those who interact with a personalized or non-tailoring version of the interface. Moreover, an extension of this would be a feeling that Alexa is the user’s alter ego, making users feel closer to Alexa when the interface is customizable.

Lastly, studies based on AMC (Sundar, 2008b) suggest that a sense of agency or control that users perceive from customization is positively associated with users’ perceived involvement with the tailored information resulted from the customization. Greater involvement can be characterized by “a high number of conscious bridging experiences, connections, or personal references per minute that the viewer makes between his own life and the stimulus”
(Krugman, 1965, p. 355). This suggests that users’ own choosing of sources of Alexa’s information is likely to increase the degree to which users attend to information and relate their personal experiences to it (Kang & Sundar, 2016). When applied to the context of user-Alexa interaction, users who can choose their preferred sources are likely to be more involved with Alexa’s information because tailored information may have deep personal meaning to them. Moreover, greater involvement with Alexa’s information may translate into cognitive engagement in the form of increased interest, focus, and curiosity in the content (Agarwal & Karahanna, 2000). Based on this rationale, it is possible that users who can customize the sources of Alexa’s information will be more involved in the content of her information compared to those who receive the same information from the sources selected by Alexa and those who experience no source tailoring at all.

Further, when digital interfaces afford users the ability to customize, it has powerful psychological effects, not only on users, but on users’ perceptions of information encountered in the interaction. The Modality-Agency-Interactivity-Navigability model (MAIN; Sundar, 2008a) explains that if digital interfaces provide users greater control, then it is more likely that they perceive the given information to be high in quality and credibility. It also argues that when users can express his or her personal identity through interactive media, their credibility evaluations of information provided by the media is enhanced. Moreover, it suggests that if users can find that interactive media respond to users’ input reflecting their personal interests in real time and therefore the information output is high in relevance and specificity, then they are likely to perceive the content highly accurate and trustworthy.

Extending theoretical rationales of AMC (Sundar, 2008b) and the MAIN model (Sundar, 2008a) as well as relevant research on source tailoring, the current study predicts a positive effect
of source customization on users’ psychology, which in turn affects perceived credibility of Alexa’s information.

H5-7: Users in the customization condition will perceive a highest level of user control over their interaction with Alexa (H5), self-identity projected on to the customizable interface of the Alexa website (H6), and greater involvement in Alexa’s information (H7) than those in the personalization and control conditions.

H8a-c: Greater a) user control, b) self-identity, and c) involvement will be positively related to greater perceived credibility of Alexa’s information.

Moreover, past research on information credibility (e.g., Johnson, Trocivia, & Potrick, 1968; Lafferty, Goldsmith, & Newell, 2002; Simons, Berkowitz, & Moyer, 1970) has found a positive relationship between information credibility and receivers’ various psychological responses, such as attitudes and behavioral intentions. Those studies assumed attitudes and behavioral intentions as psychological outcomes that follow when certain information is perceived as highly credible. For example, Johnson et al. (1968) manipulated the credibility of messages (low vs. high) and examined whether message receivers changed their attitudes toward the messages as a function of message credibility. As predicted by past research on message credibility (e.g., Hovland, Janis, & Kelley, 1953), they found that message credibility was positively related to their willingness to accept the messages and change their attitudes. Another study by Lafferty and her colleagues (2015) showed a similar finding that perceived credibility of advertisement messages was positively related to message receivers’ attitudes and their behavioral intentions toward the advertised products. Taken as a whole, past research suggests that the credibility of information is likely to affect attitudes, behavioral intentions, and trust.
H9a-c: Perceived credibility of Alexa’s information will be positively associated with a) attitudes, b) behavioral intentions toward, and c) trust in Alexa.

Further, the effect of source tailoring on users’ psychology does not appear in isolation from the effect of media platform. Whenever users tailor the sources of Alexa’s information, they are given not only the ability to exert agency over their interaction with Alexa, but several options to specify what news and forum websites to be used for search. Thus, it is possible that the hypothesized effect of source tailoring on users’ credibility of Alexa’s information significantly differ by media platform. Or, another possibility is that the predicted effect of source tailoring on the credibility of Alexa’s information is not contingent upon the types of media platform. Therefore, the effect of source tailoring on users’ perceptions of Alexa’s information is likely to occur along with the effect of media platform, which will be answered by the following research question:

RQ1: Will there be a two-way interaction effect between source tailoring and media platform on users’ perceived credibility of Alexa’s information?

Given the increasing use of virtual assistants like Alexa for information search these days, it is important to investigate how users perceive information delivered by Alexa and react to the virtual assistant. Informed by theoretical frameworks and prior research, the current research addresses the following key questions using a lab-experiment: Does source attribution lead users to trust information provided by Alexa more, leading to more positive attitudes and greater behavioral intentions toward the virtual assistant? Does the effect of source attribution vary by media platform (i.e., news vs. forum)? Plus, do users’ perceptions of Alexa’s
information and the virtual assistant vary by source tailoring (i.e., personalization vs. customization)?
Chapter 3

METHOD

To address the proposed hypotheses and research question (Figure 1-3), a laboratory experiment was conducted using a 2 (media platform: news vs. forum) × 2 (source tailoring: personalization vs. customization) + 1 (control: no source tailoring) mixed-factorial design. Media platform served as a within-subjects factor, while source tailoring served as a between-subjects factor.

Figure 1. Study Model 1

Figure 2. Study Model 2

Figure 3. Study Model 3
Pre-test

Before running the lab experiment, an online pre-test was conducted. The goal of this pre-test was to choose some questions that participants would ask Alexa and the answers that Alexa would give to them. First of all, two criteria suggested by Hovland and Weiss (1951) were used to select topics for the questions. Specifically, Hovland and Weiss (1951) suggested that when testing the effect of information sources on credibility, it is important to choose topics that are not only of great interest to information receivers, but also controversial in nature. By choosing topics that are highly controversial and interesting, a fairly even division of opinion about the topics among receivers can be obtained (Hovland & Weiss, 1951). Moreover, plausibility of argument is another key factor that affects credibility assessments (e.g., Flanagin & Metzger, 2007; Mercer, 2004; Metzger, 2007). That is, the degree to which information receivers think that the content of information is likely, valid, or acceptable can affect the extent to which they trust information.

Since the main experiment was conducted using a college student sample, three topics that were likely to be considered controversial, interesting, and plausible to college students were selected: education, health, and sports. After choosing the topics, eight sub-topics that also met the selection criteria (i.e., controversial, interesting, and plausible) were selected for each of the three topics, which resulted in a total of 24 different sub-topics for the pre-test (Appendix A). Given that participants would ask one question at a time to Alexa and then Alexa would give her answer to that question, 24 different pairs of questions and answers were created using the 24 sub-topics. All the questions and answers used in the pre-test were pertinent to the three topics (i.e., education, health, and sports) that college students would be interested in and consider plausible yet controversial so that they raise questions about the sources of information. As a
result of the pre-test, four sub-topics for each of the three topics were selected and used in the main experiment.

In the pre-test, participants were asked to evaluate the 24 pairs of questions and answers in terms of controversial-ness, personal interest, and plausibility. Specifically, participants were shown a single pair of a question and an answer at a time and then asked to indicate the degree to which they thought the question and answer were perceived as controversial, interesting, and plausible on a 10-point scale (1=not at all, 10=extremely). The order of presenting the question-and-answer pairs was randomized to avoid order effects.

A total of 50 participants (N=50) were recruited from Turk Prime (TP), a third-party platform for performing crowdsourced research using its own panel members (i.e., Turk Prime Panels). TP was chosen over Amazon Mechanical Turk (AMT) because it collects data outside of AMT with a broader and larger population. In particular, TP can recruit participants based on selection criteria that researchers specify, such as demographics. Therefore, the pre-test was conducted using TP panel members whose age was between 18 and 25, which was the same as that of the main experiment’s sample.

To analyze the pre-test data, bivariate correlations of perceived controversial-ness (C), personal interest (I), and plausibility (P) for each of the 24 pairs of questions and answers were checked (Table 1). Results showed that C was positively correlated with I in all sub-topics, suggesting that the more controversial each set of question and answer was, the more interesting. P was also positively related to I in a majority of the cases (except for seven sub-topics), meaning that the more plausible each set of question and answer was, the more interesting.
Table 1. Correlation matrix of Alexa Q&A sub-topics

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<thead>
<tr>
<th>Vision</th>
<th>C</th>
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<th>Small Meals</th>
<th>C</th>
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Based on the bivariate correlation results, a series of multiple regression analyses were conducted with C and P as the independent variables and I as the dependent variable (Table 2). Results showed that C was a significant predictor of I in 20 out of the 24 sub-topics, while P significantly predicted I in 17 out of the 24 sub-topics. Of all the cases where both C and P significantly predicted I (n=13), C rather than P was a relatively stronger predictor of I in 7 out of 13 cases (see the column for beta values in Table 2).

Table 2. Controversial-ness (C) and plausibility (P) predicting personal interest (I) in Alexa’s Q&A sub-topics

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<th>SE</th>
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<td>R² = .36, F for change in R² = 14.14***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_Grey hair</td>
<td>.443</td>
<td>.132</td>
<td>.361**</td>
</tr>
<tr>
<td>P_Grey hair</td>
<td>.554</td>
<td>.129</td>
<td>.461***</td>
</tr>
<tr>
<td>R² = .39, F for change in R² = 17.42***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_Vision</td>
<td>.552</td>
<td>.128</td>
<td>.471***</td>
</tr>
<tr>
<td>P_Vision</td>
<td>.353</td>
<td>.115</td>
<td>.335**</td>
</tr>
<tr>
<td>R² = .36, F for change in R² = 15.28***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_Stomachache</td>
<td>.083</td>
<td>.137</td>
<td>.074</td>
</tr>
<tr>
<td>P_Stomachache</td>
<td>.507</td>
<td>.144</td>
<td>.431**</td>
</tr>
<tr>
<td>R² = .19, F for change in R² = 6.48**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_Nails</td>
<td>.431</td>
<td>.139</td>
<td>.371**</td>
</tr>
<tr>
<td>P_Nails</td>
<td>.403</td>
<td>.137</td>
<td>.351**</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>SE</td>
<td>β</td>
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<tr>
<td>--------------------------</td>
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</tr>
<tr>
<td><strong>Education-related Sub-topics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_Wet clothes</td>
<td>.259</td>
<td>.100</td>
<td>.276*</td>
</tr>
<tr>
<td>P_Wet clothes</td>
<td>.564</td>
<td>.094</td>
<td>.637***</td>
</tr>
<tr>
<td>R² = .24, F for change in R² = 8.51**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_Multiple meals</td>
<td>.361</td>
<td>.109</td>
<td>.328**</td>
</tr>
<tr>
<td>P_Multiple meals</td>
<td>.554</td>
<td>.098</td>
<td>.565***</td>
</tr>
<tr>
<td>R² = .42, F for change in R² = 19.25**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C_Post-ex eating</td>
<td>.424</td>
<td>.118</td>
<td>.397**</td>
</tr>
<tr>
<td>P_Post-ex eating</td>
<td>.513</td>
<td>.117</td>
<td>.487***</td>
</tr>
<tr>
<td>R² = .35, F for change in R² = 14.44***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C_Sleep learning</strong></td>
<td>.571</td>
<td>.094</td>
<td>.605***</td>
</tr>
<tr>
<td><strong>P_Sleep learning</strong></td>
<td>.301</td>
<td>.105</td>
<td>.284**</td>
</tr>
<tr>
<td>R² = .47, F for change in R² = 23.95***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C_SPEED reading</strong></td>
<td>.407</td>
<td>.119</td>
<td>.379**</td>
</tr>
<tr>
<td><strong>P_Speed reading</strong></td>
<td>.396</td>
<td>.104</td>
<td>.419***</td>
</tr>
<tr>
<td>R² = .34, F for change in R² = 14.18***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C_Brain capacity</strong></td>
<td>.620</td>
<td>.103</td>
<td>.630***</td>
</tr>
<tr>
<td><strong>P_Brain capacity</strong></td>
<td>.087</td>
<td>.098</td>
<td>.093</td>
</tr>
<tr>
<td>R² = .35, F for change in R² = 14.44***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C_Music</strong></td>
<td>.490</td>
<td>.151</td>
<td>.398**</td>
</tr>
<tr>
<td><strong>P_Music</strong></td>
<td>.160</td>
<td>.134</td>
<td>.147</td>
</tr>
<tr>
<td>R² = .19, F for change in R² = 6.31**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C_Learning styles</strong></td>
<td>.488</td>
<td>.098</td>
<td>.523***</td>
</tr>
<tr>
<td><strong>P_Learning styles</strong></td>
<td>.408</td>
<td>.100</td>
<td>.430***</td>
</tr>
<tr>
<td>R² = .41, F for change in R² = 18.53***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C_Super Bowl</strong></td>
<td>.466</td>
<td>.160</td>
<td>.359**</td>
</tr>
<tr>
<td><strong>P_Super Bowl</strong></td>
<td>.261</td>
<td>.142</td>
<td>.252</td>
</tr>
<tr>
<td>R² = .19, F for change in R² = 6.23**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C_Compression</strong></td>
<td>.364</td>
<td>.116</td>
<td>.334**</td>
</tr>
<tr>
<td><strong>P_Compression</strong></td>
<td>.527</td>
<td>.117</td>
<td>.480***</td>
</tr>
<tr>
<td>R² = .42, F for change in R² = 19.76***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C_Study spot</strong></td>
<td>.443</td>
<td>.127</td>
<td>.423**</td>
</tr>
<tr>
<td><strong>P_Study spot</strong></td>
<td>.152</td>
<td>.138</td>
<td>.134</td>
</tr>
<tr>
<td>R² = .21, F for change in R² = 7.26**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sports-related Sub-topics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C_Streching</strong></td>
<td>.639</td>
<td>.118</td>
<td>.588***</td>
</tr>
<tr>
<td><strong>P_Streching</strong></td>
<td>.139</td>
<td>.118</td>
<td>.127</td>
</tr>
</tbody>
</table>
$$R^2 = .37, F \text{ for change in } R^2 = 15.85^{***}$$

| C_Sports drink | .072 | .135 | .609 |
| P_Sports drink | .336 | .125 | .347** |

$$R^2 = .12, F \text{ for change in } R^2 = 3.66^*$$

| C_Medal | .197 | .126 | .191 |
| P_Medal | .400 | .115 | .424** |

$$R^2 = .20, F \text{ for change in } R^2 = 6.90^{**}$$

| C_Knee pain | .386 | .117 | .396** |
| P_Knee pain | .217 | .109 | .240 |

$$R^2 = .24, F \text{ for change in } R^2 = 7.84^{**}$$

| C_Pain tolerance | .428 | .132 | .374** |
| P_Pain tolerance | .409 | .126 | .372** |

$$R^2 = .29, F \text{ for change in } R^2 = 10.79^{***}$$

| C_Swimming | .240 | .132 | .215 |
| P_Swimming | .506 | .130 | .461*** |

$$R^2 = .25, F \text{ for change in } R^2 = 8.83^{***}$$

Note. $p < .05^*, p < .01^{**}, p < .001^{***}$

Lastly, a rank order of the 24 sub-topics was created for C and I, separately (Table 3).

After ranking all the sub-topics, a series of multivariate analyses of variance were run to examine if the 24 sub-topics were indeed different from each other in terms of C and I (Table 3). Post-hoc comparison results specifically show how each sub-topic is different from another (see subscripts in Table 3).

