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**Differences in the Use of AI Assistants: How Human Values Influence  
AI Assistant Use or Disuse**

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**Differences in the Use of AI Assistants: How Human Values Influence  
AI Assistant Use or Disuse**

**by**

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**Report**

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## **Dedication**

This report is dedicated to my family, my partner, my mentors, and my friends who helped me along the way. Without their influence I would not be where I am today, nor would I be the person I am today.

## **Acknowledgements**

I would like to acknowledge the incredibly valuable assistance I have received from my supervisor and mentor Dr. Ken Fleischmann. Without his help none of this would be possible, and I would never have realized how invaluable the field of Information really is. I also want to acknowledge the invaluable advice and wisdom from Dr. Randolph Bias, not only on this project but in my overall time in my master's program. I would not be the information professional I am today without his guidance.

## **Abstract**

# **Differences in the Use of AI Assistants: How Human Values Influence AI Assistant Use or Disuse**

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The University of Texas at Austin, 2018

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This report is an analysis of the usage of artificial intelligence (AI) personal assistants such as Siri, Google Assistant, and Alexa through the examination of how an individual's personal values influence their use of these devices. These assistants have become a built-in component of many technologies, and yet there is not a large amount of research on their utilization. Like most consumer level technologies, individual preferences determine how and when they will be used. Artificial assistants exist in a multitude of forms that most technology-using people will interact with, from bot assistance on websites or through the phone, to the personalized artificial intelligences used like the aforementioned Siri, Alexa, and Google Assistant.

These specific assistants are utilized for everything from turning on the news to making purchases with the owner's credit card information. They are privy to a multitude of personal information, and like most new technology, the level of comfort that people have using these devices varies depending on individual preferences. This report utilized a survey that focused on the Portrait Values Questionnaire created by Schwartz (2007) and made gender neutral by Verma, Fleischmann, and Koltai (2017) as well as in-depth, semi-structured, open-ended interviews. The ten interviews generated a greater understanding of individual perceptions of these devices and allowed for a more in depth look at specific examples and perspectives that strengthened the findings from the survey.

The ultimate purpose of the report was to analyze how human values affect an individual's use of these devices as one step towards a greater understanding of human values' impact on technology, and how technology can be best created for humanity in turn.

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## **The Importance of Human Values**

Throughout human history, society has been impacted by technological advancements. These advancements vary in terms of the type and scale of impact. Some advancements such as the television and the microwave oven have had great and far-reaching impact. They traversed from the realm of expensive luxury to almost necessary to daily life. Many social factors have mediated that impact, such as overall usage, pricing, and the problems that these technologies attempt to solve. The television enhanced access to information and entertainment, while the microwave accelerated meal preparation and reheating. However, most technologies that attempt to solve problems beyond necessities, such as the Juciero (a juicer that squeezes pre-made juice bags that can only work if connected to the internet (Zaleski, 2017)), find themselves firmly in the space of expensive luxury, unable to transition to the general consumer market (Baran, 1995).

There are some technologies, such as the self-driving car, that are looking to bridge the gap between luxury and necessity to mixed success (Suarez, et al, 2018). While it is true currently that cars are a necessity for a large portion of the population, there are many factors that lead a consumer to look away from the newer technological option. One of the factors, much at the forefront of the average consumer's mind, is price. Many new technologies come at a higher cost due to the price of development for them and the fact that their manufacturers mainly advertise these products to early adopter customers who have more familiarity with technology and more disposable income (Bonfrer et al, 2018).

Another more nebulous factor is the differences in individuals' values that cause differing opinions on all sorts of technologies. There are ways to mitigate the differences in opinions and the difficulties this can cause in a community, for example before integrating a new technology into their community, the Amish try them together as a community and only adopt the technology if it reinforces and promotes the value of togetherness that the community upholds (Wetmore, 2007).

These human values vary among individuals for a variety of different reasons, including culture, personal experiences, and personal relationships (Fleischmann, 2013). And these values affect all aspects of daily life, from consumption to careers to choices of entertainment. The effect of an individual's values on their choice of technology has been analyzed in a few different notable ways, including Li et al.'s (2010) finding that an individual's national culture affects their satisfaction and trust in robotic counterparts and Thomas Malsch's (2001) analysis of the sociological factors that influence a user's attitude towards distributed artificial intelligence.

