Perception of Privacy in Virtual Assistants: Consumers vs. Corporations

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Siri, released by Apple with the iPhone 4S in 2011, was the first virtual assistant to gain popularity in the United States (Allen, 2021). Virtual assistants, also known as intelligent voice assistants or intelligent personal assistants, are pieces of software that can perform tasks, such as setting reminders or sending messages, when asked by a user, typically through voice commands (Amazon, n.d.-b; Apple, n.d.; Google, n.d.-b; Microsoft, n.d.). Since 2011, other technology companies have joined the trend: Siri was followed by Amazon Alexa in 2014, Microsoft Cortana in 2015, and Google Assistant in 2016. Devices with virtual assistants exploded in popularity: in 2019, Amazon SVP Dave Limp revealed that "more than 100 million devices with Alexa on board have been sold" (Bohn, 2019).

With their proliferation came questions and concerns about how virtual assistant providers utilized user data (Augustin et al., 2022). The data that they collect is extensive, Reuters reports:

> Such information can reveal a person's height, weight and health; their ethnicity (via clues contained in voice data) and political leanings; their reading and buying habits; their whereabouts on any given day, and sometimes whom they have met. (Kirkham & Dastin, 2021)

This data has many uses, including improving the machine learning models that perform text-to-speech transcription (Amazon, 2022a; Dupuy et al., 2022) and personalized advertising (Chen, 2021; Google, n.d.-c). Virtual assistants have had a controversial track record with regards to data collection and usage: headlining incidents related to virtual assistant data misuse include Amazon employees listening to recordings (Day et al., 2019), and audio recordings from Alexa have been handed over to United States law enforcement on two occasions (Fingas, 2019; Heater, 2017).

Discussions about virtual assistant privacy lie in the context of the broader conversations about digital privacy and data responsibility, and has legal, ethical, and financial consequences as it involves institutions from advertising (Chen, 2021; Iqbal et al., 2022) to law enforcement (Fingas, 2019; Heater, 2017; Williams, 2017). Companies such as Amazon and Google have a financial incentive to collect data, as they are often used for targeted advertising (Google, n.d.-c; Iqbal et al., 2022), which is a potent revenue source (Chen, 2021; Iqbal et al., 2022). They also have a financial incentive to reassure consumers that their data is used responsibly, in order to drive sales of their virtual assistants. This is manifest in their marketing of their devices, which, in addition to the convenience and usefulness of the virtual assistants, focuses on the privacy features of their ecosystems (Amazon, n.d.-a; Amazon Alexa, 2020a, 2020b; Apple, n.d.; Google, 2020; Microsoft, n.d.). Technology companies—specifically Amazon, Apple, and Google, the top three virtual assistant vendors (Olson & Kemery, 2019)—form the first major participant group of this research problem.

These companies are accompanied by the second participant group of this research problem: digital privacy advocacies and researchers. Among them is the Electronic Frontier Foundation, an advocacy group that defends "civil liberties in the digital world" (Electronic Frontier Foundation [EFF], n.d.). The EFF's stated mission is to "ensure that technology supports freedom, justice, and innovation for all people of the world," and they work towards it "through impact litigation, policy analysis, grassroots activism, and technology development" (EFF, n.d.). Groups such as the EFF act as watchdogs over technology companies, and advocate against invasive data collection and other unethical data practices.

The final participant group in this research problem are the consumers themselves. Consumers decide where to spend their money, and thus decide whether they want to purchase

and use virtual assistant technology. Consumers also include journalists and technology reviewers, who report and opine on privacy issues of virtual assistants.

The question is thus how do consumers, technology companies, and privacy advocacies compete to determine the limits of permissible data collection by virtual assistants. For the purposes of this paper, the scope of this question is limited to the United States.