**Table 3. Ranks of Alexa Q&A Sub-topics**

<table>
<thead>
<tr>
<th>Health-related Sub-topics</th>
<th>Controversial-ness (C)</th>
<th>Personal Interest (I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-topic</td>
<td>$M (SD)$</td>
<td>Sub-topic</td>
</tr>
<tr>
<td>Vision</td>
<td>6.36 (2.27)$_1$</td>
<td>Vision</td>
</tr>
<tr>
<td>Multi-meals</td>
<td>5.92 (2.34)$_1$</td>
<td>Multi-meals</td>
</tr>
<tr>
<td>Fat tongue</td>
<td>5.75 (2.33)$_1$</td>
<td>Post-ex eating</td>
</tr>
<tr>
<td>Stomachache</td>
<td>5.46 (2.39)$_2$</td>
<td>Wet clothes</td>
</tr>
<tr>
<td>Wet clothes</td>
<td>5.44 (2.67)$_3$</td>
<td>Fat tongue</td>
</tr>
<tr>
<td>Post-ex eating</td>
<td>5.23 (2.48)$_4$</td>
<td>Stomachache</td>
</tr>
<tr>
<td>Grey hair</td>
<td>4.89 (2.36)$_5$</td>
<td>Grey hair</td>
</tr>
<tr>
<td>Nails</td>
<td>4.35 (2.45)$_6$</td>
<td>Nails</td>
</tr>
</tbody>
</table>

Wilks’ $\lambda = .53, F (7, 43) = 6.31, p < .001$ Wilks’ $\lambda = .74, F (7, 43) = 2.46, p < .05$

**Education-related Sub-topics**
### Controversial-ness (C) vs. Personal Interest (I)

<table>
<thead>
<tr>
<th>Sub-topic</th>
<th>M (SD)</th>
<th>Sub-topic</th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning styles</td>
<td>6.41 (2.48)</td>
<td>Brain capacity</td>
<td>7.09 (2.25)</td>
</tr>
<tr>
<td>Sleep learning</td>
<td>6.29 (2.08)</td>
<td>L-R brain</td>
<td>6.96 (2.36)</td>
</tr>
<tr>
<td>Note-taking</td>
<td>6.00 (2.04)</td>
<td>Sleep learning</td>
<td>6.82 (2.21)</td>
</tr>
<tr>
<td>L-R brain</td>
<td>5.84 (2.35)</td>
<td>Note-taking</td>
<td>6.79 (2.11)</td>
</tr>
<tr>
<td>Study spot</td>
<td>5.62 (2.00)</td>
<td>Music</td>
<td>6.44 (2.50)</td>
</tr>
<tr>
<td>Music</td>
<td>5.47 (2.28)</td>
<td>Learning styles</td>
<td>6.26 (2.34)</td>
</tr>
<tr>
<td>Brain capacity</td>
<td>5.44 (2.39)</td>
<td>Study spot</td>
<td>6.25 (2.27)</td>
</tr>
<tr>
<td>Speed reading</td>
<td>4.97 (2.53)</td>
<td>Speed reading</td>
<td>6.18 (2.39)</td>
</tr>
</tbody>
</table>

Wilks’ $\lambda = .75, F(7, 43) = 2.40, p < .05$  
Wilks’ $\lambda = .77, F(7, 43) = 2.05, p < .05$

### Sports-related Sub-topics

<table>
<thead>
<tr>
<th>Sub-topic</th>
<th>M (SD)</th>
<th>Sub-topic</th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee pain</td>
<td>6.21 (2.25)</td>
<td>Knee pain</td>
<td>6.40 (2.04)</td>
</tr>
<tr>
<td>Stretching</td>
<td>6.14 (2.24)</td>
<td>Stretching</td>
<td>6.28 (2.46)</td>
</tr>
<tr>
<td>Swimming</td>
<td>5.78 (2.41)</td>
<td>Compression</td>
<td>6.16 (2.64)</td>
</tr>
<tr>
<td>Compression</td>
<td>5.58 (2.02)</td>
<td>Medal</td>
<td>6.11 (2.22)</td>
</tr>
<tr>
<td>Super bowl</td>
<td>5.57 (2.24)</td>
<td>Swimming</td>
<td>6.04 (2.45)</td>
</tr>
<tr>
<td>Medal</td>
<td>5.27 (2.60)</td>
<td>Pain tolerance</td>
<td>5.93 (2.48)</td>
</tr>
<tr>
<td>Sports drink</td>
<td>4.92 (2.30)</td>
<td>Super bowl</td>
<td>5.84 (2.59)</td>
</tr>
<tr>
<td>Pain tolerance</td>
<td>4.72 (2.26)</td>
<td>Sports drink</td>
<td>5.72 (2.23)</td>
</tr>
</tbody>
</table>

Wilks’ $\lambda = .63, F(7, 43) = 3.55, p < .01$  
Wilks’ $\lambda = .79, F(7, 43) = 1.68, p < .01$

*Note.* Means with no subscript in common differ at $p < .05$ using the post-hoc comparisons.

Using the rank data in Table 3, four sub-topics that were highly ranked on both criteria (i.e., C and I) were selected and used in the main experiment. To choose such sub-topics that were not only controversial but interesting, the top 4 sub-topics in C and I ranks were first examined.

For example, *education*-related sub-topics like “Sleep learning” and “Note-taking” were in the top 4 of both criteria (i.e., C and I) (Table 3), and therefore these sub-topics were selected and used in the main experiment. However, “Learning styles” was ranked the highest in C, but in the middle in I. In this case, an average rank of this sub-topic was calculated. To calculate the average rank of that sub-topic, post-hoc comparison results were used (Table 3). Specifically, the
results showed that controversial-ness of “Learning styles” was not statistically different from “Sleep learning” and “Note-taking,” as was indicated by the same subscript of “1” for these three sub-topics (i.e., learning styles, sleep learning, and note-taking) in Table 3. This means that these sub-topics were all ranked the same (i.e., raked “1”) in terms of controversial-ness, but differed from other sub-topics like “L-R brain” (see the subscript of “2” for this sub-topic) and “Study spot” (see the subscript of “3”). As for personal interest of “Leaning styles,” it was ranked third (see the subscript of “3”). Given that “Learning styles” was ranked “1” in controversial-ness and “3” in personal interest, the average rank of that sub-topic is “2.”

Given that four sub-topics were needed for each of the three topics (i.e., education, health, and sports) for the main experiment, two more education-related sub-topics were selected. To choose two more sub-topics, average ranks of all the other sub-topics were checked, including “L-R brain” (the average rank of “1.5”), “Study spot” (the average rank of “3.5”) and “Brain capacity” (the average rank of “3”). By comparing average ranks of all the remaining education-related sub-topics, it was found that “Learning styles” and “L-R brain dominance” showed higher average ranks compared to the other sub-topics, and therefore those two sub-topics were selected and used in the main experiment. The same procedure was applied to other topics (i.e., health and sports).

Procedure

The main experiment consisted of two parts: 1) completing a pre-questionnaire and 2) participating in a lab experiment (Figure 4). First of all, any individuals who were interested in participating in this study were asked to complete a pre-questionnaire in which their general news reading habits and preferences were captured (Appendix B). This pre-questionnaire was
designed to give an impression to participants, especially those who were later assigned to the personalization condition, that their personal interests were captured and taken into consideration when Alexa selects some sources for information search. However, none of their responses was in fact used to design the experimental stimuli of this study.

In the pre-questionnaire, participants reported how closely they follow news about various topics (i.e., health, education, sports, business, politics, science, and entertainment) and how often they get news from various sources (i.e., news organizations, friends/family, social media, and online communities). They were also asked to list 3 websites they visit to get news every day and 3 websites they recommend to their friends and family to get news. When participants completed the pre-questionnaire, they were directed to an online scheduling site to sign up for an upcoming lab experiment. Once they scheduled an appointment, a confirmation email was sent to each participant.

The lab experiment was administered to participants individually. Participants explored the Alexa website with the degree to which they could tailor the sources of Alexa’s information varied according to random assignment (i.e., customization vs. personalization vs. no tailoring). After exploring the stimulus website, participants filled out an online questionnaire in which they were asked their thoughts about the stimulus site that they had explored (i.e., user control and self-identity).

Once participants answered the questions about the stimulus website, they underwent two rounds of voice interaction with Alexa and reporting their perceptions of the interaction. In the first round, participants asked a total of 6 questions to Alexa (one question at a time) and the virtual assistant answered the questions. In particular, her answers were particularly sourced from one of the media platforms under study (e.g., news). After asking the first six questions to
Alexa, participants reported their thoughts about the media platform that was used to source Alexa’s answers (i.e., source expertise and source-receiver homophily) and their perceptions about the virtual assistant and her answers (i.e., the credibility of Alexa’s information, their attitudes, behavioral intentions toward, and trust in Alexa) using the online questionnaire. This completed the first round of the voice interaction with Alexa.

The second round was identical to the first, with the only difference being that Alexa sourced her answers from the other media platform (e.g., forum). After participants finished the second round, they were additionally asked some questions about themselves (i.e., demographics, power usage, political views, and prior virtual assistant usage experience) using the online questionnaire. After they completed the questionnaire, they were thanked for their participation, quickly debriefed about the study, and dismissed. Each lab session lasted about 50-55 minutes.

Figure 4. Procedure of the main (lab) experiment
Participants

One hundred and seventy-eight participants were recruited from undergraduate communication courses via e-mail announcements. All participants were provided with extra course credit for participating in this study. The study was approved by the Institutional Review Board at the Pennsylvania State University and all participants signed a consent form before participation. The sample was 72.8% female with a median age of 20. The majority of participants (73.03%) reported their race “White/Caucasian” (N=130), 10.11% reported “Asian” (N=18), 8.98% reported “Hispanic” (N=16), 5.61% reported “Black/African American” (N=10), and 2.24% reported “Others” (N=4).

Study Materials

The lab was set up like a typical living room with a TV, table, and sofa. An Echo speaker was placed on the table in the room and a first-generation Echo speaker was used in this experiment.

Alexa website. To manipulate the types of source tailoring, a stimulus website that seems almost identical to the official Alexa website by Amazon (https://alexa.amazon.com) was designed. The contents and design of the stimulus site were the same across the experimental conditions except for the source tailoring page.

The stimulus website consisted of six internal pages: 1) Home, 2) About Alexa, 3) New! Ask Alexa, 4) Music, Video, & Books, 5) Reminders & Alarms, and 6) Help & Feedback. Since the pages for entertainment, reminder/alarms, and help/feedback features were not relevant to
testing key hypotheses of this study, none of those features were activated. That is, none of the provided links were operational even though participants could view the content of each page.

“Home” (Figure 5) was a landing (i.e., front) page of the stimulus website where a brief introduction about Alexa was presented (“Using Alexa is as simple as asking a question. Just ask to play music, read the news, control your smart home, tell a joke, and more – Alexa will respond instantly”). “About Alexa” presented a short video clip introducing Alexa services for participants who were not familiar with Alexa. On “Music, Video, & Books” page, a list of entertainment services that users could synch with Alexa was shown, while “Reminders & Alarms” page provided several options to set reminder and alarms. Lastly, “Help & Feedback” page provided a link to a user guide to various Alexa services.

“New! Ask Alexa” was the page where the source tailoring manipulations occurred. For participants in the customization condition, a list of news and forum websites was shown and they were asked to choose three news sites and three forum sites from where Alexa gets her answers from. After selecting their preferred sources, they clicked “Save” to save the source settings and the saved settings were emailed to the researcher in real time (Figure 6). Frequency of each source that was selected by participants in the customization condition was as follows: for news websites, CNN (n=35), the New York Times (n=51), the Washington Post (n=27), Forbes (n=10), Fox (n=18), and the Wall Street Journal (n=12); for forum websites, Yahoo! Answers (n=51), Answers.com (n=45), Reddit (n=42), BlurtIt (n=2), Fluther (n=2), and Quora (n=11).
In the personalization condition, the same list of news and forum websites was presented but three news sites and three forum sites had been already selected by the researcher. Participants were then told that Alexa (i.e., the system) had already chosen some sources for them based on their personal interests (Figure 7). They could not make any changes to the selected sources and were asked to simply review the sources. In order to ensure personalization of the source settings, it was also noted on the source setting page that “To better answer your questions, Alexa refers to various websites including popular news and forum sites. From a list
of sites, Alexa has already selected those that might be relevant to your interests and needs.” By adding this additional description, participants were informed that Alexa obtained her information from certain sources that might be close or similar to their personal preferences rather than from the web sites that they had been captured in the pre-questionnaire.

To control source variability between the customization and personalization conditions, each participant in the personalization condition received the sources that had been selected by one of the participants in the customization condition. This way of controlling content variability across experimental conditions is called “yoking technique” (e.g., Kang & Sundar, 2016). After every session of the customization condition, the selected sources were screen captured and saved by the researcher. The saved sources were then randomly distributed to each participant in the personalization condition, and participants in the personalization condition were told that Alexa had already selected those sources that might be relevant to their interests.

In the control condition, participants were shown the same list of news and forum websites as the customization and personalization conditions but without any explanation about what specific web sites Alexa would use for search (Figure 8).

**News and forum web sites on the source list.** To choose 12 different news and forum websites that were presented on the source setting page (i.e., “New! Ask Alexa”), traffic rankings of online news and forum sites reported by Alexa.com were used. Alexa.com is an American Internet company providing commercial web traffic data analytics. Using the traffic rankings for news and forum website categories, the top six sites with a large number of unique visitors and page views for each category were selected (i.e., 6 news and 6 forum) and used in the main experiment.
According to the traffic rankings, CNN, the New York Times, the Guardian, the Washington Post, BBC, and Forbes were the top six news websites, while Yahoo! Answers, Answers.com, Reddit, BlurtIt, Fluther, and Quora were the top six forum websites that Internet users often visit to get information. Only the popular websites were used in this study in order to control the potential confounding effect of source authority on credibility judgements.

**Figure 6.** “New! Ask Alexa” page for the *customization* condition
Study instructions. In each experiment session, participants received instructions, both verbally and via textual materials (Appendix C). The researcher gave a few short verbal instructions about several tasks that participants had to complete and more details of the tasks were provided using textual instructions, which were projected on a TV screen in the lab. In particular, the scripts of textual instructions had been converted into multiple audio files using a text-to-speech conversion program and the converted audio files were played simultaneously when the corresponding scripts were presented on the TV screen.
At the beginning of each session, the first text instruction (Appendix C) was presented on the TV screen such that participants could read it, while listening to the audio recording file of that particular instruction at the same time. Participants were told that s/he would try a new feature called “Ask! Alexa,” designed to help users answer some tricky questions on popular topics like health, sports, and education. It was also mentioned that the feature was still in its experimental stage and had not been released to the public.
When the first instruction ended, the researcher guided participants to the first task, which was to explore the stimulus website for 7 minutes, using a Windows laptop. Although a mobile version of the web site could be used in this study, a desktop version was employed so that participants could easily navigate and review the site on a large screen. Participants were asked to review the content of each page of the stimulus website. While reviewing “New! Ask Alexa” page, they were asked to read the description of the new feature and then complete the source setting task depending on the condition.

Upon reviewing the stimulus site, participants were provided with an online questionnaire measuring their thoughts about the source tailoring experience. Once they finished the questions, the second textual instruction (Appendix C) about the next task was presented on the TV. The next task was to complete two rounds of voice interaction with Alexa and answer some questions using the online questionnaire. Before starting the voice interaction, participants picked 12 different random numbers between 1 and 100 and told those numbers to the researcher. Once the researcher received the numbers, she left participants to enter the numbers into the lab’s computer system (which was installed in the observation room located right next to the participant’s room; see Appendix D). Once the researcher entered the selected numbers to the system, specific questions corresponding to those numbers appeared on the TV screen – one question at a time – and participants read and asked the questions to Alexa. While they were asking questions to Alexa, the researcher stayed in the observation room such that they could better focus on the voice interaction with Alexa.