Ultimately, this kind of analysis has aided a movement in the design field; human centered design or designing for desires of the intended user at the center of the design. This kind of design thinking is beneficially both to the consumer and to the developer as systems made with a focus on needs mean they will meet their audience's requirements for purchasing and be something that their audience will use and enjoy (Borning et al., 2009). Human centered analysis also has benefits for the general populace as well, as analyzing how humanity interacts with the world allows us to have a greater understanding of

ourselves (Bias et al., 2012). It becomes even more important to look at our interaction with the world as the world changes drastically.

From user centered design came value-centered design. This form of user centered design moved away from general user need considerations to the more focused concept of designing based upon the values of the desired users (Friedman et al., 2006). This approach also combines the analysis of human values along with ethical consideration when designing human and technology interactive systems. Technological innovations directly influence human values, and vice versa (Friedman et al., 2008). Therefore, to gain a better understanding of the relationship between human beings and technology human values must be analyzed in relationship to technology. This is especially important in our current technological age.

Technology is advancing at a level beyond our understanding, people are growing up utilizing technology in all aspects of life, and we do not currently know how that will impact their quality of life or indeed our lives in the future. Thus, as new technology is introduced into daily life it must be looked at with a critical lens to see both how it affects humanity but also how it can best fit humanities current use cases, or current values. One of the newer technologies currently hitting the consumer market with mixed results is artificial intelligence personal assistants.

## **What Are Artificial Intelligence Personal Assistants?**

Artificial intelligence (AI) has frequently been subject matter in science fiction for many years. From HAL 9000 in *2001, A Space Odyssey* as an example of malicious artificial intelligence to the positive *Computer* from the original *Star Trek*, they cover most bases of humanity's opinions of this form of technology. Overall, AI include software and hardware that are made to behave as if they were intelligent. This includes being able to hold conversations, complete certain tasks, and if connected with machine learning, learn as they interact (Ertel, 2018). While they are not currently on the same ability level as HAL, they are beginning to utilize natural language processing, or having them respond intelligently to natural language as opposed to having them respond in pre-coded phrases to pre-determined words or phrases (Hirschberg and Manning, 2015).

These devices are also currently becoming more prominent on the consumer level. In the past few years, mostly since Apple's Siri entered the market and inspired competitors, these kinds of devices have become prepackaged into the already commonplace smartphones, distributing them to a large population of people. And with the creation of Amazon's Alexa in 2014 these devices have also become common place as their own physical hardware, as opposed to the pre-packaged software. However, these devices still are not at the level of general populace approval as the smartphones that house them.

The implication in these devices that can assist at any time is that they are listening at all times to make that happen (Bohac and Keck, 2018). Amazon asserts that the Echo is always on and listening for the key phrases that activate the device, and that the Echo does not collect or record data unless those key words or phrases are stated (Orr, and Sanchez, 2017). The thought of a device sitting and always listening impacts the value of privacy among individuals and may create an uneasy feeling towards these technologies.

## **The Problems with Data Collection and Storage**

There are even more implications to consider with regards to the storage of this data. For instance, does law enforcement accessing this data in investigations violate the Fourth Amendment in America? These devices are potential sources of digital evidence, or data valuable to an investigation that is stored, received, or transmitted by an electronic device. A specific example of this would be law enforcement's interest in gathering the recordings from Amazon while investigating the murder of Victor Collins in 2015. There was a fairly lengthy legal battle where Amazon was not willing to release the information as the request was seen as overbroad. It was not until 2017 that the suspect in question provided a waiver to the Police to allow them to use the recordings from Amazon (Orr and Sanchez, 2017).

While this data being access by law enforcement is not a cause of concern for a large part of the populace, there are 8.2 million Echo devices in homes across America as of December of 2017. These devices are gathering data that has now been allowed to be accessed by someone other than the manufacturer of the device, and this sets a precedent for the sharing of this data with other entities outside of the users knowledge or control. Facebook has dealt with a balance between user privacy and law enforcement as well. In the first half of 2017 there were 32,716 requests for users' private data from US law enforcement. Eighty-five percent of those requests were complied with, and 57 percent of the data requests they received from law enforcement included a non-disclosure order that



prohibited the company from notifying the user (Musil, 2017). This number only includes requests from law enforcement, there may be many more from commercial agents that they do not share.