From reviewing market and academic research, as well as statements from virtual assistant users, technology companies, and privacy advocacies, I contend that users are largely apathetic about the data collection and privacy issues surrounding virtual assistants; that companies allay concerns about privacy by implementing some privacy controls and by advertising; and that companies and privacy advocacies compete to shape privacy legislation.

Review of Research

There is plenty of published research on the privacy issues of virtual assistants (Edu et al., 2021); however, this paper is concerned more with how consumers respond to those privacy issues, and how companies respond to their concerns. To do this, this paper must draw on research into the habits and views of consumers regarding privacy and virtual assistants.

Several researchers have contended that consumers are often unaware of the data policies of their virtual assistants (Augustin et al., 2022; Lau et al., 2018; Malkin et al., 2019).

Augustin et al. (2022) found that even when people are aware of the privacy concerns associated with virtual assistants, they do not act in a way that might address those concerns. They proposed explanations of why this occurs, including “privacy calculus,” when users decide that the benefits outweigh the risks to privacy, simple trust of the technology companies behind virtual assistants, and “privacy cynicism,” “privacy apathy,” and “privacy fatigue,” which are

when consumers lose interest in privacy due to feelings of being unable to do anything about invasions of privacy (Augustin et al., 2022, pp. 315–316). Lau et al. (2018) found that non-users often cited privacy as a reason for not adopting smart speakers, whereas users either accepted the privacy tradeoff, or were consciously ignorant of privacy issues. They also noted that users were often aware of the privacy controls available on smart speakers, but only rarely used them (Lau et al., 2018). Malkin et al. (2019) found that many smart speaker users were unaware of the data retention policies of their devices, and few of those who knew of the privacy controls used them. Y. Liao et al. (2019) found that users tended to trust the companies behind virtual assistants with their data and had few privacy concerns, while those adamant about not using virtual assistants commonly cited privacy as a concern.

Fruchter and Liccardi (2018) performed an analysis of user reviews of virtual assistant-enabled smart speakers from Amazon and Google, and found that only 2% of reviews mentioned privacy concerns. Within that 2%, Fruchter and Liccardi found that consumers voiced "concerns about the amount, scope, and type of data collected" (2018, p. 4), feelings of the smart device being "creepy" or a "spy" (2018, pp. 4–5), and "events which pass their personal privacy thresholds" (2018, p. 5). They note that "a substantial number of reviews indicate that a loss of privacy is an adequate tradeoff given their device's functionality" (Fruchter & Liccardi, 2018, p. 5). A study by Microsoft claims that 41% of virtual assistant users are concerned about privacy (Olson & Kemery, 2019). Of those 41%, more than half report they were concerned that their personal information was not secure, and more than 40% said they were concerned about virtual assistants listening when they were not supposed to (Olson & Kemery, 2019).

There has been little to no academic research on how privacy advocacies have influenced this debate. This paper aims to uncover their impact, or lack thereof. Similarly, there has been

little research on how advertising of privacy features has impacted consumer attitudes towards data privacy. Martin & Murphy (2017) contend that privacy can be used as an effective marketing strategy, but only if those promises are carried through, as "consumer perceptions of privacy deficiencies are likely to be widely shared and well-known" (pp. 150-151). They also contend that high-profile breaches of privacy impact the reputation of firms seen as similar to those which had a breach of privacy occur (Martin & Murphy, 2017). Some analogous conclusions might be found in the advertising of tobacco companies about the health impacts of smoking. A study by Cummings et al. (2002) contends that advertising by tobacco companies in the 50 years leading up to the study was successful in misleading consumers, particularly smokers, about the health risks of smoking. This would support a contention that advertising about privacy could mislead consumers about the privacy of virtual assistants.

Argument

Consumers are largely apathetic about the privacy issues of virtual assistants.

As there are many millions of consumers of virtual assistants, and many millions more Americans who do not use them, their attitudes are difficult to qualify. One avenue of research would be to examine user reviews of virtual assistant products, but this route has been taken by academic researchers using machine learning algorithms that quantify sentiments in reviews (Fruchter & Liccardi, 2018). Instead, I want to augment that research by looking at social media posts for people's opinions on virtual assistant privacy.