Unbeknownst to participants, however, all the questions that were presented to participants had been already selected by the researcher regardless of the numbers that participants chose. Moreover, the Echo speaker and the TV screen in the participant’s room of
the lab were connected to a desktop computer in the observation room (Appendix D) so the researcher could remotely project the questions that participants received and play the audio recordings of Alexa’s answers as if the virtual assistant was answering the questions in real time.

**Questions to and answers from Alexa.** Alexa’s answers were recorded using Alexa’s voice before the main experiment (Appendix E) and played remotely by the researcher in the observation room. Participants asked a total of 12 questions about the three topics (i.e., health, education, and sports), which included 4 questions for each topic (i.e., 4 health-related questions + 4 education-related questions + 4 sports-related questions).

**Presence (or absence) of source.** Alexa revealed or withheld the sources of her answers depending on the condition. In the customization and personalization conditions, Alexa revealed the source (e.g., “*According to the New York Times,* eating small meals multiple times will increase metabolism” or “*According to Reddit,* eating small meals multiple times will increase metabolism”). In the control condition, however, Alexa did not reveal the source of her answer (e.g., “*Eating small meals multiple times will increase metabolism*”).

**Media platform.** When Alexa revealed the sources of her information, she referred to two types of media platform: news vs. forum. Each platform was referred to with the same frequency. For example, when she answered 4 health-related questions, the first two answers were sourced from news websites (e.g., the New York Times) and the next two answers were from forum websites (e.g., Reddit) (Figure 9). To randomize the order of referring to each media platform, two possible permutations (i.e., “news-forum” or “forum-news”) were used alternately for each experiment session.
**Topics.** When users ask questions to Alexa in the real world, they change topics of their questions frequently. Given that, topics of questions to Alexa in this study also changed every two questions. For example, if a participant asked two questions about health, then the next two questions should be about a different topic (i.e., education or sports) (Figure 9). In order to randomize the order of topics, all possible orders were created (i.e., Health-Education-Sports, HSE, EHS, ESH, SHE, and SEH) and one of the six permutations (e.g., HES) was randomly selected and used for each experiment session. To ensure that each permutation is used at the same frequency, once a certain permutation was used (e.g., HES) in one session, the next session used one of the other permutations (i.e., HSE, EHS, ESH, SHE, or SHE).

![Diagram of Alexa's info from news sites and forum sites](image)

**Figure 9.** Sourcing Alexa’s answers from different media platforms

**Selected news and forum sites.** Participants in the customization and personalization conditions received information from six different websites selected by either themselves (customization) or Alexa (personalization): 3 news and 3 forum websites (for example, for News: the New York Times, CNN, and BBC, and for Forum: Reddit, Yahoo Answers, and Quora). To decide the order in which each of these selected websites is attributed to as the sources of Alexa’s answers, the first website selected for each platform (e.g., *the NYT* for news and *Reddit* for forum in the above example) was paired and labeled “source pair 1,” the second
pair was named “source pair 2” (e.g., CNN and Yahoo Answers), and the third pair was labeled “source pair 3” (e.g., BBC and Quora). All possible orders of source pairs were created (i.e., pair1-pair2-pair3, 132, 213, 231, 312, and 321) and one of the six permutations was randomly chosen (e.g., 213) and used for each experiment session.

Measurement

Manipulation checks. In order to verify the efficacy of the source tailoring manipulation, two Likert-type items (1=strongly disagree, 7=strongly agree) asked participants to indicate the degree to which they agreed that the source setting page (i.e., New! Ask Alexa page) helped them 1) choose the sources they prefer and 2) represent their personal source preferences.

To assure the efficacy of the media platform manipulation, participants were asked to recall from what web sites Alexa brought her answers. Specifically, they chose where Alexa obtained most of her answers from among the following answer options: “1=News web sites (e.g., CNN, the New York Times, the Washington Post, Forbes, Fox News, and the Wall Street Journal),” “2=Forum web sites (e.g., Yahoo! Answers, Answers.com, Reddit, BlurtIt, Fluther, and Quora),” “3=News and forum web sites,” “4=Neither news nor forum web sites,” and “5=From Amazon library.”

Dependent variables. Five items adapted from Marathe (2010) were used to measure participants’ attitudes toward Alexa. Specifically, participants were asked to report the degree to which they had positive perceptions about Alexa after their interaction with the virtual assistant using a 7-point Likert scale (1=strongly disagree, 7=strongly agree). The measurement items were: “The way Alexa delivered information to me was very involving,” “I am satisfied with the
information search service by Alexa,” “I am satisfied with the way Alexa searches information on the Web,” “The interaction with Alexa was fun,” and “Alexa that I interacted with was really cool.” Since attitudes toward Alexa were measured twice – the first time after getting Alexa’s information sourced from one of the media platforms (e.g., news) and the second time after getting Alexa’s information from the other platform (e.g., forum) – its descriptive statistics and reliability statistic are reported for each platform: for news, $M = 5.67$, $SD = 0.88$, Cronbach’s $\alpha = .81$; for forum, $M = 5.52$, $SD = 1.01$, $\alpha = .84$.

Four items from Kim and Gambino (2016) were used to measure participants’ behavioral intentions toward Alexa using a 7-point Likert scale (1=strongly disagree, 7=strongly agree). Specifically, participants were asked to indicate the degree to which they wanted to interact Alexa again and recommend Alexa to others using a 7-point Likert scale (1=strongly disagree, 7=strongly agree). Four measurement items were “I would like to use Alexa again to search information online,” “I would like to rely on Alexa next time when I search information on the Web,” “I would like to recommend Alexa to my friends and family,” and “I would like to invest my time in exploring Alexa more.” This variable was also measured for each media platform: for news, $M = 5.36$, $SD = 1.15$, $\alpha = .87$; for forum, $M = 5.25$, $SD = 1.23$, $\alpha = .87$.

Five semantic-differential items from Ohanian (1990) were used to assess participants’ trust in Alexa. Specifically, participants reported the degree to which they perceived Alexa as trustworthy using a 7-point scale. The five pairs of adjectives were: undependable—dependable, dishonest—honest, unreliable—reliable, insincere—sincere, and untrustworthy—trustworthy. This variable was also measured for each media platform: for news, $M = 5.47$, $SD = 1.03$, $\alpha = .88$; for forum, $M = 5.37$, $SD = 1.09$, $\alpha = .92$. 
Mediating variables. Ten semantic-differential items from Zaichkowsky (1985) were used to measure participants’ perceived involvement in Alexa’s information. Specifically, participants indicated the degree to which they perceived Alexa’s information was cognitively involving to them on a 7-point scale. Sample scales included “In general, Alexa’s responses were ____ to me”: irrelevant—relevant, worthless—valuable, and uninterested—interested (M = 4.83, SD = 0.87, α = .91).

Eight items modified from Marathe and Sundar (2011) were used to measure participants’ perceived control over their interaction with Alexa. Specifically, participants were asked to indicate the extent to which they were able to influence how Alexa searches information online on a 7-point Likert scale (1=strongly disagree, 7=strongly agree). Sample measures included “I was able to influence how Alexa searches information on the Web,” “I was able to adapt Alexa’s information search service in a way I wanted,” “I was able to control what information Alexa delivers to me” and “I was able to initiate actions to modify what sites Alexa uses to get information” (M = 4.57, SD = 1.45, α = .94).

Four items modified from prior research (Ball & Tasaki, 1992; Kang & Sundar, 2016; Tractinsky & Zmiri, 2006) were used to assess participants’ self-identity expressed over the course of interaction with Alexa. Specifically, participants reported the degree to which they could project their own identity projected on to the source setting page using a 7-point Likert scale (1=strongly disagree, 7=strongly agree). The measurement items included “I felt “New! Ask Alexa” web page had a personal connection to me,” and “I felt ownership toward “Ask Alexa!” web page,” “I felt “Ask Alexa!” web page represented my core personal values,” and “I felt “Ask Alexa!” web page was a true representation of who I am” (M = 4.13, SD = 1.37, α = .88).
Three items adapted from Hu and Sundar (2010) were employed to assess participants’ perceived expertise of each media platform used as the source of Alexa’s information. Specifically, participants were asked to rate the degree to which they thought the individuals who ran each platform were “experts in the fields,” “informed,” and “qualified” on a 7-point Likert scale (1=strongly disagree, 7=strongly agree). This variable was also measured twice for each platform: for news, $M = 5.80$, $SD = 1.04$, $\alpha = .86$; for forum, $M = 4.52$, $SD = 1.43$, $\alpha = .93$.

Four items adapted from McCroskey and Richmond (1996) were used to measure participants’ perceived homophily or similarity toward the media platforms. Specifically, participants were asked to indicate the degree to which they felt similar to gatekeepers of the media platforms where Alexa had pulled her answers from using a 7-point Likert scale (1=strongly disagree, 7=strongly agree). The measurement items included: It appears that the individuals who run the news (or forum) web sites where Alexa got her answers from _____: “are like me,” “are similar to me,” “behave like me,” and “think like me.” This variable was also measured for each platform: for news, $M = 4.63$, $SD = 1.03$, $\alpha = .92$; for forum, $M = 4.79$, $SD = 1.13$, $\alpha = .85$.

Six adjectives from past research on information credibility (Sundar, 1999; Sundar & Nass, 2001) were used to measure participants’ perceived credibility of Alexa’s information. Specifically, participants indicated the extent to which they agreed with they thought each adjective well described the credibility of Alexa’s information on a 10-point scale (1=not at all; 10=extremely). The adjectives included believable, accurate, unbiased, objective, fair, and sensational. This variable was also measured for each platform: for news, $M = 4.91$, $SD = 1.33$, $\alpha = .92$; for forum, $M = 4.75$, $SD = 1.34$, $\alpha = .92$. 
Table 4. Descriptive statistics of key variables by experimental condition

<table>
<thead>
<tr>
<th></th>
<th>Customization</th>
<th>Personalization</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>News</td>
<td>Forum</td>
<td>News</td>
</tr>
<tr>
<td>Credibility</td>
<td>6.05 (0.36)</td>
<td>5.87 (0.48)</td>
<td>5.58 (0.41)</td>
</tr>
<tr>
<td>Attitudes</td>
<td>5.78 (0.81)</td>
<td>5.53 (0.94)</td>
<td>5.65 (0.85)</td>
</tr>
<tr>
<td>BI</td>
<td>5.48 (1.09)</td>
<td>5.39 (1.13)</td>
<td>5.42 (1.09)</td>
</tr>
<tr>
<td>Trust</td>
<td>5.45 (1.08)</td>
<td>5.29 (1.16)</td>
<td>5.58 (0.94)</td>
</tr>
<tr>
<td>Expertise</td>
<td>5.69 (1.12)</td>
<td>4.37 (1.24)</td>
<td>5.92 (0.96)</td>
</tr>
<tr>
<td>Homophily</td>
<td>4.67 (0.87)</td>
<td>4.98 (1.26)</td>
<td>4.59 (1.17)</td>
</tr>
<tr>
<td>Control</td>
<td>5.63 (.92)</td>
<td>4.41 (1.57)</td>
<td>3.71 (1.07)</td>
</tr>
<tr>
<td>Identity</td>
<td>4.82 (.117)</td>
<td>4.30 (1.35)</td>
<td>3.30 (1.12)</td>
</tr>
<tr>
<td>Involvement</td>
<td>5.39 (.84)</td>
<td>4.88 (.65)</td>
<td>4.24 (.71)</td>
</tr>
</tbody>
</table>

Note. BI = behavioral intentions; participants in the control condition were not provided with any source details and their perceived credibility of Alexa’s answers, attitudes, BI toward and trust in Alexa were measured two times: 1) the first time when they received Alexa’s first six answers and 2) the second time when they received her next six answers. This mimics the procedure followed in the other two conditions.

Control variables. Prior research has shown that participants’ individual differences, such as power usage, prior usage experience, and political views, may affect users’ perceptions about online interfaces and their content (e.g., Kim, Lehto, & Morrison, 2007; Venkatesh, Morris, & Ackerman, 2000). Hence, the following variables were measured in the interest of statistically controlling their effects.

Twelve items from Marathe, Sundar, Bijvank, Van Vugt, and Veldhuis (2007) were used to measure participants’ self-efficacy and expertise in information technology (i.e., power usage). Participants reported the degree to which they generally rely on technology and feel
comfortable with which they use it on a 7-point Likert scale (1=strongly disagree; 7=strongly agree). Sample items included “I make good use of most of the features available in any technological device,” “Using any technological device comes easy to me,” and “I love exploring all the features that any technological gadgets offer” \( (M = 5.30, SD = 0.83, \alpha = .82) \).

Participants’ prior experience with using any virtual assistant services were measured by asking whether they had ever used any online or mobile virtual assistant services to search information online, including Siri, Amazon Echo, Google Home, Cortana, and others, using a binary answer option (No, Yes) (Yes=118, 78.1%). If they responded positively to the question, a follow-up question asked how long they had used it (in months) (Siri (72.2%; 29.69 months), Alexa (51.7%; 4.15 months), Google Home (12.6%; 3.42 months), Cortana (8.6%; 1.04 months).

Participants’ political views were measured by a single measure. Specifically, they were asked to indicate their political ideology using a 7-point scale on which the political views people might hold are arranged from 1=extremely liberal to 7=extremely conservative \( (M = 3.56, SD = 1.39) \).

**Data Analysis**

To test the efficacy of the source tailoring manipulation, a one-way analysis of variance was conducted with source tailoring as the independent variable (IV) and participants’ perceived degree of source tailoring as the dependent variable (DV) because the IV was nominal with three levels and the DV was continuous, and the hypothesized effect was directional.

To check the efficacy of the media platform manipulation, a two-way (source tailoring × participants’ recall of Alexa’s sources) chi-square test was run because both variables were
categorical. In particular, the chi-square test was used to confirm that participants who had received Alexa’s source information (i.e., participants in the personalization and customization conditions) remembered that Alexa had gotten her answers from “news and forum web sites,” and for participants who had not received Alexa’s sources (i.e., participants in the control condition), they recalled that Alexa had brought her information from “neither news nor forum sites.”

To test H1-H3 and answer RQ1, a series of mixed-model analysis of covariance (ANCOVA) were conducted, given that both IVs were nominal with two levels but one of the IVs was a within-subjects variable, while the other one was a between-subjects variable, and the DVs were continuous.

To test H4a-b and H9a-c (Study Model 2), a series of within-subjects mediation analyses were run, using the MEMORE macro (Montaya & Hayes, 2017). The MEMORE is a macro for SPSS that estimates the total, direct, and indirect effects of IV on DV through one or more mediators in the two-condition within-subjects design. This macro is designed to estimate specific indirect effects of independent variables on dependent variables in statistical models that include up to 10 mediating variables that operate in a parallel or serial manner (Montoya, 2016; Montoya & Hayes, 2017). When specifying mediation models for analysis using this macro, it should be noted that “the data file for a within-subjects design mediation analysis does not include a column for the independent (X) variable” (Montoya, 2016, p. 2) and therefore there is “no specification of the X variable in the MEMORE code” (p. 2). The independent variables are instead represented in the data set by repeated measurements of the mediating variables and dependent variables. Further, it is important to note that the macro estimates the indirect effects based on the difference scores between the mediator measurements and the differences between
the dependent variable measurements. For example, if a participant receives Alexa’s information from news websites and forum websites consecutively, and their measurements of a mediator (e.g., source expertise) and a dependent variable (e.g., perceived credibility of Alexa’s information) are followed right after each media platform, the mediator measurements would be recorded as “mv news” and “mv forum” and the dependent variable measurements as “dv news” and “dv forum” in the data file. The macro would then construct the different scores as “mv news - mv forum” and “dv news - dv forum” and use the differences for estimating the indirect effects.