Similar to the Echo and Alexa, Facebook collects a large amount of data on its users, often much more than the user understands. For the sake of transparency, it is possible to download a zip file from the website that contains all of the data Facebook collects on you as an individual. However, this has included all phone calls and texts, specifically from Android users, a fact of which many Android users were not aware. According to a Facebook spokesperson in 2018:

*The most important part of apps and services that help you make connections is to make it easy to find the people you want to connect with. So, the first time you sign in on your phone to a messaging or social app, it's a widely used practice to begin by uploading your phone contacts.*

In the past few years incidents like this have been making consumers more cognizant of the kind of data that they are giving to what they utilize, for better or for worse. High profile breaches of privacy such as the Facebook and Cambridge Analytica scandal have only brought this problem more to the forefront. This incident had Cambridge Analytica, a political data firm, accessing the private information of more than 50 million Facebook users (Granville, 2018). While this wasn't a data breach, since Facebook allows researchers to have access to data for academic purposes (which users consent to when

creating an account), it is against Facebook's terms of service as they prohibit the sale or transfer of this data to ad networks, data brokers, or other advertising or monetization services, as was the case in this instance (Granville, 2018).

The outcome of this instance has yet to be determined, but the effects have been immediate. A movement for the deletion of Facebook accounts and Mark Zuckerberg testifying to Congress on data privacy, are some of the immediate actions taken in the wake of the scandal. This also has had the effect of consumers looking to big technology manufacturers and companies and their own use of data and privacy and starting a larger conversation on the implications of our data oversharing in the past.

## **Purpose of This Research**

Artificial Intelligence personal assistants are becoming more prominent at a time where many consumers are starting to be more cognizant of where their data goes, with or without their permission. At the same time, the convenience of technology, from self-driving cars to making accounts of websites through social media, is well valued. The intersection of these two values, where the need for privacy is outweighed by the desire for convenience is where these devices are currently sitting. That is just the intersection of two aspects of human values, there are also other values that could affect the purchase or use of these devices by consumers.

Human values and different technologies such as service robots have been analyzed in the past, however the amount of data on these AI personal assistants is sparse due to their relative newness and the fact that they were created to be incorporated into other technologies in the beginning. This research attempts to bridge some of the gap in this area and examine the role of how human values influence the use of AI personal assistants.

This research sought to examine four of the most popular AI personal assistants: Apple's Siri, Google's Google Assistant, Amazon's Alexa and Microsoft's Cortana.

## **Methodology**

As discussed in the beginning of this report, this study focused on identifying how human values affect an individual's use or disuse of AI personal assistants. The ultimate aim of this research was to get information that could shed light on general consumers' views on and usage of the most common commercial artificial intelligence personal assistants. Therefore, the design of the study was divided into two main parts, getting general data from a larger group of individuals, and getting detailed data from some individuals from within that group. The general data can be used to get a glimpse of the study sample's current views, and the detailed data allows for a better understanding of the "why."

To get information from the larger number of individuals, I conducted a survey using the survey creation platform Qualtrics. Primarily, the survey was designed to get more information on individuals' human values, through Schwartz's (2007) Portrait Values Questionnaire (PVQ). The survey also included demographic data such as educational level, age, and area of work or study. The main aspects the survey measured were values, demographics, and the use of AI personal assistants. Thirty-nine participants completed the survey.

The PVQ used in this study was originally developed by Shalom Schwartz in 2007. The survey measures ten value types and four higher-order value dimensions. The value

types are self-direction, stimulation, hedonism, achievement, power, security, conformity, tradition, benevolence, and universalism. The higher-order value dimensions are openness to change, conservation, self-transcendence, and self-enhancement. These listed values were developed by Schwartz by extrapolating from the following three universal requirements of the universal condition: “the needs of individuals as biological organisms, the requisites of coordinated social interaction, and the survival and welfare needs of groups.”

Schwartz’s theories and earlier survey data guided the development of the 21-item PVQ, which is a component of the European Social Survey. Specifically, this study employed a gender-neutral version of the PVQ (Verma, Fleischmann, and Koltai, 2017). The PVQ utilizes an ordinal scale ranging from 2 (“Not Like Me At All”) to -2 (“Very Much Like Me”). To analyze how an individual identified with a particular value, labels of “high” and “low” are used, with high being above the median score of a value and low being below the median core of a value, again following the approach of Verma, Fleischmann, and Koltai (2017).