On the social media site Reddit, one of the most popular forums is r/technology, which hosts news about technology, and has many posts about virtual assistants and their privacy

shortfalls. A comment on a post titled “Amazon confirms it keeps your Alexa recordings basically forever” states:

> Ethics and questionable practices aside; if we are to get to some sort of interactive sci-fi future it's just a fact that our tech will be constantly monitoring and storing information about us. Need to come up with ways to protect users and hold companies accountable. (bdez90, 2019)

This is one post that shows a belief that technology must perform data collection in order to perform its functions. Another commenter, on a post titled “Amazon’s Alexa Collects More of Your Data Than Any Other Smart Assistant,” goes further and fully takes responsibility over their data that is kept by virtual assistants:

> Not just Alexa focused but many of these points are related to “your account” such as photos and whatnot. Of course it has that data, I put it there.
>
> I want it to know my downloads, what I've streamed, what I've read, and what device I'm using for what. That's how it assists after all.
>
> None of these are points I wasn't aware of and almost all of them are specific to how I use it and are required to assist me in what I “hired” it to do. How can it call mom if it doesn't have mom's contact details? How can I email mom if it doesn't have her address?...
>
> Anyhow, whatever, there isn't anything here enlightening. If anything I wish Amazon would collect more data on what I read for books because their recomendation system sucks ass. Yeah, I really want to read a teen book after digesting 10 space marine books. (xynix_ie, 2021)

The point that virtual assistants require data to function, and that users should expect as such in their understanding of data privacy, is echoed in other posts about Alexa’s data use. Reddit user Dugen comments on their post “I found an Amazon folder with thousands of audio recordings from my home gadgets,” writing:

> I'm posting this article just to complain about it and articles like it. Amazon is clear about its data collection. Do people not pay attention when apps request access to their data on

> their phone? Do they not look at their history at all in the Alexa app where it lets you view and delete the copies of the audio clips that they do voice recognition on? None of this is interesting, no less scandalous. (2021)

These comments reflect a seemingly popular view on Reddit's r/technology forum that privacy is no longer something that can be controlled by consumers if they are to use technology. They also reflect a perception that privacy issues are well-known, and no longer worth discussing, signaling a resignation to corporate data collection. However, on the Reddit forum r/privacy, there is pushback against this view; a comment on the post "Report shows that Amazon uses data from Alexa smart speakers to serve targeted ads" states:

> All the comments are acting like this article is dumb for reporting something everyone knows, but the fact is we need more articles highlighting this because the vast majority of the population is ignorant as fuck and doesn't realize any of this is happening in their home. Shitting on the article is shooting privacy activism in the foot. Word needs to spread. (kazoozazooz, 2022)

Sentiment like this is expected on a forum about data privacy and shows that there is resistance against data collection by technology companies. I found more resistance to perceived invasions of privacy in the comment section of the Washington Post article "Alexa has been eavesdropping on you this whole time," where user EasterIslandStatue writes "I like technology but draw the line at devices that listen to me" (2019). There are many comments on news sites that echo this sentiment; on the Guardian article "'Alexa, are you invading my privacy?' – the dark side of our voice assistants," user ildfluer writes "Why, just why the hell would you even bring something like that into your own home?" (2019). However, there are also commenters who express that the benefits of virtual assistants outweigh the privacy risks, like user Aestumanda, who says "I have considered the privacy implications but for me the independence these assistants offer me far outweighs my privacy concerns" (2019). This is evidence that some users are aware of the

privacy issues of virtual assistants but decide to use them anyways. This view is found in professional reviews of virtual assistant products. In his review of the 2020 Amazon Echo, an Amazon Alexa device, Nick Pino writes:

> Having Alexa know when you open your garage or turn off your lights is still a huge source of concern for a lot of us, though, and Amazon hasn't done much to allay those concerns. It's not enough to stop millions of us from using Amazon's devices, but it's something we remain leery of all the same. (2021)

My findings confirm prior research that contends that some consumers have become apathetic to privacy issues, from a belief that they are an inescapable part of life in modern technological society. This corroborates concepts such as "privacy fatigue" and "privacy calculus" that seek to explain why consumers disregard privacy (Augustin et al., 2022). My findings also show that people who are truly concerned about privacy simply do not adopt virtual assistant devices. Consumers participate in the privacy debate primarily using their wallets: if they are unconcerned about privacy, they will adopt technology that they find useful.

Companies address concerns about virtual assistant privacy by implementing privacy controls and by advertising their privacy features.

Each of the three major virtual assistant vendors (Google, Amazon, and Apple) employ two main methods of managing consumer skepticism about their privacy approaches: first, they implement measures that allow consumers to control their data, and second, they advertise privacy as a feature of their devices.

Amazon (n.d.-a) says they implement privacy features, such as the ability to "view, hear, and delete your voice recordings," and to "see and update the Alexa Skills that you've granted permission to access specific data." On their smart speakers, which is a common use point for

Alexa, they implement controls such as the illuminated microphone off button, which they say is designed so "power is provided either to the dedicated red light on the device or to the device's microphones, but not both at the same time" (Amazon, n.d.-d). Amazon has implemented ways to interact with the privacy controls while using the device as a virtual assistant, by issuing voice commands such as "Alexa, tell me what you heard" or "Alexa, delete everything I've ever said" (n.d.-a). Google (n.d.-d) lists similar features on their privacy pages for Google Assistant: users can use voice commands to access privacy controls just like with Alexa, and can set up a schedule to automatically delete their data from Google. They also claim to allow users to disable microphones on their smart speaker devices with a switch (Google, n.d.-a). Apple highlighted a different privacy approach for Siri, its virtual assistant product. Instead of streaming audio to servers for processing, Apple (n.d.) claims that their devices process Siri requests directly on the device, eliminating the risk of audio being stored and viewed on Apple's servers. However, Apple (2022b) says they still store some data related to the requests but will automatically delete most data within six months, and allows users to delete their Siri data manually. These privacy controls aim to give consumers some level of control over their data, but prior research has suggested that they are rarely utilized (Lau et al., 2018; Malkin et al., 2019).

The companies advertise these privacy features: the product pages for virtual assistants feature privacy. The second line on Apple's product page for Siri boldly claims that Siri has "the strongest privacy of any intelligent assistant" (n.d.). Google has a large statement that "Google Assistant is built to keep your information private, safe, and secure" on its product page (n.d.-b). On the Amazon product listing for Amazon Echo, Amazon states that Alexa and Echo devices are "designed to protect your privacy" (n.d.-c). Amazon and Google both try to refute claims that

their devices are always listening by emphasizing the concept of "wake words" and "activation," which are phrases that virtual assistants must detect before they start transmitting audio (Amazon, n.d.-e; Google, n.d.-d). Much of the messaging about privacy takes a somewhat technical approach, which could signify that these companies believe that more technically minded consumers have more reservations about privacy.

Television advertising for virtual assistants emphasizes their utility and ease of use through the voice interface, and typically does not mention privacy (Amazon, 2022b; Dwayne The Rock Johnson, 2017; Google, 2017). Although each of the major vendors of virtual assistants have published videos about the privacy features of their devices (Amazon Alexa, 2020a, 2020b; Google, 2020), only Apple has engaged in television and online advertising over their privacy features, although these address privacy on iPhones more generally, and not just Siri (Apple, 2022a). This shows that Apple is willing to market its privacy as a feature that elevates their products above those of competitors, and other companies may start advertising privacy features more prominently in the future.