Using this macro, a parallel mediation analysis was employed to test H4a-b in the current study, while a serial mediation analysis was performed to test H9a-c.

To test H5-H7, a one-way multivariate analysis of covariance (MANCOVA) was run because the IV was nominal with three levels and the DV was continuous. Lastly, for H8a-c and H9a-c (Study Model 3), a phantom model analysis was performed to test significance of the hypothesized individual mediators when the multiple mediators were present.

When running some of the above analyses involving the mediating variables related to media platforms (i.e., source expertise and source-receiver homophily), cases in the control condition were excluded from the analyses because Alexa did not reveal the sources of her answers and thus neither platform was attributed to in Alexa’s answers.
Chapter 4

RESULTS

This chapter first reports the efficacy of the source tailoring and media platform manipulations, followed by the findings from a series of mixed-model ANCOVAs that tested whether the presence of source affected participants’ perceptions of Alexa’s answers and the virtual assistant. Moreover, a set of mediation analyses are reported that examined the indirect effect of media platform on the perceptions of Alexa’s information and the virtual assistant through source expertise and source-receiver homophily. Further, results from a series of MANCOVAs that investigated how different types of source tailoring affected the perceptions of Alexa’s information and the virtual assistant are reported. Lastly, results of phantom modeling analyses testing the indirect effect of source tailoring on participants’ attitudes, behavioral intentions toward, and trust in Alexa via distinct psychological mechanisms are reported.

Manipulation Checks

Source tailoring. A one-way ANOVA with source tailoring as the IV and participants’ perceived tailoring of Alexa’s sources using the source setting page of the Alexa website as the DV showed a significant main effect for source tailoring, $F (2, 148) = 58.68, p < .001, \eta_p^2 = .44$. Bonferroni post-hoc comparisons showed that participants in the customization condition ($M = 5.54, SE = .19$) compared to those in the personalization condition ($M = 3.37, SD = .18$) were more likely to agree that the source tailoring page allowed them to change Alexa’s sources and represent their personal interests and tastes ($p < .001$). The difference between the customization condition and the control condition ($M = 2.84, SD = .18$) was significant ($p < .001$) so was the
difference between the personalization condition and the control condition \((p < .05)\). In sum, the manipulation of source tailoring was successful.

**Media platform.** A 3 (source tailoring: customization, personalization, and no tailoring) \(\times 5\) (participant’s recall of Alexa’s information sources: news websites, forum websites, news and forum websites, neither news nor forum websites, and Amazon library) chi-square test was run to examine whether participants correctly remembered what media platforms Alexa used as the sources of her answers as a function of source tailoring. Simply put, this chi-square test was used to check if participants who were provided with Alexa’s source (i.e., participants in the personalization and customization conditions) recalled that Alexa had gotten her answers from “news and forum websites,” and if participants who were not given with Alexa’s source information (i.e., those in the control condition) remembered that Alexa had pulled her answers from “neither news nor forum websites.”

Results showed that participants’ memory of Alexa’s sources was significantly different as a function of source tailoring, \(\chi^2(6, N=165) = 151.45\), Cramer’s \(V = .68\), \(p < .001\). Holm’s sequential bonferroni post-hoc comparisons showed that a significantly larger percentage of participants in the customization condition (47.1%) (where Alexa’s sources were disclosed) than those in the control condition (3.8%) (where the source information was hidden) remembered that Alexa’s information was brought from “news and forum websites” \((p < .001)\). Similarly, the difference in participants’ memory of Alexa’s sources between the personalization condition (49.0%) and the control condition (3.8%) was also significant \((p < .001)\). But the differential between the personalization condition (49%) and the customization condition (47.1%) was not significant \((p = .29)\). Moreover, all participants who were not provided with Alexa’s source information (i.e., those in the control condition) correctly remembered that Alexa had brought
her information from “neither news nor forum websites.” In all, the manipulation of media platform was successful.

**Presence of Alexa’s Sources**

H1 predicted that the presence of Alexa’s sources would lead to greater credibility of Alexa’s information than the same information with the sources hidden. A mixed-model ANCOVA with the presence (or absence) of sources and types of media platform as the IVs, participants’ credibility of Alexa’s information as the DV, and participants’ prior VA usage experience, political views, and power usage as the control variables found a main effect for the presence of Alexa’s sources, $F(1, 146) = 1207.61, p < .001, \eta^2_p = .89$. Specifically, participants who received Alexa’s answers with the sources perceived the information as more credible ($M = 5.71, SE = .04$) than those who received the same information without the sources ($M = 3.10, SE = .06$), thus supporting H1. No other main or interaction effects were significant, $F < .07$, all other $p > .80$.

**Perceived Source Expertise and Source-Receiver Homophily**

H2 predicted that Alexa’s information from news websites would lead to greater perceptions of source expertise compared to the same information from forum websites. A mixed-model ANCOVA was conducted with source tailoring and media platform as the IVs, source expertise as the DV, and participants’ prior VA usage experience, political views, and power usage as the control variables. Importantly, when running this analysis, all cases in the control condition were excluded because Alexa did not pull her answers from either news or forum websites and thus attributed no source. Given that, the analysis was run using the cases in the customization and personalization conditions only. Results showed a significant main effect
for media platform on source expertise, $F (1, 95) = 5.99, p < .05, \eta_p^2 = .06$. When participants received Alexa’s answers from news websites ($M = 5.81, SE = .11$), they were more likely to perceive gatekeepers of news websites were well-informed and experts in the fields (i.e., source expertise) compared to those of forum websites ($M = 4.51, SE = .14$), supporting H2.

Similarly, H3 predicted that Alexa’s information sourced from forum websites would have greater source-receiver homophily than the same information from news websites. A similar ANCOVA with the same IVs and control variables, but with source-receiver homophily, used the cases in the customization and personalization conditions only for the same reason for data analysis for H2. Results revealed no main effect for media platform on source-receiver homophily, $F (1, 95) = .94, p = .33, \eta_p^2 = .01$. Specifically, when Alexa brought her answers from news websites, participants expressed similar levels of agreement that gatekeepers of news websites would be similar to themselves (i.e., source-receiver homophily) ($M = 4.63, SE = .10$) compared to when Alexa brought her answers from forum websites ($M = 4.79, SE = .11$), thus rejecting H3.

H4 predicted that a) source expertise and b) source-receiver homophily would be positively related to credibility of Alexa’s information. To test these hypotheses, a parallel mediation analysis with media platform as the within-subjects IV, source expertise and source-receiver homophily as the parallel mediators, and credibility as the DV, using the MEMORE macro (Montoya & Hayes, 2017). Results showed that both source expertise ($b = .12, SE = .04, p < .01$) and source-receiver homophily ($b = .13, SE = .04, p < .01$) were significantly related to credibility of Alexa’s answers, supporting H4a and H4b. Additionally, the analysis revealed a significant indirect effect of media platform on credibility via expertise ($b = .16, SE = .05, 95\% \text{ BcCI} = .0625, .2697$), but not via homophily ($b = -.02, SE = .05, 95\% \text{ BcCI} = -.0552, .0034$).
Specifically, when participants received Alexa’s answers from news websites, they felt greater source expertise compared to the same answers from forum websites, which in turn led to greater credibility of her answers.

H9a-c described in Figure 2 predicted that credibility of Alexa’s information would be positively related to participants’ a) attitudes, b) behavioral intentions toward, and c) trust in Alexa. A set of serial mediation analyses were conducted using the MEMORE macro (Montoya & Hayes, 2017). Notably, the indirect effect route from media platform to the DVs via source-receiver homophily and credibility was not tested based on non-significance of the path from media platform to credibility via homophily (H4b). The analysis showed that credibility of Alexa’s information was not significantly related to attitudes ($b =-.13, SE =.15, p =.38$) and trust ($b =.13, SE =.16, p =.42$), but it was significant for behavioral intentions toward Alexa ($b =.19, SE =.13, p <.05$). Also, the overall indirect effect of media platform on behavioral intentions via expertise and credibility was significant ($b =.03, SE =.02, 95\% \text{ BcCI } = .001, .0987$). The indirect effects to attitudes ($b =-.02, SE =.04, 95\% \text{ BcCI } = -.1154, .0362$) and trust ($b =.02, SE =.04, 95\% \text{ BcCI } = -.0337, .1205$) were not significant.

To answer RQ1 that examined a two-way interaction effect between media platform and source tailoring on credibility of Alexa’s information, a mixed-model ANCOVA with media platform and source tailoring as the IVs, credibility as the DV, and prior VA usage experience, political views, and power usage as the control variables was run. The analysis showed a significant main effect for source tailoring, $F (1, 95) = 34.61, p < .001, \eta_p^2 = .27$, but neither a main effect for media platform, $F (1, 95) = .04, p = .84, \eta_p^2 = .00$, nor an interaction effect, $F (1, 95) = .04, p = .83, \eta_p^2 = .00$. That is, when participants were able to customize Alexa’s sources, they perceived Alexa’s answers as more credible ($M = 5.96, SE = .06$) compared to those who
simply received a personalized list of Alexa’s sources \((M = 5.48, SE = .06)\). But such source tailoring effect did not vary as a function of media platform.

**User Control, Self-identity, and Involvement**

H5-H7 predicted that participants who customized Alexa’s sources would perceive greater control over their interaction with Alexa (H5), their self-identity projected on to the source tailoring page of the Alexa website (H6), and involvement with Alexa’s information (H7) compared to those who received a personalized list of Alexa’s sources or those who did not experience any kind of source tailoring.

A one-way MANCOVA with source tailoring as the IV, user control, self-identity, and involvement as the DVs, and prior VA usage experience, political views, and power usage as the control variables was conducted. The analysis revealed a significant main effect for source tailoring, Wilk’s \(\lambda = .96, F(3, 143) = 16.30, p < .001, \eta_{p}^2 = .26\). Specifically, participants in the customization condition perceived a significantly higher level of user control over their interaction with Alexa \((M = 5.65, SE = .17)\) followed by those in the personalization condition \((M = 4.34, SE = .17)\) and the control condition \((M = 3.77, SE = .17)\), \(F(2, 145) = 32.20, p < .001, \eta_{p}^2 = .31\), thus supporting H5. The analysis also revealed that participants in the customization condition \((M = 4.83, SE = .17)\) showed a significantly higher level of self-identity projected on to the source tailoring page compared to those in the personalization condition \((M = 4.26, SE = .17)\) and the control condition \((M = 3.34, SE = .17)\), \(F(2, 145) = 18.70, p < .001, \eta_{p}^2 = .21\), supporting H6. A similar pattern was found for involvement in Alexa’s information, that is, participants in the customization condition \((M = 5.38, SE = .10)\) showed a significantly higher level of involvement in Alexa’s information than those in the personalization condition \((M = 4.82, SE = .10)\).
= .10) and the control condition ($M = 4.30, SE = .10$), $F (2, 145) = 29.50, p < .001, \eta^2_p = .29,$ supporting H7.

H8a-c predicted that perceived a) control, b) self-identity, and c) involvement would be positively associated with credibility of Alexa’s information. Additionally, H9a-c in Figure 3 predicted that credibility of Alexa’s information would be positively associated with participants’ a) attitudes, b) behavioral intentions toward, and c) trust in Alexa. Given that these hypotheses proposed to test significance of the multiple mediators that simultaneously induce distinctive effects on attitudes, behavioral intentions, and trust toward Alexa, the phantom model approach in structural equation modeling (Macho & Ledermann, 2011; Rindskopf, 1984) was employed such that all the paths were tested as a whole, and all mediators were operated at the same time. By running the phantom model analysis, the effects of the multiple mediators in the model were tested at once.

Before conducting the phantom model analysis, zero-order correlations of all the variables in the phantom model were checked (Appendix F). All the correlations were consistent with the hypothesized directions at statistically significant level of .05 or .01.

**Item Parceling**

In the interest of parsimony of the phantom model, item-parceling technique (Hall, Snell, & Foust, 1999) was used for latent variables with five or more observed measures. Specifically, parcels were created using a content-based parceling technique by which measurement items were assigned to parcels such that each parcel constitutes a “theoretically meaningful cluster” (Matsunaga, 2008, p. 287). This technique was applied to all latent factors with five or more items and three parcels were created per factor, following Matsunaga (2008)’s recommendation.
After item parceling was completed, *user control* had three parcels labeled as “operation,” “selection,” and “tailoring,” *involvement* had three parcels named “importance,” “practicality,” and “essence,” *credibility of Alexa’s answers* had three parcels called “veracity,” “plausibility,” and “impartiality,” *attitudes toward Alexa* had three parcels named “entertaining,” “satisfying,” and “involving,” *trust in Alexa* had three parcels called “earnest,” “accurate,” and “faithful,” and *power usage* had three parcels labeled as “easy use,” control by humans,” and “control by technology.” (Appendix G)

**The Phantom Model**

To construct the phantom model (Figure 10-11), the IVs were first dummy-coded as “0=the control condition” and “1=the customization condition,” creating a dummy variable named “D_custom” and coded as “0=the control condition” and “1=the personalization condition,” resulting in another dummy variable named “D_person.”

Given that the proposed hypotheses focused on comparing the effect of source customization on the DVs compared to the other source tailoring conditions (i.e., the personalization and control conditions), “D_custom” was used as the exogenous variable in the phantom model, while “D_person” was statistically controlled in the model. Additionally, other control variables in the study – prior VA usage experience, political views, and power usage – were also specified in the phantom model. Since both prior VA usage experience and political views were directly observed constructs, they were added as observable variables, while power usage was not a directly observable construct so it was added as a latent variable.

After adding the dummy-coded variables, the phantom variables were added in the form of latent factors to the main IV of the current study with no error terms. Specifically, 15 phantom
variables (i.e., CU, CUF, CUFA, CUFB, CUFT, CS, CSF, CSFA, CSFB, CSFT, CI, CIF, CIFA, CIFB, and CIFT) were added.

Once the phantom variables were added to the model, the path coefficients were constrained. For example, “source customization → user control → credibility → attitudes” path in the model was replicated as “A1 → B → E1” (i.e., Phantom Path 1). In particular, instead of assigning numerical regression weights for the paths, specific path coefficients like A1, B, and E1 were used such that they correspond with the respective coefficients for the specific indirect effect in the model. The same procedure was followed for Phantom Path 2 through Phantom Path 9 that correspond to the nine indirect effects hypothesized under study (Figure 10). This phantom model analysis was run with 5,000 bootstrapped resamples and 95% bias-corrected confidence intervals (BcCI).

Moreover, the variables of credibility, attitudes, behavioral intentions, and trust were measured twice – 1) the first time when participants received Alexa’s answers from news websites and 2) the second time when they received Alexa’s answers from forum websites. Hence, these variables were represented in the data set by two different variables for each – one for Alexa’s information from news sites and the other from forum sites. Given that, two different phantom models were created to test the hypotheses – 1) the first model (Figure 10) testing the indirect effect of source customization on the DVs related to Alexa’s information from news websites and 2) the other model (Figure 11) for examining the indirect effect of source customization on the DVs associated with Alexa’s information from forum websites. The same procedure as the previous phantom model was followed to construct Phantom Path 10 through Phantom Path 18 (Figure 11) that correspond to the indirect effects hypothesized under study. Therefore, the following section reports the sequential indirect effects for each model separately.
Note. To reduce visual clutter, the other dummy variable (D_person) and the control variables (prior VA usage, political views, and power usage) were not included in the above figure although they were all included when the phantom model analysis was actually conducted.