## **INTERVIEWS**

The interview script was developed to gather more detailed information about the general view of users of these devices. It was framed around identifying frustrating and successful experiences with these devices, as well as identifying the individual’s overall views on AI personal assistants. I interviewed ten users of AI personal assistants about the

relationship between their values and their use of AI personal assistants. I analyzed the data from the interview using Braun and Clarke's thematic analysis (2006). After transcribing the verbal data from the audio recordings with the participants, I coded potential themes such as "too many menus" and "can't handle simple tasks". Once the themes had been reviewed, I further defined them by identifying the three main themes described in detail in the below overall findings section.

## Results of Data Collection

The focus of this research was on human values and AI personal assistants. Therefore, the main analysis was focused on the Portrait Values Questionnaire and the use of AI personal assistants by the participants. The results begin with a description of the survey results and ends with a summation of the three main themes identified through thematic analysis of the ten interview transcripts.

### SURVEY RESULTS

Participants in the survey ranged from the age bracket of 18-24 to the bracket of 65-74. The age range that had the greatest participation was 25-34 years of age. Histograms for all demographic categories are shown in Figures 1 through 5. The majority of participants fell under the gender identity of female ( $n=28$ ). Nine participants identified as male, and two participants did not identify their gender identity. All participants were at least high school graduates, but the majority of participants had completed at least a 4-year degree ( $n=28$ ). The most highly represented area of work or study was science, technology, engineering, and math (STEM) ( $n=17$ ). The second most represented area was galleries, libraries, archives, and museums (GLAM) ( $n=7$ ). The majority of participants were white ( $n=32$ ), with Asian/Pacific Islanders ( $n=6$ ) and Hispanic or Latino ( $n=1$ ) also represented.