Technology companies compete with privacy advocacies to shape privacy legislation.

After the passage of the General Data Protection Regulation in the European Union, new data privacy legislation has been pushed in the United States. These bills are subject to the forces of technology companies and privacy advocacies, who want to rewrite them in their favor or strike them down.

In the United States, privacy legislation applicable to virtual assistants exists in the California Consumer Protection Act (CCPA) and its amendment, the California Privacy Rights Act (CPRA), also known as Proposition 24. Several consumer privacy advocacies worked to

advance this legislation. Both the CCPA and the CPRA were sponsored by Californians for Consumer Privacy (CCP, n.d.). Californians for Consumer Privacy is headed by Alastair Mactaggart, who funded it during the push for the CCPA with almost $2 million of his own funds (Cal-Access, n.d.-a).

To oppose the CCPA, the California Chamber of Commerce, a business advocacy, set up an organization called the Committee to Protect California Jobs (Fang, 2018). This organization was funded by many technology companies, including Amazon, Microsoft, and Facebook (Cal-Access, n.d.-b; Fang, 2018; Lapowsky, 2018). Together, they raised $2.1 million to oppose the CCPA. The Committee was used by industry to organize lobbyists against the CCPA and its associated ballot initiative (Fang, 2018). Sarah Boot, a lobbyist, was quoted saying "although AB 375 is deeply flawed, the privacy initiative is even worse. The stakes are astronomical because if the initiative is passed, the legislature will be virtually unable to amend the law in the future" (Fang, 2018). Facebook later withdrew from its support of the opposition campaign, stating they "took this step in order to focus our efforts on supporting reasonable privacy measures in California" (Brodkin, 2018). CCP initially pushed for a ballot initiative, but compromised for a bill to be passed in California's state assembly (Fang, 2018). This was supported by technology companies, as assembly bills in California are able to be amended, but ballot initiatives are not (Fang, 2018).

After the CCPA was passed, the Electronic Frontier Foundation, a privacy advocacy, claims the CCPA started coming under attack through new legislation that would weaken it (Schwartz et al., 2019). The EFF claims they worked to oppose these new bills, including California S.B. 753, which they say "would have created a new exemption from the right to opt-out of data sales for surveillance-based online ads" (Schwartz et al., 2019). Also during this time,

CCP proposed a new ballot initiative, called Proposition 24, which would later be approved by voters as the CPRA (CCP, 2020). They claim that the act would "establish an enforcement arm" for data privacy in the state government, and that it would "make it much harder to weaken privacy" (CCP, 2020). The EFF, along with a coalition of advocacies including the Center for Digital Democracy, the American Civil Liberties Union, and Privacy Rights Clearinghouse, among others, published a letter to Mactaggart before the initiative was finalized for the ballot (ACLU of California et al., 2019). This letter specifies ways that the coalition believed the proposed initiative could be improved (ACLU of California et al., 2019). The EFF has published their general recommendations for good data privacy legislation (Gebhart, 2019), and has voiced opposition to the passage of privacy bills that they deem insufficient. They opposed the Virginia Consumer Data Privacy Act, claiming that it "has almost no teeth" (Tsukayama, 2021). These recommendations are another way that privacy advocacies influence data protection legislation.

The case study of the CCPA and CPRA demonstrates the competition between advocacies and technology companies to shape legislative action on data privacy. Data privacy legislation does not specifically address privacy in virtual assistants, rather they address data privacy in all forms.

Conclusion

Virtual assistant privacy is one front in the wider debate about digital privacy. As use of the internet has become inextricable with life in the United States, this is a debate in which nearly every American is a participant. Although decades of lax data privacy regulation and a lack of consumer pushback has empowered technology companies to use data at their will, there is a movement today that aims to reign in their practices. As consumers became more aware,

they have begun to support legislation that protects their data privacy, first in Europe, then in California, and perhaps soon in the rest of the United States.

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