Sequential Indirect Effects

The phantom model about Alexa’s information from news websites. Results of the first phantom model analysis showed that user control ($b = .26, SE = .05, p < .001$), self-identity ($b = .12, SE = .05, p < .05$), and involvement ($b = .82, SE = .10, p < .001$) were all positively related to credibility, supporting H8a-c. Moreover, credibility was positively associated with attitudes ($b = .29, SE = .06, p < .001$), behavioral intentions ($b = .48, SE = .10, p < .001$), and trust in Alexa ($b = .31, SE = .08, p < .001$), supporting H9a-c.
Figure 11. Illustration of the phantom paths (forum)

Note. To reduce visual clutter, the other dummy variable (D_person) and the control variables (prior VA usage, political views, and power usage) were not included in the above figure although they were all included when the phantom model analysis was actually conducted.

The analysis also revealed two significant sequential indirect effects. First, the sequential indirect effect from source customization to attitudes via involvement and credibility was significant ($b = .33, SE = .16, p < .05, 95\% \text{ BcCI} = .0797, .6286$). Specifically, the effect of source customization on attitudes was sequentially mediated by 1) customization $\rightarrow$ involvement ($b = 1.40, SE = .14, p < .001$), 2) involvement $\rightarrow$ credibility ($b = .82, SE = .10, p < .001$), and 3) credibility $\rightarrow$ attitudes ($b = .29, SE = .06, p < .001$). In other words, participants who were able to customize the sources were more involved in Alexa’s information, which in turn led to greater credibility of Alexa’s information and ultimately more positive attitudes toward Alexa.
In addition, the sequential indirect effect from source customization to behavioral intentions via involvement and information credibility was significant ($b = .55, SE = .25, p < .05, 95\% \text{ BcCI} = .1000, .9975$). Specifically, the effect of source customization on behavioral intentions was significant through 1) customization $\rightarrow$ involvement ($b = 1.40, SE = .14, p < .001$), 2) involvement $\rightarrow$ credibility ($b = .82, SE = .10, p < .001$), and 3) credibility $\rightarrow$ behavioral intentions ($b = .48, SE = .10, p < .001$). This means that participants who were able to customize sources for Alexa were more involved in Alexa’s information. Such greater involvement with Alexa’s information led them to perceive the information as more credible and ultimately show greater behavioral intentions toward Alexa.

The phantom about Alexa’s information from forum websites. Results of the second phantom model analysis showed that user control ($b = .17, SE = .05, p < .001$), self-identity ($b = .11, SE = .05, p < .05$), and involvement ($b = 1.00, SE = .10, p < .001$) were all positively associated with credibility, supporting H8a-c. Additionally, credibility was positively related to attitudes ($b = .22, SE = .06, p < .001$), behavioral intentions ($b = .47, SE = .10, p < .001$), and trust in Alexa ($b = .27, SE = .01, p < .001$), supporting H9a-c.

The analysis also showed four significant sequential mediation effects in the model. First, the sequential indirect effect from source customization to attitudes through user control and credibility was significant ($b = .07, SE = .04, p < .05, 95\% \text{ BcCI} = .0009, .1750$). The sequential indirect effect of source customization on attitudes was significant via 1) customization $\rightarrow$ user control ($b = 1.83, SE = .20, p < .001$), 2) user control $\rightarrow$ credibility ($b = .17, SE = .05, p < .001$), and 3) credibility $\rightarrow$ attitudes ($b = .22, SE = .06, p < .001$). This means that participants who were able to customize sources for Alexa felt greater control over their interaction with Alexa,
which in turn led to greater credibility of the information and ultimately more positive attitudes toward Alexa.

Second, the sequential indirect effect from source customization to behavioral intentions through user control and credibility was significant \((b = .15, SE = .08, p < .05, 95\% \text{ BcCI} = .0018, .3667)\). Specifically, the effect of source customization on behavioral intentions was sequentially mediated by 1) customization \(\rightarrow\) user control \((b = 1.83, SE = .20, p < .001)\), 2) user control \(\rightarrow\) credibility \((b = .17, SE = .05, p < .001)\), and 3) credibility \(\rightarrow\) behavioral intentions \((b = .47, SE = .10, p < .001)\). That is, participants in the customization condition felt greater control over their interaction with Alexa, resulting in greater credibility of Alexa’s information and ultimately great behavioral intentions toward Alexa.

Third, the sequential indirect effect from source customization to trust through user control and credibility was significant \((b = .08, SE = .05, p < .05, 95\% \text{ BcCI} = .003, .2131)\). The indirect effect of source customization on trust was sequentially mediated by 1) customization \(\rightarrow\) user control \((b = 1.83, SE = .20, p < .001)\), 2) user control \(\rightarrow\) credibility \((b = .17, SE = .05, p < .001)\), and 3) credibility \(\rightarrow\) trust \((b = .27, SE = .01, p < .001)\). This implies that participants in the customization condition felt greater control over their interaction with Alexa, which resulted in greater credibility of Alexa’s information and eventually great trust in Alexa.

Lastly, the sequential indirect effect from source customization to behavioral intentions through involvement and credibility was significant \((b = .65, SE = .26, p < .05, 95\% \text{ BcCI} = .2240, 1.2044)\). The indirect effect of source customization on behavioral intentions was significant via 1) customization \(\rightarrow\) involvement \((b = 1.38, SE = .14, p < .001)\), 2) involvement \(\rightarrow\) credibility \((b = 1.00, SE = .10, p < .001)\), and 3) credibility \(\rightarrow\) behavioral intentions \((b = .47, SE = .08, p < .001)\).
= .10, \( p < .001 \)). This suggests that participants in the customization condition were more involved in Alexa’s information, which in turn led to greater credibility of Alexa’s information and ultimately higher behavioral intentions to use and recommend Alexa.

In addition to testing the original hypotheses concerning the effect of source tailoring on all the downstream variables, this study also conducted follow-up analyses to examine whether the effects of source tailoring and media platform change after controlling for participants’ perceived source tailoring (i.e., the degree to which participants agreed that they could 1) choose the sources they prefer and 2) represent their personal interests and needs using the source setting page of the Alexa website, which were captured by the manipulation check items for the source tailoring manipulation). Perceived ability to tailor the source settings was statistically controlled because it was possible that some participants received sources that were not of their interest and thus not satisfied with the source settings. The same data analyses as the original hypothesis testing were conducted but with perceived source tailoring included as an additional control variable.

Results showed that there was no difference between the follow-up and the original hypothesis testing in terms of statistical significance of their findings. That is, the same patterns of results were found even when perceived source tailoring was statistically controlled. However, there were several different findings from the follow-up phantom modeling analysis. Specifically, involvement as a mediator disappeared for news websites when controlling for perceived differences in participants’ ability to reflect their source preferences, but still user control and self-identity served as key mediators. For forum websites, involvement was a critical mediator, while user control and self-identity no longer served as mediators. This means that when Alexa gets information from news websites, participants in the customization condition
perceive greater control over their interaction with Alexa and their self-identity projected on to the source tailoring page, resulting in greater credibility of Alexa’s information and eventually more positive attitudes, greater behavioral intentions and higher trust in the virtual assistant. On the other hand, when obtaining Alexa’s answers from forum websites, participants in the customization condition are more involved in her answers, leading to greater credibility of Alexa’s information and ultimately greater behavioral intentions and trust in the virtual assistant.

Furthermore, both phantom models were run without the covariates (i.e., power usage, political views, and prior VA experience) and results showed that all the hypothesized paths and the sequential indirect paths were still significant in the same direction. In other words, there was no substantial change in the phantom modeling results when the covariates were removed from the model.

Summary of Findings

This chapter has reported various ways in which different types of media platform and source tailoring impact users’ perceived credibility of Alexa’s information as well as their attitudes, behavioral intentions toward, and trust in the virtual assistant through distinct psychological mechanisms. The major findings are summarized below.

Effect of source presence. The analysis revealed that participants who received Alexa’s information with the sources perceived the information as more credible than those who received the same information without the sources, supporting H1.

Effects of media platform. When Alexa’s sources were presented to users, participants showed different psychological reactions depending on whether Alexa’s answers were sourced
from news or forum websites. Specifically, when participants received Alexa’s answers from news websites, they were more likely to perceive gatekeepers of news websites were well-informed and experts in the fields (i.e., high source expertise) compared to those of forum websites, supporting H2. But, when it comes to participants’ perceived similarity to gatekeepers of Alexa’s information sources, they showed no difference between news and forum websites, thus rejecting H3.

Such different psychological reactions to Alexa’s information sources impacted participants’ credibility of Alexa’s answers. Specifically, both source expertise and source-receiver homophily were significantly related to credibility of Alexa’s answers, supporting H4a and H4b. But, the indirect effect of media platform on credibility was significant only via expertise, not via homophily. Further, participants’ credibility of Alexa’s answers was found to ultimately affect their attitudes, behavioral intentions toward, and trust in Alexa. In particular, the serial mediation effect of media platform on behavioral intentions via expertise and credibility was significant.

**Effects of source tailoring.** The analyses showed that participants who customized Alexa’s sources perceived greater user control over their interaction with Alexa compared to those who received a personalized list of Alexa’s sources or those who did not experience any kind of source tailoring, thus supporting H5. Additionally, participants in the customization condition showed greater self-identity projected on to the source tailoring page than those in the personalization and control conditions, supporting H6. A similar pattern was found for involvement in Alexa’s answers, showing that participants in the customization condition perceived greater involvement in Alexa’s answers than those in the personalization and control conditions, supporting H7.
Moreover, when participants received Alexa’s answers from news websites, their perceived control over their interaction with Alexa, self-identity projected on to the source tailoring page, and involvement in Alexa’s answers were all positively related to their credibility of Alexa’s answers, supporting H8a-c. In addition, credibility was in turn positively associated with their attitudes, behavioral intentions toward, and trust in Alexa, supporting H9a-c.

Further, the additional analyses revealed two significant sequential indirect effects. Specifically, participants who were able to customize the sources for Alexa were more involved in Alexa’s answers, which in turn led to greater credibility of her answers and ultimately more positive attitudes toward Alexa (i.e., source customization → involvement → credibility → attitudes). Also, participants who were able to customize the sources for Alexa were more involved in Alexa’s answers and such greater involvement in Alexa’s answers led them to perceive her answers as more credible and ultimately show greater behavioral intentions toward Alexa (i.e., source customization → involvement → credibility → behavioral intentions).

When participants’ received Alexa’s answers from forum websites, user control, self-identity, and involvement were all positively associated with credibility, supporting H8a-c. Plus, credibility was positively related to attitudes, behavioral intentions, and trust, supporting H9a-c.

When the additional analyses were run, four significant sequential mediation effects were identified. First, participants who were able to customize the sources for Alexa felt greater user control over their interaction with Alexa, which in turn led to greater credibility of Alexa’s answers and ultimately more positive attitudes toward the virtual assistant (i.e., source customization → user control → credibility → attitudes). Second, participants in the customization condition felt greater control over their interaction with Alexa, resulting in greater
The credibility of Alexa’s answers and then great behavioral intentions toward Alexa (i.e., source customization → user control → credibility → behavioral intentions). Third, participants in the customization condition felt greater control over their interaction with Alexa, resulting in greater credibility of Alexa’s answers and ultimately great trust in Alexa (i.e., source customization → user control → credibility → trust). Lastly, participants in the customization condition were more involved in Alexa’s answers, which in turn led to greater credibility of Alexa’s answers and ultimately great behavioral intentions toward Alexa (i.e., source customization → involvement → credibility → behavioral intentions).

The next chapter provides interpretations of these results in light of their theoretical and practical implications.
Chapter 5

DISCUSSION

Given the growing importance of Alexa as an intelligent assistant in searching various online information for users, the current research examined how users’ credibility of Alexa’s information and their psychological reactions to the virtual assistant (i.e., attitudes, behavioral intentions, and trust) changed as a function of information sources. The major findings of this study hold theoretical implications for research on source orientation in human-computer interaction, information credibility, and user psychology, as well as practical implications for product designers and researchers, and both of which are discussed in the following section.

Effect of Source Presence

Study findings reveal that telling users the sources of Alexa’s answers increases their perceived credibility of her answers. When participants were provided with the sources, they were more likely to perceive her answers as trustworthy. This finding is consistent with past research regarding the effect of information source on credibility (e.g., Flanagin & Metzger, 2000; Greer, 2003). Why does source matter to Alexa users? Considering that participants asked Alexa controversial questions, her answers may have appeared to be questionable as well. Therefore, specifying the sources of her answers may have helped them positively evaluate the credibility of her information because participants could at least verify the origin of her answers. Moreover, when Alexa revealed the sources, she referred to well-known news and forum websites, and thus participants may have perceived the sources with familiarity, encouraging them to trust Alexa’s answers more. Based on this, one could argue that letting users know the sources is critical for improving the credibility of her answers.
This study also provides empirical support for the CAS model (Nass & Brave, 2005; Reeves & Nass, 1996; Sundar & Nass, 2000) in the context of human-\textit{virtual assistant} interaction. Specifically, results showed that when Alexa attributed the sources of her answers to specific news and forum websites, users tended to perceive her answers as more trustworthy. That is, when Alexa made the sources of her answers \textit{transparent}, users positively evaluated the answers. In fact, a common finding in the literature on source effects in human-human interaction is that information provided along with the source is rated as more trustworthy and higher in quality than the same content without the source attributed (e.g., Kumkale et al., 2010; Metzger, 2007). A similar pattern of findings has been documented in the communication literature in the domains of online journalism (e.g., Cassidy, 2007; Turcotte, York, Irvin, Scholl, & Pingree, 2015) and health communication (e.g., Eastin, 2001; Westerman, Spence, VanDer Heide, 2014). Moreover, a large body of literature in human-computer interaction has replicated the source effect (e.g., Kang et al., 2011), although none with voice-based virtual assistants.

Consistent with the findings in the literature supporting the CAS model (Reeves & Nass, 1996), the current study reveals that when Alexa tells users from where she gets information, not only Alexa’s answers to users’ questions but the virtual assistant itself are trusted more, just like we would trust information from a human being more when they attribute the source (as opposed to not attributing it). This implies that users are likely to view virtual assistants like Alexa as an autonomous source of information, supporting the key assumption of the CAS model. However, when that autonomy is exhibited in the form of revealing the origin of information provided by Alexa, it is appreciated by users, just like we would a human information provider. Therefore, this study uniquely extends the CAS model by showing that when it comes to providing
information, computers are seen as being quite similar to other humans—they are more credible when they attribute the source of information they provide.

**Effects of Media Platform**

This study also shows that the credibility of Alexa’s information differs by media platform (i.e., news vs. forum). Specifically, participants perceived gatekeepers of news websites as more professional and well-informed compared to those of forum websites, and thus they rated her answers sourced from news websites as more trustworthy. This result not only replicates the power of source expertise on credibility observed in the literature (e.g., McGinnies & Ward, 1980; Wiener & Mowen, 1986), but also extends the expertise effect (e.g., Amos et al., 2008; Eastin, 2001; Go et al., 2014; Hu & Sundar, 2010; Kang & Sundar, 2016) to a novel domain where virtual assistants ascribe the source of information to a platform of high expertise.

This finding is intriguing because simply mentioning several names of high-expertise sources increased the credibility of Alexa’s information, suggesting heuristic, rather than systematic, processing based on source cues. Given that the interaction with Alexa was very brief, it was unlikely that users carefully thought about the source and then decided whether her answers were trustworthy or not. Rather, they were likely to rely on some heuristics to make a quick evaluation of her answers, such as the *expertise* heuristic (i.e., “experts’ statements can be trusted”), which is often elicited by a source cue during the presentation of information (Sundar, 2008a). Thus, a design recommendation coming from this finding is that if new types of media platform are to be added as the source of Alexa’s answers, online sources of high expertise, such as government agencies and international non-governmental organizations, need to be included and explicitly attributed to enhance the credibility of her answers.
While source expertise was a significant mediator of credibility effects, this study found no evidence to suggest that participants perceive gatekeepers of forum websites as similar to themselves. As a result, Alexa’s information from forum was not rated more credible than the same information from news websites. Based on the literature on source-receiver homophily, it was predicted that users would perceive information from forums as more trustworthy since they might feel psychologically close or similar to general Internet users who run online forums. Contrary to this expectation, however, participants expressed similar levels of source-receiver similarity when they received Alexa’s information from news and forum websites.