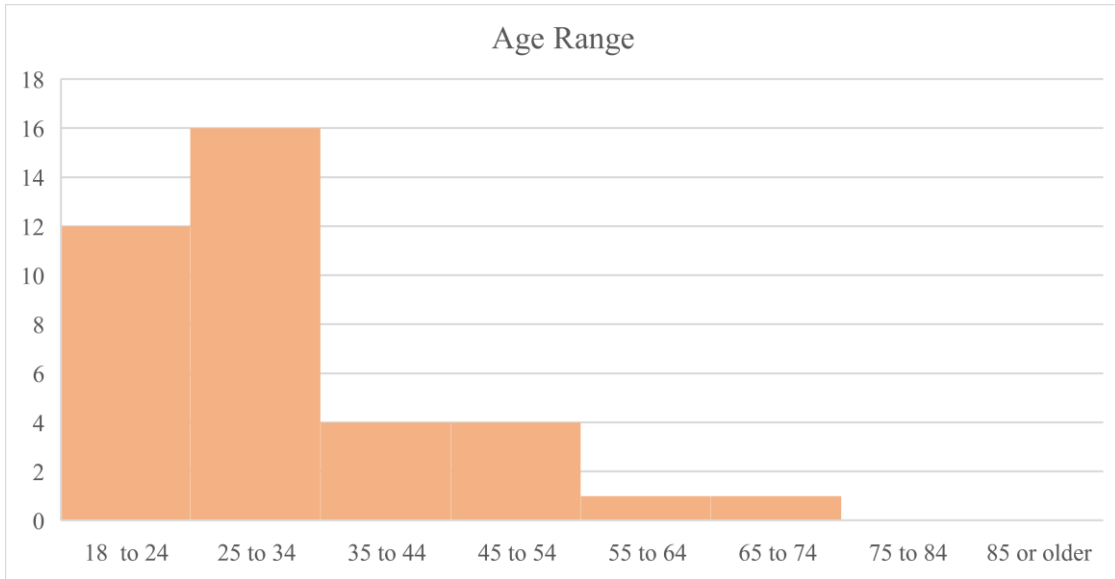


Figure 1: Age Range

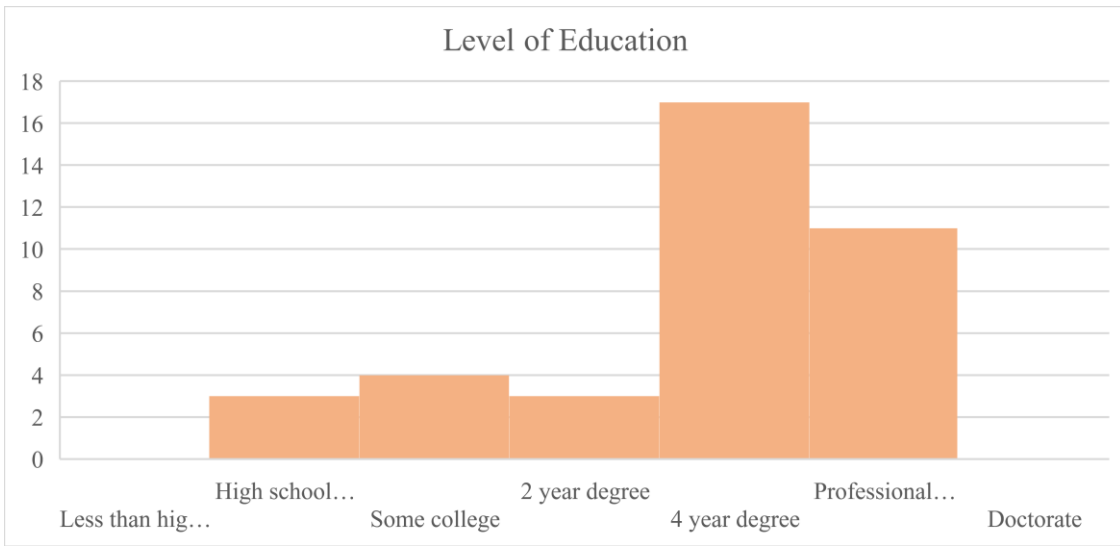


Figure 2: Level of Education



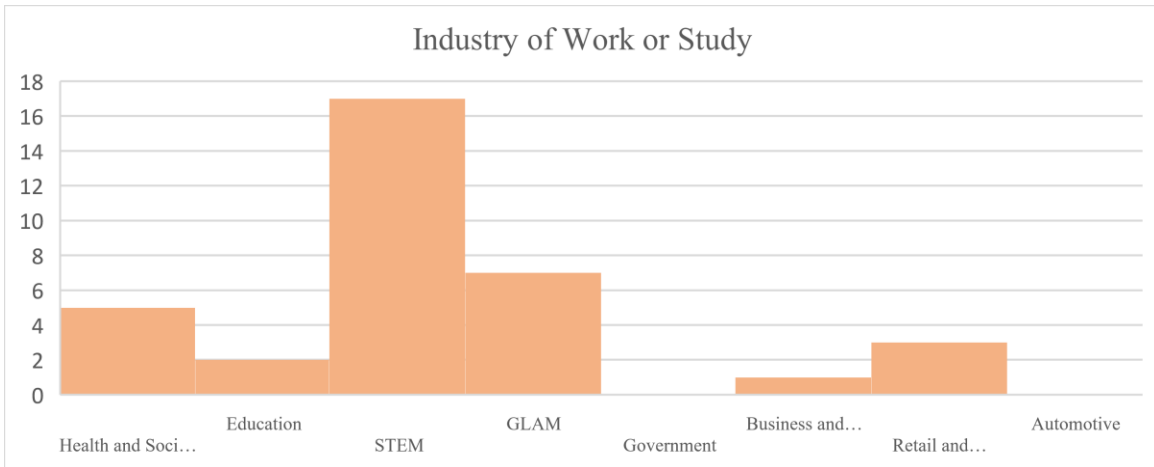


Figure 3: Industry of Work or Study

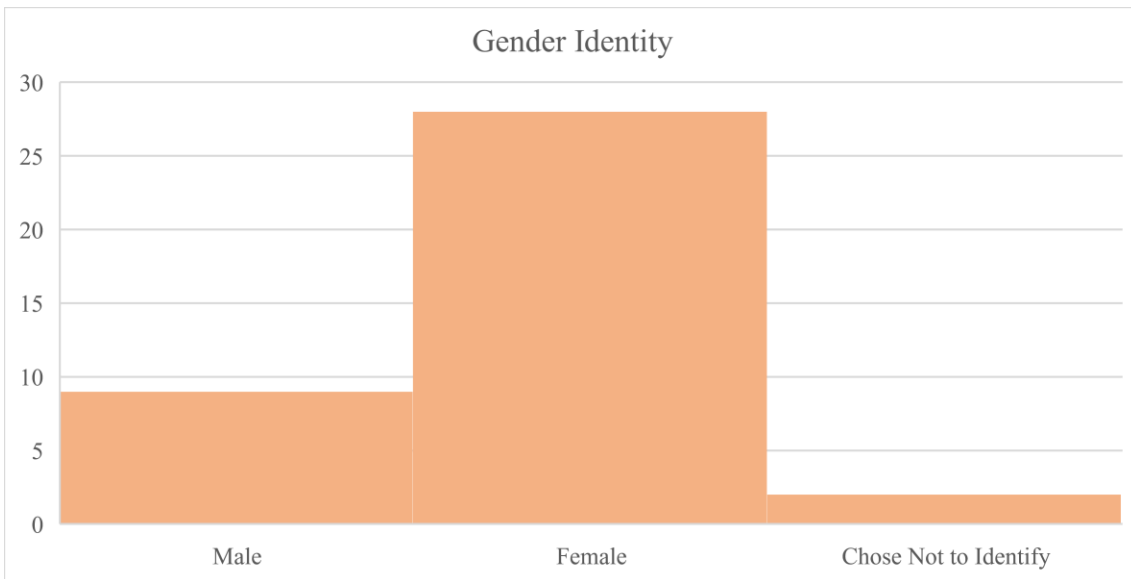


Figure 4: Gender Identity

In the analysis of which AI personal assistants the participants used provided the first surprise of the research. When creating the study materials, it was expected that there were four dominant AI personal assistants, Siri, Alexa, the Google Assistant, and Microsoft's Cortana. The first three were well represented, however none of the 31

participants in the survey who used AI personal assistants used Cortana. The most represented AI personal assistant was Siri (n=15), followed by a tie in usage of Alexa and the Google Assistant (n=11). One participant used the Dragon Mobile Assistant, developed by Nuance. Nuance is a developer that focuses on speech data and speech solutions, including voice recognition services with AI (Fast Facts).

Eight of the participants in the study utilized more than one AI personal assistant. Three of those participants used Alexa, Siri, and Google, four of them utilized Alexa and Siri, and one utilized Google and Alexa.

### **Portrait Values Questionnaire Results**

For each of the 21 value questions used in the survey an average value number was generated to understand how much or how little the statement related to the average participant in the survey. Each of the questions related to a different aspect of human values, and for the purposes of this research a few will be highlighted. Questions and average scores can be found below in Table 1.

Table 1: Results of the Portrait Values Questionnaire

<i>Value Question</i>	<i>Average Score</i>	<i>Value Question</i>	<i>Average Score</i>
<i>Thinking up new ideas and being creative is important to me. I like to do things in my own original way.</i>	-0.94	<i>It's very important to me to help the people around me. I want to care for their well-being.</i>	-1.27
<i>It is important to me to be rich. I want to have a lot of money and expensive things.</i>	0.03	<i>Being very successful is important to me. I like to impress other people.</i>	-0.19
<i>I think it is important that every person in the world be treated equally. I believe everyone should have equal opportunities in life.</i>	-1.49	<i>It is important to me that the government ensure my safety against all threats. I want the state to be strong so it can defend its citizens.</i>	0.08