One possible explanation is that participants may have assumed that gatekeepers of news sites who manage the news content are also humans just like themselves. Such an assumption may have led them to think that they are similar to those who run news websites. Moreover, it is also possible that some of the forum sources used in the current experiment may have been unfamiliar to several participants, such as Fluther.com and BlurtIt.com, even though they were reported as very popular online forums according to the website traffic report by Alexa.com. Such perceived low popularity of those forum websites may have decreased participants’ perceived source-receiver homophily, and therefore the effect of media platform on homophily was not strong enough. Another explanation is that participants may have thought that individuals who edit and monitor contents on news websites “think” and “behave” like them because questions asked to Alexa were all informal and ordinary such that even non-experts can write a news story about them. Therefore, participants may have perceived Alexa’s answers sourced from news websites as highly relatable and familiar to themselves, increasing their perceived homophily with individuals who originally posted information about those topics to news websites. This pattern of finding is consistent with Hu and Sundar (2010) in that source-
receiver homophily does not affect the credibility of information from a low-expertise source (i.e., layperson). The study pointed out that a high level of prior knowledge or familiarity about certain topics might lower the impact of source cues on receivers’ perceptions of information related to the topic under study (i.e., sunscreen). Specifically, it was possible for participants of the study to not trust controversial information about sunscreen posted on a blog by a layperson (i.e., a low-expertise source) because the topic was already very popular among many Internet users and thus participants were likely to have prior knowledge about the topic and thus carefully review the posted content to assess its credibility. Therefore, when testing the source tailoring effects on users’ perceptions of Alexa’s information, topics of less familiarity among users would be more effective in future testing of source effects, yielding more interesting outcomes for hypothesis testing.

This study also revealed that when participants received Alexa’s information sourced from news websites, they felt the sources were professional and well-informed and thus perceived Alexa’s answers as more credible, which was eventually related to greater behavioral intentions toward Alexa. This result is not only theoretically meaningful by providing direct evidence for the positive association between information credibility and users’ psychological responses toward information deliverer observed in past research (e.g., Lafferty et al., 2002, 2015), but practically meaningful by suggesting the utility of high-expertise platforms as Alexa’s information sources. It is a particularly intriguing finding for Alexa interface designers and developers because Alexa’s source attribution to news websites contributes to increasing users’ interest in using Alexa for information search in the future, spending more time with her, and even recommending her to their families and friends (i.e., greater behavioral intentions toward Alexa).
Effects of Source Tailoring

As anticipated, this study captured the positive effect of source tailoring on perceived user control. Participants in the customization condition perceived greater user agency than those in the personalization and control conditions. Operationally, source tailoring was manipulated as interface features that elicit users’ actions, such as selectable check boxes for news and forum websites and the “Save” button on the source setting page. Such actions of the users may have resulted in greater user agency, positively affecting their attitudes and behaviors (Sundar et al., 2015) toward the virtual assistant. This implies that the use of customization features on digital interfaces may directly influence users’ psychology by triggering actions on the part of the user. Therefore, if designers want to enhance a sense of agency among users, they should consider adding interface features that involve users’ actions to perform various tasks, such as selecting the sources of Alexa’s answers.

The current research also reveals the positive association between source customization and self-identity. This adds to the growing body of evidence that when interactive technologies offer options for customization that help users articulate their interests and needs, users are likely to perceive greater self-identity from the customized interfaces and the content (Sundar, 2008b). This is of interest to designers as well as researchers because eliciting a sense of self-identity through customization is the key to increasing users’ gratification from their interaction with digital media (Kang et al., 2009). In the current study, providing the ability to customize Alexa’s sources resulted in greater self-identity projected on to the technology, which may have served to boost users’ gratifications, as manifested in the form of positive perceptions of Alexa and her information. The MAIN model (Sundar, 2008a) and AMC (Sundar, 2008b) explain that such perceived agency may have resulted from the operation of the identity heuristic (i.e., “if it is
related to myself, it is credible”) triggered by users’ own changing of the sources. The activation of the heuristic may have helped users positively evaluate Alexa’s answers and even show greater behavioral intentions toward the virtual assistant. In addition to the potential operation of the identity heuristic, it is also possible that the hostile media effect may have come into play such that some participants who received Alexa’s answers sourced from news websites that Alexa had recommended (i.e., personalization) perceived her answers negatively. Simply put, their perceived credibility of Alexa’s answers may have decreased because of the hostile media effect (Vallone, Ross, & Lepper, 1985). In fact, Vallone et al. (1985) explained that individuals who have a strong preconception or attitude on certain issues, such as political ideology, tend to perceive media coverage as biased against their perspective. Given that, when Alexa brings her answers from news websites, some participants are likely to perceive her answers as biased or partisan due to their pre-existing political views, which negatively affects their credibility judgements of her answers.

The hostile media effect can also account for a possible outcome of an additional study condition that could have been added to this study, which is to have Alexa disclose the sources of her answers, such as news websites (i.e., presence of media platform) but not allow users to change the source settings through the Alexa website (i.e., no source tailoring). In the potential study condition, a similar pattern of results to the personalization condition would be found due to the hostile media effect because users would perceive Alexa’s answers on certain issues from news media as biased against their perspectives. Even though this predicted argument needs to be tested in future research, the hostile media effect may serve to better understand why users who receive Alexa’s answers with the sources attributed, especially those from news media, perceive her answers relatively less credible.
The positive association between source customization and involvement also supports the theoretical utility of self-as-source in AMC (Sundar, 2008b) by revealing that participants in the customization condition felt greater involvement with Alexa’s information than those in the personalization and control conditions. Their great involvement in Alexa’s information may have occurred because the own-ness heuristic (i.e., “if digital media provide content that reflects myself, then the content is trustworthy”) (Sundar, 2008a) was operated in users’ minds. Specifically, when users can articulate their source preferences using the customization feature of Alexa, such customization affordance of interactivity serves to communicate a strong feeling of attachment to Alexa and information that she delivers to users because the customizable interface is largely a representation of the users themselves (Sundar & Marathe, 2010). Hence, a design recommendation emerging from this finding is that customization features should accurately reflect user input and clearly explain it to users, such that they can feel that they are serving as their own gatekeeper and easily understand the content provided by the interface reflecting their own persona (Sundar, 2008a); otherwise, users are less likely to get involved in the resulting content.

Another important contribution of this study is that it examined the effects of source tailoring and media platform not only on proximal psychological outcomes (i.e., user control, identity, involvement, and credibility), but also on distal outcomes concerning users’ perceptions of Alexa (i.e., attitudes, behavioral intentions, and trust toward Alexa). The latter was analyzed using a phantom modeling technique and the results identified a set of significant indirect effects. Those indirect-effect findings shed light on several psychological mechanisms through which source customization influences user psychology. Given that the patterns of significant pathways
were slightly different by media platform, the following section first discusses common pathways observed in both models and then proceeds to platform-specific pathways.

Both phantom models show that having users serve as the origin of tailoring encourages them to perceive Alexa’s information as highly relevant, useful, interesting, and important to them (i.e., high involvement). Greater involvement in turn elevates their credibility of Alexa’s information and leads them to spend more time with Alexa in the future (i.e., greater behavioral intentions). This finding provides supporting evidence for AMC in the context of human-virtual assistant interaction by showing that customization features may lead to various psychological benefits for users, especially great behavioral intentions toward virtual assistants. It also means that embedding the source customization feature in Alexa’s online interface can determine users’ engagement with Alexa in the long run. That is, source tailoring not only has the short-term impact on the credibility of Alexa’s information, but holds the key to users’ long-term decisions on Alexa use. Hence, the potential of customization feature to increase user base should not be underestimated when updating UI of the Alexa website and its mobile application.

Besides the common pathway that was significant in both models, the phantom model concerning news platform uniquely shows that when Alexa gets information from news websites, customization of Alexa’s sources leads users to be greatly involved in Alexa’s information and perceive the content as highly credible. Such a heightened sense of credibility is in turn related to their positive attitudes toward Alexa. This is an interesting finding specific to news sites, suggesting that users’ perceptions of Alexa become positive when the virtual assistant brings information from news websites. One possible explanation to this unique pattern of finding is that users generally consider news sites as being high in expertise, maintained by professional journalists or experts, and thus information brought from such platforms is typically
regarded accurate, objective, and thus reliable. Hence, when Alexa refers to news websites as her source, users are likely to think that the virtual assistant delivers reliable information to them and thereby form positive attitudes toward her.

The phantom model for forum platform also shows a unique pattern that user control is key to boosting the credibility of Alexa’s information. When Alexa brings her information from forum sites, users feel that they can adapt Alexa’s search service to their needs. Such perceived control not only leads to their positive attitudes toward Alexa but also greater behavioral intentions toward and trust in Alexa. This pattern only occurred in the forum-specific model, suggesting that when Alexa gets information from forum sites, the action of source customization may be considered as a way of exercising user control over the interaction with Alexa. Unlike in news sites, anyone and everyone, just like participants in this study, can directly contribute to discussions on forum websites. Such grassroot participation by the general public is vital for forum sites to have more vibrant and meaningful conversations among users (Dahlberg, 2001; Park, 2013). It is also a way of exercising users’ own agency over the mediated interaction with others (Grabill & Pigg, 2012; Stanley & Weare, 2004; Vaast, 2007). Given the public-driven nature of online forum, it is possible that when users find that Alexa attributes to online forums as her source, which are often managed by general Internet users like themselves, their simple act of modifying the source settings is likely to prime the importance of laypeople as gatekeepers in the information selection process (i.e., receivers as a selecting source; Sundar & Nass, 2001), thereby enhancing a sense of their own agency and control over their interaction with Alexa. Such heightened sense of user agency may have increased their perceived credibility of Alexa’s information and positively affected other psychological outcomes. In sum, this
finding suggests that giving users more agency through source tailoring can be a powerful and effective way to generate positive psychological outcomes.

**Theoretical Implications**

One of the key objectives of this study is to add to the empirical base of research that examines the effects of source tailoring on user psychology driven by various theoretical frameworks on source attribution in human-computer interaction (Reeves & Nass, 1996; Sundar & Nass, 2000; 2001) and user agency and customization in interactive media (Sundar, 2008b). Many studies have been carried out on users’ conceptions of different communication sources (e.g., Go et al., 2014; Hu & Sundar, 2010; Kang et al., 2011; Sundar & Nass, 2001), showing that users tend to attribute to different types of sources when interacting with digital media. The literature shows that there exist psychological differences between different types of information sources, and such psychological distinctions in sources affect users’ processing of information. It is therefore important for researchers to take into account various types and layers of sources to better understand the effect of source attribution on user psychology (Hu & Sundar, 2010; Sundar & Nass, 2001).

As seminal research on the conceptualization of sources in new media (Hu & Sundar, 2010; Sundar & Nass, 2001) has explicated, when online information is delivered to users through new media, not only the person or organization that originates the content (i.e., original source) but venues or vehicles that gatekeep the content (i.e., selecting source) can be perceived as the source of information. Sundar and Nass (2001)’s typology of sources in online media particularly suggests that “the media or channels of content presentation” (p. 58) can be perceived as the source, implying that new communication technology, like virtual assistants that
help search, select, and deliver online information for users, can be viewed as the source of information they deliver. In fact, the data of this study demonstrate that when Alexa helps identify the original source of information, users tend to appreciate information more and show positive psychological responses to the virtual assistant. This finding implies that users are likely to positively perceive Alexa’s information if she serves as a selecting source, rather than the original source of her answers. Put another way, users feel comfortable with Alexa being a gatekeeper that brings information from certain original sources by exercising her own discretion. This not only extends the examination of source distinction to the human-virtual interaction domain but shows what psychological outcomes follow when the computer helps distinguish the source of information. In particular, results of this study show that when users can dictate the sources of Alexa’s information (i.e., customization), they tend to feel greater perceptions of their own control over the interaction with the virtual assistant, their own identity projected onto the Alexa source tailoring interface, and even greater involvement in her answers. These results imply that users are likely to view Alexa as a technical tool that simply follows users’ commands, rather than an autonomous source of information that generates the content, which supports the CAM model by suggesting that users regard machines like Alexa as a medium or channel operating between users and the original sources of information.

Another attempt at extending the scope of the literature on source attribution is with the focus on users’ heuristic processing of Alexa’s information driven by aural cues. When Alexa reveals the source of information by referring to names of popular news and forum websites, those names serve as peripheral cues invoking relevant mental shortcuts or decision rules that help evaluate the credibility of information quickly (Sundar, 2008a). Such heuristic processing of Alexa’s information based on aural cues is typically automatic (Petty & Cacioppo, 1986; Sundar,
2008a), with users not being cognitively aware of it (Bargh & Chartrand, 1999). For instance, if Alexa refers to popular news organizations as the source of her answers, such as CNN, NPR, and the Washington Post, the expertise heuristic (“experts’ statements can be trusted”) may have been invoked in users’ minds, based on which the “expertise equals high credibility” rule that the users already have (based on their prior experience) is used to conclude that her answer is reliable and trustworthy. Moreover, if Alexa chooses the sources of information, it is also possible that they perceive information as being higher in quality compared to the same information selected by users themselves or other users. Another similar heuristic that may have been cued is the authority heuristic (“popular name, brand, or organization can guarantee the credibility of information”), which is operational when an official authority or expert serves as the source of information (Sundar, 2008a). When Alexa refers to a high-expertise platform like news websites, it is likely to imply importance and pedigree to information delivered by that source, thereby enhancing their perceived credibility of Alexa’s answers. Further, it is possible that participants applied the machine heuristic (“if a computer chose information, then it must be objective in its selection and free from ideological bias”) such that they evaluated information positively. When a non-human agent like Alexa is mainly involved in gatekeeping the content, users are likely to infer high objectivity and quality of the content, and other mechanical attributes to the performance of Alexa’s information search task (Sundar, 2008a). In order to ensure that those heuristics are at work when users evaluate the credibility of Alexa’s information, however, future research should consider directly measuring the extent to which users believe in those heuristics and examine if such belief predicts their positive evaluations of information (Bellur & Sundar, 2014).
Further, while several studies have been conducted on the variable of tailoring, operationalized at the content level, this study is one of the few studies that operationalize tailoring at the level of information source (e.g., Kalyanaraman & Sundar, 2006; Marathe & Sundar, 2011). For instance, Kalyanaraman and Sundar (2006) provided some of the early findings that the customization results in positive user-interface relationships. Specifically, they found that the customization of interface positively affected users’ attitudes toward the website through perceived relevance, involvement, interactivity, and novelty. Even though the study participants did not tailor the website on their own, rather it was tailored by the researcher, they positively evaluated the tailored website. Similarly, Marathe and Sundar (2011) examined whether changing the presentation and functionality of the website interface positively affected user psychology. Results of the study show that the ability of users to change the interface design invokes results in a richer and agentic experience with the interface than simply browsing the content of the website. Along the same lines, the current research reveals that user-initiated tailoring of the source of Alexa’s information through the customization feature is indeed a powerful predictor of users’ positive perceptions of Alexa and her answers, attesting to the theoretical utility of customization of digital interfaces even in human-virtual assistant interaction.

In particular, one of the important contributions of this study lies in delineating how and why customization positively affects users’ psychology. One of the recent studies that examines the effect of customization on users’ perceptions of online health information (Kang & Sundar, 2016) tested the same of psychological underlying mechanisms as the current study (i.e., control, identity, and involvement) between self-as-source and users’ behavioral intentions toward a persuasive health message but found the supporting evidence for identity only. However, the
current study not only shows the significant mediating effect of perceived identity but also argues that such effect could be more nuanced by showing that the tailoring effect occurs, especially when Alexa’s information is sourced from a low-expertise platform like forum websites. Such moderating effect of media platform was not directly tested in Kang and Sundar (2016) but this study took it into account so as to further understand how customization affects users’ perceptions through identity. However, this finding needs to be interpreted with caution because the mediating effect of identity was identified when perceived differences in the ability to reflect participants’ source preferences was statistically controlled. When perceived source tailoring was not controlled, identity did not mediate the hypothesized relationship. This suggests the need for testing a possible moderating effect of perceived source tailoring in future research, showing under what conditions the psychological effects of customization are pronounced.

Sundar and Marathe (2010) also explored the mediation effect of perceived control between tailoring and users’ attitudes toward a website and did not receive support from the data either. That is, user control did not predict changes in users’ positive attitudes toward the website. The current study, however, provides consistent and nuanced evidence that user control does mediate tailoring and users’ positive responses to Alexa in the form of positive attitudes, greater behavioral intentions, and trust in Alexa, especially when the virtual assistant brings information from *forum* websites. In contrast, when perceived tailoring was controlled, the mediating effect of user control was found only when Alexa gets information from *news* websites. These findings again reveal the need for probing the effect of perceived differences in users’ ability to tailor the way Alexa gatekeeps information on users’ psychology apart from examining the effects of source tailoring and media platform. Hence, future researchers should
explore the role of perceived source tailoring when testing the source effects on users’ perceptions of other virtual assistants like Google Assistant and information delivered by them.

**Practical Implications**

How can the major findings from this research be used to better design virtual assistants like Alexa? First, this study provides an idea for a possible design change in how Alexa presents information to users based on the finding that providing the source details to users can increase the credibility of Alexa’s information. From a voice-based interface design perspective, providing the source should be easily deployable because the existing algorithm already makes Alexa reveal the source when Wikipedia is used for information search. By updating the algorithm that is used for source attribution, users may not only trust Alexa’s information more, but show greater interest in using the virtual assistant for various search tasks. The use of source-revealing algorithm can be extended to other virtual assistant products, including Siri in iPhone, Cortana in Windows laptop, and Google Assistant in Google Home speaker. The revelation of information source has the potential to help users receive more trustworthy information by identifying the origin of information. For example, source attribution can be useful for identifying true news stories and distinguishing them from fake news. This will also pave the way for extending the use of virtual assistants for finding scholarly journal articles, government reports, and the like, where source attribution is critical for judging the credibility of information.

Another finding that might be useful for designing more helpful virtual assistants is that users’ perceptions of information delivered by Alexa vary by types of media platform that she refers to. When authoritative sources like news sites are used as the source, users are likely to trust information more and show greater behavioral intentions toward Alexa. Thus, a design
recommendation coming from this finding is that when developing a search algorithm for Alexa, online sources that users are likely to perceive as highly professional and well-informed (e.g., popular news companies, government agencies) should be considered as the primary source, followed by less authoritative ones.

However, it should be noted that the power of authority might be only applicable to evaluating the credibility of information delivered by Alexa. As Sundar and Nass (2001)’s typology of sources in online media showed, Internet users can serve as a selecting source of information at the individual and collective levels, contributing to choosing the content to be consumed. Specifically, the typology forwarded two types of receiver sources involved in the information selection process: *self* as source and *audience* as source. While the former refers to each receiver at the individual level choosing certain content that s/he consumes, the latter indicates a mass of individuals that influences the content selection. Sundar and Nass (2001)’s study specifically found that when the source of online news was attributed to other users as a selecting source, news was perceived as higher in quality and likeable than when it was attributed to news editors or receivers themselves. Plus, when other users served as the selecting source, users thought that news stories were more newsworthy than when the users themselves selected the content. Such positive perception of information selected by other users implies that users also tend to trust other laypersons as a selecting, rather than the original, source of information. This suggests that media platforms that are managed by other users or laypersons, such as online forum, may also be more useful to generate positive perceptions of various online information delivered by virtual assistants. Specifically, the use of crowdsourced platforms may be perceived as more helpful for users when they seek recommendations or advice from other Internet users, such as finding good restaurants in town and getting troubleshooting tips for
technical issues. However, the data from the current study (see Table 4) reveal that sourcing Alexa’s information from the layperson-edited platform led to much lower scores on all the key psychological outcomes compared to the expert-edited platform. These results imply that the power of expert-edited platform might be uniquely applicable for news searching using Alexa but not other content domains, such as e-commerce, where crowd-sourced forums might compete with expert-edited platforms more closely. Therefore, when developing a new information search algorithm concerning platform selection for other virtual assistant products than Alexa, it is important to first empirically test whether the positive effect of authoritative (i.e., high-expertise) sources on information credibility holds true to the virtual assistants of interest, whether the power of layperson sources enhances credibility to a greater extent, or both types of sources are effective in boosting credibility.

Findings of this study also suggest that the current version of the source tailoring available on the Alexa website may not be useful for boosting users’ perceived credibility of Alexa’s answers and their positive perceptions and attitudes toward Alexa. Specifically, the current version of the Alexa website and its mobile application does provide several source setting options in the main menu by which users can specify what news providers for Alexa to pull hourly news updates from for its “Flash Briefing” feature. But it does not support changing the sources of all kinds of information that Alexa delivers to users. As findings of this study suggest, letting users serve as the source of interaction with Alexa may substantially generate various psychological benefits to users, yet such a feature is not supported in Alexa products. Hence, it is necessary for UI designers to consider adding features that elicit user input as part of the “setting” menu so users can fully adapt Alexa’s search services to their needs and have a better user experience with Alexa. Of course, this holds true for other virtual assistant products
like Google Assistant because adding such a simple feature to reflect users’ needs can make the users feel like they are the source of changes, resulting in various psychological benefits pertaining to cognition, affect, and behavior (Sundar, 2008b).

**Limitations and Directions for Future Research**

The findings of this research should be interpreted in light of several limitations. To begin with, the types of media platform used as Alexa’s sources were limited to news and forum only. Among various types of media platforms available online, the effects of online news and forum were selected for this study not just because they are commonly used platforms for information search (Funk et al., 2017) but also because they are different in terms of perceived gatekeeper expertise and homophily, which are critical for credibility judgements (McCroskey & Richmond, 1996). However, given that Internet users refer to a myriad of online resources to get the most relevant and reliable information, ranging from government agency websites to blogs and social media, it will be interesting to test how those platforms differently affect users’ perceived credibility of Alexa’s information. Moreover, it will be important to examine through what psychological mechanisms those platforms make an impact on the credibility of Alexa’s information other than source expertise and source-receiver homophily.

Another limitation is that participants of the study were provided with questions that had been already selected by the researcher. Alexa’s answers to those questions had been recorded a priori and the recorded answers were played by the researcher using the Echo speaker. Although it might have been better if participants could choose any questions and ask them to Alexa, there were several reasons why the pre-selected questions were used.
First, the current version of Alexa software cannot answer questions that are highly debatable and controversial, including the ones used in this study. When such questions are asked to Alexa, she says “ Hmm, I don’t know that” or “I don’t have any answers to that.” Therefore, it was technically impossible to use the current version of the software to get the controversial questions answered even though such questions are commonly discussed among many Internet users. Second, if participants were allowed to ask Alexa any questions they wanted, perceived complexity of questions might turn out to be different, serving as a confounding factor in the study. In order to systematically control for the confounding factor and test the effect of source tailoring and media platform, the level of perceived complexity and the content of questions and answers had to be kept constant across all the study conditions. Lastly, Alexa does not always understand what users ask her. Although the probability that Alexa correctly understands users’ questions has increased, she cannot understand questions when a user has a strong accent or speaks too fast or slow. In order to ensure that Alexa picks up all questions correctly and answer them in this study, it was necessary to record her answers and play them as if she was answering participants’ questions in real time such that all participants could successfully get the answers to their questions. In future research, therefore, there is a need for using questions that users come up with on their own and let Alexa answer them so that the interaction between users and Alexa becomes more natural.

Moreover, it is possible that participants in the personalization condition did not receive sources that were not perfectly personalized for them because the researcher yoked the source tailoring stimulus of the personalization to that of the customization condition. Such incorrect personalization cases may have contributed to the effect of source tailoring on users’ reactions to Alexa’s information and the virtual assistant. Hence, the cases where participants received the
inappropriate sources were completely filtered out by checking how many participants received their preferred sources correctly and those who did not, based on their political views (which had been captured in the pre-questionnaire). As a result, twelve cases where participants received sources that did not match with their political views were identified, i.e., conservative participants received liberal news sources and liberal participants received conservative sources. Those inappropriate personalization cases were then filtered out from the data file and then all the data analyses conducted for hypothesis testing in the current study were executed again to examine if any different results are found. Results showed no change in the direction of statistical significance of all the hypotheses under study (see Appendix H). That is, there was no substantial difference in the results when only the correct personalization cases were used for the analyses. This shows that the inappropriate personalization cases did not negatively influence the testing of the source tailoring effect on users’ psychology.

Lastly, the limitations that are typically related to experimental studies are applicable to this research. The participants were primarily young, white, and female college students, implying that findings of this study may not be generalizable to other demographics such as seniors and the elderly who use Alexa for various information search tasks. Hence, this study needs to be replicated across other population to test its generalizability. Moreover, participants were able to interact with Alexa for only a short period of time and some participants had had no prior usage experience with virtual assistants like Alexa before they participated in the current study, and thus some might argue that the key findings of this research are due to novelty effect, which is a valid critique. However, as more virtual assistants including Alexa are increasingly used in our daily life to perform various information search tasks, the degree to which we trust Alexa as well as her answers may improve over time. Given that, it is important to explore the
long-term effect of media platform and source tailoring of Alexa as we use such a virtual assistant for a longer period of time. Further, it is possible that Alexa may become more social and natural such that they can express various emotions, speak in different voices, and even change its gender, which may in turn change our understanding of Alexa as a personal assistant and her answers. Additionally, the experiment was conducted in a research lab that was set up like a typical living room where Alexa is commonly used so participants could feel comfortable talking to her. But it was not a completely natural but rather artificial setting. Future studies should thus consider running a field study in which users do not have to accustom to a new environment to interact with Alexa and have them use their own Echo device so they feel more comfortable talking to Alexa.

**Conclusion**

As Alexa becomes smarter to better serve our diverse informational needs and interests, the success of information search service by Alexa appears to be dependent not only on the content of information she delivers, but also on how she presents information. When we evaluate the credibility of Alexa’s information, one of the most basic yet important questions that we would ask her is “Where do you get your information?” But this question has not never been successfully answered by the virtual assistant. When Alexa cannot verify the origin of her information, we are less likely to rely on her as well as her advice to guide our everyday-decisions. Hence, being able to answer the source-related question successfully is the first step toward enhancing the credibility of Alexa’s information. Plus, another key factor that would influence our credibility judgements is whether the original sources that she refers to are trustworthy or not. As demonstrated in the current research, the power of expertise of the source still holds true, encouraging us to trust Alexa’s information sourced from high-expertise
platforms more. Further, the credibility of Alexa’s information can also be improved if Alexa’s online and mobile interface enables us to tailor the source of her information. When the interface affords us such power to exert control over her information search practices, we would appreciate her information more and show more positive responses toward this emergent technology.
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Appendix A. Topics and Sub-topics for the Pre-test

- Health-related Sub-topics

Sub-topic #1. Fat tongue
Question: If I gain weight, will my tongue get fat as well?
Answer: There are some people who think that your tongue cannot get fat even if you gain weight. But, if you get fat, so does your tongue. The human tongue has a high percentage of fat, and there is a correlation between tongue fat volume and obesity.

Sub-topic #2. Vision
Question: Will using artificial sweeteners make my eyes more sensitive to light?
Answer: Some people assume that using artificial sweeteners has nothing to do with your vision. But, artificial sweeteners may make your eyes more sensitive to light. Blurred vision, eye pain, and in extreme cases blindness can be a side-effect of sweeteners like aspartame.

Sub-topic #3. Stomachache
Question: Can drinking soda ease an upset stomach?
Answer: It is often said that drinking a cup of clear soda can settle stomach distress. But, such a remedy may do more harm than good. Carbonated sodas in fact provide inadequate fluid and electrolyte replacement and cannot be recommended. They also contain too much sugar and little sodium to help people rehydrate after vomiting and diarrhea. They include essentially no useful electrolytes to help your stomach relax.

Sub-topic #4. Multiple meals
Question: Does eating multiple small meals boost metabolism?
Answer: There’s a common belief that eating small meals multiple times will increase metabolism. Yet, meal frequency has no effect on metabolic rate. Rather, eating more meals a day can make you want to eat more. What matters is not how many meals you eat but the amount of calories you consume.

Sub-topic #5. Grey hair
Question: Does pulling out a grey hair make more grow?
Answer: Some people believe that pulling out a grey hair makes more grow. But plucking grey hair will not cause three or more grey hairs to grow back in its place. However, plucking is not an advisable activity because it can destroy the hair follicle and possibly lead to bald patches.

Sub-topic #6. Nails
Question: Do nails need to breathe between manicures?
Answer: It is a common belief that we need to give our nails a break from cosmetic applications as they need oxygen to breathe. However, nails are made of dead cells and therefore do not have the ability to get oxygen from the outside world. Any oxygen they need is obtained from the bloodstream. Painting your nails does not interfere with this process, so wearing or not wearing polish isn’t a factor in your nail’s ability to receive oxygen.
Sub-topic #7. Wet clothes
Question: Does going out with wet hair or clothes cause a cold?
Answer: Conventional wisdom says you will get sick if you go out in the cold with wet hair or clothes. But, being cold has nothing to do with contracting the cold or flu virus. The reason we often associate the two is that the flu virus more commonly circulates during the fall and winter than during other times of year.

Sub-topic #8. Post-ex eating
Question: Does eating after exercise cancel out a workout?
Answer: It is generally believed that eating after exercise will cancel out a workout. However, the calories you consume post-exercise are not immediately shuttled back into your fat cells. In fact, it's important to eat after a sweat session. Working out takes a toll on your body so it is important to eat a clean, nutritious meal that can provide your cells with the raw materials needed to heal and repair.

• Education-related Sub-topics

Sub-topic #1. Learning styles
Question: Do students have different learning styles?
Answer: It is generally thought that students have particular modes by which they learn best. However, different learning styles do not exist; but students absorb information just as well whether or not they encounter it in their preferred mode. So, what teachers and parents should focus on is the universal learning style of the human mind, which is to deliver information in multiple forms, such as text and images, and keep students’ interest alive with novelty and variety.

Sub-topic #2. Sleep learning
Question: Is subliminal (or sleep) learning effective?
Answer: It is often believed that you cannot learn as you sleep. But your brain can in fact absorb information during your sleep. For example, if you’ve been learning vocabulary in a foreign language, it can be highly effective to hear these words played over again while you sleep. To make practical use of this method, you’ll need to play audio of foreign words you’ve already heard and set the audio to run for the first two to three hours of sleep.

Sub-topic #3. Left-right brain dominance
Question: Do students learn differently depending on left or right-brain dominance?
Answer: It is commonly said that students learn differently because of the left versus right-brain dominance difference. However, the concept of left-brain versus right-brain dominance is obsolete. Humans use both sides of the brain to perform various tasks at hand. For example, some students are better at languages than others, but this is not because they are left-brain dominant. Language learning was thought to be a left-brain activity, but it does not take place in any one side or region of the brain.
Sub-topic #4. Note-taking
Question: Does taking notes in a certain color help you remember more?
Answer: Some people consider that ink color does not affect your memorization of the notes. Yet, cognitive performance indeed varies when students take notes in red or blue. Red color can make students focus better and remember information more accurately, and blue can make them think more creative. This is because the moods associated with colors may affect cognitive performance.