<i>It's very important to me to show my abilities. I want people to admire what I do.</i>	-0.83	<i>I look for adventures and like to take risks. I want to have an exciting life.</i>	-0.14

Table 1 (continued)

<i>It is important to me to live in secure surroundings. I avoid anything that might endanger my safety.</i>	-0.89	<i>It is important to me always to behave properly. I want to avoid doing anything people would say is wrong.</i>	-0.43
<i>I like surprises. It is important to me to have an exciting life.</i>	-0.05	<i>It is important to me to get respect from others. I want people to do what I say.</i>	-0.16
<i>I believe that people should do what they're told. I think people should follow rules at all times, even when no-one is watching.</i>	0.05	<i>It is important to me to be loyal to my friends. I want to devote myself to people close to me.</i>	-1.22
<i>It is important to me to listen to people who are different from myself. Even when I disagree with them, I still want to understand them.</i>	-1.35	<i>I strongly believe that people should care for nature. Looking after the environment is important to me.</i>	-1.32

Table 1 (continued)

<i>It is important to me to be humble and modest. I try not to draw attention to myself.</i>	-1.03	<i>Tradition is important to me. I try to follow the customs handed down by my religion or my family.</i>	0.35
<i>Enjoying life's pleasures is important to me. I like to spoil myself.</i>	-0.50	<i>I seek every chance I can to have fun. It is important to me to do things that give me pleasure.</i>	-0.81
<i>It is important to me to make my own decisions about what I do. I like to be free to plan and to choose my activities for myself.</i>	-1.24		

The value questions that had the averages that fell closest to the “Very Much Like Me” score of -2 were the value question regarding equality (-1.49), the value question regarding listening to differing opinions (-1.35), and the value question regarding the environment (-1.32). No questions were close to the score of 2 for “Not At All Like Me,” though the score closest to that was the question regarding following traditions (0.35). This indicates that the participants in the survey most valued equality, listening to differing opinions, and protecting the environment.

As discussed above, privacy and security are often big factors in the utilization of technologies that involve using personal information, such as AI personal assistants. Other factors include how willing the individual is to try new technologies and experiences, as well as enjoying novelties (which as discussed above most of these technologies currently are). The human value question regarding security received an average score of -0.89, indicating that those who took the survey did value their personal security, but not to a major personal level. Similarly, the value question regarding new ideas and creativity had an average score of -0.94, indicating that the participants also value creativity. Lastly the participants in the study valued fun and enjoyment in life, with an average score of -0.81.

## **INTERVIEW RESULTS**

The ages of the participants in the interviews ranged from 22 to 34. The majority of participants were between 22 and 25 ( $n=7$ ). The majority of participants worked or studied in a STEM field ( $n=8$ ). All participants had at least completed some of a bachelor's degree, with most having completed or currently completing a master's degree ( $n=8$ ). The most used AI was the Google Assistant ( $n=6$ ), followed by Siri ( $n=5$ ), the least used was Alexa ( $n=3$ ). Four participants used two AI personal assistants. One participant used Siri and Alexa, one used Google Assistant and Alexa, and two used Siri and Google Assistant.

There was an equal split between those satisfied with current AI personal assistants and those not satisfied with their AI personal assistants. Those who were not satisfied

attributed that to the fact the AI did not act or did not have the functionality that they would expect. Problems with technology function were found by all participants, usually relating to voice recognition and the devices not following natural language, instead responding to key phrases and words.

Another commonality between all participants was that the manufacturer of the device mattered almost as much as the functionality of the devices when determining what they would willingly use or purchase. While most utilized the software focused artificial intelligence personal assistants were on their phones, the decision in buying their phones was determined by manufacturer. Most notable when considering the manufacturer was whether or not they trusted the manufacturer with their data.

Some participants ( $n=2$ ) did not like utilizing their artificial intelligence personal assistants due to the perceived breach of privacy. Particularly, Participant Seven stated:

*I don't want it listening to me. When you start down that road, when will it end up? Machines that can't think and only do simple things I want it to stop right there. I think it's cool if you are impaired physically and you use it to make a call or something I like that, but I don't want it to think. I want humans to do things, I don't see a need for a machine to become a human. That's what humans are for.*

Participant Ten also had similar feelings, stating that they felt they were “too private I guess, I feel my privacy is gone when using these applications.” However, all

participants did realize that data was taken, and the important thing to the majority was that they trusted the company that was collecting the data.

There was also a pattern that the price of these devices is a deciding factor in their use or disuse of the technology. Participant Nine stated that they would choose devices based upon price primarily, as did Participant Three. Price is a common barrier to use for newer technologies.



## Overall Findings

Based upon the results from the survey and the interviews, three main points have been identified as the main findings of this research. These themes were found as commonalities in the background research, and also found as unifying factors between the one on one interviews and the results of the Portrait Values Questionnaire in the distributed survey.

### FUNCTIONALITY OF TECHNOLOGY

The artificial intelligence personal assistants being able to do their expected functions was one of the main points in all users of this technology. The level to which a participant was able to handle the difference between expectations and the ability of the technology influenced whether or not they enjoyed the use of the artificial intelligence personal assistant at all. For example, Participant Five stated about their AI personal assistant Siri:

*I mean like it should be able to do more. Like I think I should be able to say an address to it and it should know exactly what I mean and it should be able to go to “my favorite Starbucks” they track my data they should know [what that store would be] by now.*

On the other hand, those that were able to recognize the limitations still had problems, but modified their mental models so that their expectations of the technology

would better meet reality, and thus had a more enjoyable experience. According to Participant Two, who did enjoy their Google Assistant:

*There are occasionally things that I think it should do, but it can't do, or can't do yet. I can tell a Google Home (if you have a Chromecast) to play something on Netflix and it works, but if you ask it to play something on Google Play it doesn't work. It doesn't make sense!*

In that instance, the Google device was unable to run something that Google developed and owned, leading to great frustration stemming from an expectation is that devices made by the same manufacturer should be able to work together. A limitation in technology was felt by all participants in this study, whether if it was due to problems with voice recognition, which was the complaint held by every participant, or if it was due to a region lock.