Sub-topic #5. Speed reading
Question: Can speed reading help you learn fast?
Answer: People commonly believe that speed reading can help them learn fast. But speed reading in fact negatively affects comprehension. Most speed reading methods do not involve saying words in your head while reading, which is key to understanding information. Also, when speed reading, words come in faster than your working memory can deal with them.

Sub-topic #6. Brain capacity
Question: Is our brain’s storage capacity limited?
Answer: It’s generally agreed that people say that there’s a limit in saving information in our brain. However, there’s no such thing as knowing too much or learning so much that you can’t retain any more information. Your brain doesn’t get used up like the data storage in your computer or smartphone. Although lack of sleep can affect your brain’s ability to create more memories, there is endless brain power.

Sub-topic #7. Music
Question: Does listening to music while studying interfere memory?
Answer: Conventional wisdom says listening to music while studying can have negative impacts on memorizing information. However, music can impact and regulate your mood and create the best mood to study in is a more relaxed mood. So, it is important to choose music that helps you relax but also with enough beat or rhythm to ensure you don’t zone out while studying.

Sub-topic #8. Study spot
Question: Does having a fixed study spot affect cognitive performance?
Answer: It is often believed that finding and sticking with a specific place helps students study better. But students retain knowledge faster and remember it longer when they change their study environment. Changing up the scene rather than having a dedicated study area can help the information get enriched, which slows down forgetting.

• Sports-related Sub-topics

Sub-topic #1. Knee pain
Question: Will running ruin one’s knees?
Answer: It is generally agreed that pounding pavement will kill your knees in the long term. But running does not increase the risk of developing arthritis, even if you bang out marathons on a regular basis. In fact, runners who had no previously existing knee problems actually tend to have a lower risk of developing arthritis compared to less active non-runners.
Sub-topic #2. Swimming
Question: Does eating within 1 hour of swimming make one cramp?
Answer: There’s a common belief that we should wait at least 1 hour after eating until swimming because you might get cramps. But exercising after eating has little to do with cramping. Rather, it is important to eat enough to provide the fuel needed for you to swim. If you experience cramping, it’s more a result of overexertion. It is not related to the food you ate.

Sub-topic #3. Compression clothes
Question: Do sports compression clothes help improve athletic performance?
Answer: Some people generally think that wearing compression clothes will deliver more power and stamina. However, the effect of compression is not strong enough to greatly improve performance. Any benefits felt when wearing compression clothing during exercise may be due to the placebo effect.

Sub-topic #4. Stretching
Question: Is stretching a cure-all for tight muscles?
Answer: Conventional wisdom says that if you stretch a tight muscle group harder, you can prevent serious injuries in sports games. However, muscles usually get tight because they’re working harder than they should be, or in ways that they shouldn’t be. So, stretching will only serve as a temporary fix, which does not prevent more serious injuries.

Sub-topic #5. Super Bowl
Question: Does the Super Bowl bring huge economic benefits to the host city?
Answer: It is often considered that hosting the Super Bowl will see an economic boost. But the real impact on the host city is very small considering the money needed to pay for stadium renovations, upgrades to the roads and street of the city and the security that they have to bring in for the event.

Sub-topic #6. Sport drink
Question: Do sports drinks boost one’s energy?
Answer: There’s a common belief that sports drinks give you energy. Yet, with all of the added sugar that they contain, sports drinks raise blood sugar levels at a rapid rate. You may feel like you’re super-energized right after consuming one, but what you’re experiencing is merely a sugar high. In 30 minutes or so, the sugar high will taper off, and you will feel more tired.

Sub-topic #7. Olympic medal
Question: Are gold Olympic medals made of pure gold?
Answer: Some people think that gold Olympic medals are made of pure gold. However, the 1912 Olympic Games were the last to include gold medals actually made of solid gold. Currently, the gold medals are 93 percent silver and six percent copper, leaving about one percent for the highly prized gold finish.

Sub-topic #8. Pain tolerance
Question: Do sports athletes have a high tolerance for pain?
Answer: Some people assume that sports athletes show higher pain tolerance. Yet, playing through the pain does not make them more of an athlete and toughen them up. Bearing the pain
can cause the pain to worsen and possibly prolong the amount of time to recover. Although how athletes react to that pain can be very different, they feel pain like ordinary people do.
Appendix B. Pre-test questionnaire

In this short survey, we are going to ask you some questions about what you think about news. What we mean by *news* is all kinds of information about events and sub-topics that involve more than your friends and family.

1. How closely do you follow …? (1=Not at all closely; 5=very closely)
   - International news
   - National news
   - Local news

2. How closely do you follow news about the following topics, either in the newspaper, on television, radio, or the Internet?
   (1=Not at all closely; 5=very closely)
   - Health or medical sub-topics
   - Schools or education
   - Sports
   - Business and finance
   - Government and politics
   - Science and technology
   - Arts and entertainment

3. How often do you get news from …? (1=never, 2=hardly ever, 3=sometimes, 4=often, 5=always)
   - National news organizations
   - Local news organizations
   - Friends, family, and acquaintances
   - Social media (e.g., Facebook, Twitter, Instagram)
   - Online communities

4. How much do you trust the information you get from …? (1=not at all; 5=very much)
   - National news organizations
   - Local news organizations
   - Friends, family, and acquaintances
   - Social media (e.g., Facebook, Twitter, Instagram)
   - Online communities

5. How much do you prefer to get your news by …? (1=never, 2=little, 3=somewhat, 4=much, 5=a great deal)
   - Reading it
Watching it
Listening to it

6. What are the TOP 3 websites that you visit to get news every day?

1._____________________
2._____________________
3._____________________

7. What are the TOP 3 websites that you would recommend to your friends and family to get news?

1._____________________
2._____________________
3._____________________
Appendix C. Study Instructions

Textual instruction #1

Hello! Welcome to the study. Thank you very much for your participation.

Today, you will explore a voice-based virtual assistant, Amazon's Alexa. Alexa is Amazon's personal assistant built into a smart speaker called Amazon Echo, which you can see right in front of you.

The Echo speaker can hear you using its built-in microphone. When you want to use Alexa, just say the wake word Alexa, and Alexa will respond to your voice instantly. Using Alexa, you can do many things hands-free. No tapping or searching required. When you say, “Alexa, play music for a dinner party,” Alexa will help you set the mood by choosing the relaxing dinner music playlist. Plus, Alexa can control smart home devices, shop on Amazon, read the latest news, set reminders and so on.

In this experiment, you will try a new feature called “Ask! Alexa.” This feature is designed to help you answer some tricky questions on popular topics like health, sports, and education. This feature is still in its experimental stage and has not been released to the public.

When you are ready to try this feature, please let the researcher know. She will guide you to the next step.

Textual instruction #2

Now, let’s ask Alexa some questions about topics like health, sports, and education. Here’s how you do it.

Considering that there are a lot of questions that Alexa can answer, we will randomly pick a few for this session of the study. To try this feature, pick twelve different numbers between 1 and 100 and give those numbers to the researcher. The researcher will then enter those numbers into the system and specific questions corresponding to those numbers will appear on the TV screen in front of you – one question at a time.

When you see a question on the TV screen, just ask that to Alexa and wait for her response. When you ask the question, please read it loud and clear, so that Alexa can understand your question correctly.

When you are ready to start, please tell the researcher.
Appendix D. Lab Settings for the Main Experiment

[Image 1 (left) & 2 (right)] This is the lab where the experiment was conducted. There was a table where a laptop computer and an Echo speaker were placed (Image 1) and two chairs where participants could sit during the experiment (Image 2). There was also a large TV in front of the table (Image 2) where the textual study instructions were presented. The TV screen was linked to a desktop computer in the observation room (which is located right next to this room) such that the researcher could remotely control the instructions. The researcher could also look into this experiment room through a one-way mirror (Image 1).
Participants interacted with the stimulus web site using a laptop computer and tailored sources for Alexa depending on the condition. For example, if a participant was assigned to the customization condition (Image 3), he was asked to choose three news and three forum web sites from where he wanted Alexa to obtain her answers. On the other hand, if a participant was assigned to the control condition (Image 4), she simply reviewed a list of news and forum sites without source tailoring.
The researcher walked participants through each step of the experiment. For example, for the second task (two rounds of voice interaction with Alexa), participants told the researcher 12 random numbers between 1 and 100 and she wrote them down on her note and then she went back into the observation room to enter the numbers into the system and played the recording files of Alexa’s answers.
Inside the observation room, the researcher played the recording files of Alexa’s answers using a laptop computer connected to the Echo speaker (Image 7) such that participants believe that the virtual assistant was answering to their questions in real time. She also projected all the questions that participants were asked to read to Alexa using a desktop computer (Image 8), which was connected to the TV screen in the participant room.
Appendix E. Recording Alexa’s Answers

In order to record Alexa’s answers to participants’ questions about various topics, Alexa’s existing voice command called “Simon says …” was used. By saying “Alexa, Simon says” and then a phrase to any Echo speaker, Alexa repeats whatever is said next. Using this command, the researcher first said the voice command and read Alexa each sentence of her answers (one sentence at a time). When she repeated the given answers, the sound of her answers was captured and recorded using a computer connected to the Echo speaker. After recording all of her answers, all the voice recording files were edited and split into multiple files such that each file includes her answer to a single question.
### Appendix F. Correlation Matrix for the Phantom Modeling Analysis

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**Note.** Cred=credibility of Alexa’s information, Atti=attitudes toward Alexa, BI=behavioral intentions toward Alexa, Trust=trust in Alexa, Prior VA=prior VA usage experience; *p < .05*, **p < .01**
Appendix G. Item Parceling

User control over their interaction with Alexa

Keeping in mind your experience with using Alexa website, please indicate your agreement with the following statements.

Parcel 1: Control over the Alexa search service operation
I was able to influence how Alexa searches information on the Web.
I was able to adapt Alexa’s information search service in a way I wanted.

Parcel 2: Control over the Alexa source selection
I was able to influence what websites Alexa uses to search information on the Web.
I was able to freely choose the sites where Alexa go to search information.
I was free to decide where Alexa goes to search for information.

Parcel 3: Control over the Alexa source tailoring
I was able to initiate actions to modify what sites Alexa uses to get information.
I was able to change what sites Alexa uses for information search to my personal taste.
I felt in charge of my experience with Alexa's information search service.

User’s perceived involvement with Alexa’s information

In general, Alexa’s answers were ________ to me.

Parcel 1: Importance
not at all important --- very important
of no concern --- of great concern
insignificant --- significant

Parcel 2: Practicality
useless --- useful
worthless --- valuable
not beneficial – beneficial
uninteresting -- interesting

Parcel 3: Essence
trivial --- fundamental
superfluous --- vital
irrelevant --- relevant

Perceived credibility of Alexa’s information

Alexa’s answers to my questions were ________ so far.

Parcel 1: Veracity
Attitudes toward Alexa

Keeping in mind Alexa’s performance in answering your questions, please indicate your agreement with the following statements.

**Parcel 1: Involving**
The way Alexa delivered information to me was very involving.

**Parcel 2: Satisfying**
I am satisfied with Alexa's information search service.
I am satisfied with the way Alexa searches information on the Web.

**Parcel 3: Entertaining**
The interaction with Alexa was fun.
Alexa that I interacted with was really cool.

Trust in Alexa

Please evaluate Alexa on each of the following dimensions.

**Parcel 1: Faithful**
undependable --- dependable
unreliable --- reliable

**Parcel 2: Accurate**
deceptive --- veracious

**Parcel 3: Earnest**
insincere --- sincere
untrustworthy --- trustworthy

Power usage

**Parcel 1: Easy use**
I think most of the technological gadgets are complicated to use (R)
I make good use of most of the features available in any technological device
Using any technological device comes easy to me
I often find myself using many technological devices simultaneously

Parcel 2: Control by humans
I love exploring all the features that any technological gadgets offer
I prefer to ask friends how to use any new technological gadget instead of trying to figure it out myself (R)
I have to have the latest version or updates of technological devices (or software) that I use
Using information technology gives me greater control over my work environment

Parcel 3: Control by technology
I would feel lost without information technology
Use of information technology has almost replaced my use of paper
I feel like information technology is a part of my daily life
Using information technology makes it easier to do my work
Appendix H. Results of Hypothesis Testing Without the Incorrect Personalization Cases

- **H1 (supported)**: a main effect for the presence of Alexa’s sources, $F (1, 134) = 436.68, p < .001, \eta^2_p = .92$; absence of source ($M = 3.09, SE = .05)$ < presence of source ($M = 5.78, SE = .04$)

- **H2 (supported)**: a main effect for media platform on source expertise, $F (1, 83) = 5.19, p < .05, \eta^2_p = .06$; forum ($M = 4.51, SE = .14$) < news ($M = 5.81, SE = .11$)

- **H3 (rejected)**: no significant main effect for media platform on source-receiver homophily, $F (1, 83) = .76, p = .39, \eta^2_p = .01$; news ($M = 4.59, SE = .11$) ~ forum ($M = 4.81, SE = .12$)

- **H4a-b (supported)**: a positive relationship between source expertise ($b = .12, SE = .04, p < .01$) and credibility of Alexa’s answers; a positive relationship between source-receiver homophily and credibility of Alexa’s answers ($b = .11, SE = .04, p < .05$)

- **RQ1**: no interaction effect between media platform and source tailoring, $F (1, 83) = .32, p = .58, \eta^2_p = .00$.

- **H5-7 (supported)**: a main effect for source tailoring, Wilk’s $\lambda = .52, F (2, 133) = 17.20, p < .001, \eta^2_p = .28$; **user control**: control ($M = 3.76, SE = .16$) < personalization ($M = 4.26, SE = .19$) < customization ($M = 5.64, SE = .16$), $F (2, 133) = 36.02, p < .001, \eta^2_p = .35$. **self-identity**: control ($M = 3.34, SE = .17$) < personalization ($M = 4.26, SE = .17$) < customization ($M = 4.83, SE = .17$), $F (2, 133) = 18.55, p < .001, \eta^2_p = .22$; **involvement**: control ($M = 4.31, SE = .10$) < personalization ($M = 4.85, SE = .11$) < customization ($M = 5.39, SE = .09$), $F (2, 133) = 32.57, p < .001, \eta^2_p = .33$

- **H8a-c (supported) & H9a-c (supported)** -- the phantom model for news websites: a positive relationship between credibility and user control ($b = .24, SE = .05, p < .001$), self-identity ($b = .12, SE = .05, p < .05$), and involvement ($b = 1.07, SE = .12, p < .001$); a positive relationship between credibility and attitudes ($b = .24, SE = .06, p < .001$), behavioral intentions ($b = .37, SE = .08, p < .001$), and trust in Alexa ($b = .29, SE = .07, p < .001$)

- **H8a-c (supported) & H9a-c (supported)** -- the phantom model for forum websites: a positive relationship between credibility and user control ($b = .19, SE = .05, p < .001$), self-identity ($b = .09, SE = .05, p < .05$), and involvement ($b = 1.13, SE = .13, p < .001$); a positive relationship between credibility and attitudes ($b = .18, SE = .06, p < .01$), behavioral intentions ($b = .38, SE = .09, p < .001$), and trust in Alexa ($b = .27, SE = .08, p < .01$)

*Note.* Results showed no change in the direction of statistical significance of all the hypotheses under study. That is, there was no substantial difference in the results when only the correct personalization cases were used for the analyses.
VITA

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