Once of the participants (Participant Seven) in the interview process moved from Australia to Sweden and has a Google Assistant on their Google Pixel phone that registers as the Australian version of the assistant. Their Google Assistant views itself as being in Australia, and there are features such as the Recipe feature and the connectivity with a Roomba that are region locked and unable to be accessed in Sweden.

There is also a language lock on the Google Assistant on Android phones, in that if you want to utilize multiple languages with the device, you have to go and change it in settings which requires going through multiple menus and toggling the language of the

entire device every time you want to use a different language, a fact that annoyed Participant Nine.

While the language selection annoyed them and they weren't satisfied by the technology, Participant Nine did specifically choose their phone based upon research into the AI personal assistants. Specifically, they commented on the Google Assistant's voice recognition ability, "reviews I've seen of the other assistants don't hold up nearly as well, speech detection [on Google Assistant] is by far the best."

This is a factor that was widely held by those who used the Google Assistant and by experts. Google Assistant is the best AI personal assistant for understanding context (Hindy, 2017). Context is a major factor in voice recognition, as humans speak with intent and context, and by matching how humans naturally process language it makes it easier for the user to achieve the goals they have for using the device.

#### **TRUST IN THE MANUFACTURER**

As mentioned above, the manufacturer of the AI personal assistants matters in the use or disuse of the devices. Companies that have a history of data protection and no scandals about data spreading, such as Google, are typically viewed better than Apple or Amazon. Participant Two currently trusts Google, but with some hesitancy for the future. They stated that "as far as we know, Google protects users' data jealousy, as they use targeted ads to make money. Therefore, I think they will value it. If Facebook did it, I would think they were directly selling my information to another company." They stated

that the second point was partially due to the recent data and privacy scandals with Facebook, but also from their data practices from the beginning.

However, it is not just the view of their data practices that influence purchases. Familiarity and brand loyalty matter as well. Four of the participants that used Siri chose to use it because they were brand loyal to Apple. Their reasoning for brand loyalty varied, though it usually boiled down to their previous Apple products being reliable in the past. For example, Participants Four and Five stated that they used Siri because it was on an Apple device and they had a positive history with Apple since they had used them for “10 years now and don’t have any problems. I get a lot of use out of them.” Participant Ten uses Apple products because they enjoy and are familiar with the user interfaces of the devices, and that is ultimately what had them use Siri.

General manufacturer practices matter as well, Participant Nine refuses to purchase any Apple products because they dislike their general business practices. One example of this practice is that there is only one version of hardware to choose from, and that developing for iPhone is more difficult than developing for an Android device.

### **PRIVACY VS CONVENIENCE**

As discussed in the beginning of this paper, privacy is something that is important to the populace. This was evidenced in the survey and also in the interviews conducted for this research. All interview participants indicated that they were varying levels of uncomfortable with the data collection, though some were distrustful while others viewed it as necessary for the functionality of the devices. Participant One noted that they disliked

the feeling of “a robot listening in” but by using the device in a positive manner they “just got used to it.” It comes down to whether or not the payment for the use of the devices is equal to their functionality.

The payment for the use of these devices, outside of the initial purchase cost, is the collection of data. In order to get the functionality expected (ideally), the data must be collected. How comfortable one is with this exchange determines whether or not they are satisfied with the technology itself. In the interconnected Internet Age, and in the future to come, an individual’s stance on this issue is going to become the level to which they utilize new technology. All technology, from smart fridges to money transferring websites like Venmo, collect data. In fact most of them have aspects of social media. For instance, unless you opt out, Venmo shares your money transfers publicly with all your contacts. This includes who you send or receive money from, and what the money is for. People who are not comfortable with that use other services. But it is possible that in the future, all AI personal assistants will collect and monetize users’ data.

## Conclusion

The overall findings of this research fall in line with other research conducted on how human beings' values interact with the use of technology. While not a surprising result, it is one that does offer some insight into the use of these AI personal assistants. The main purpose of this research was to see the effect that human values have on the use of these devices. Additionally, for the sample size of the study, a correlation between some values and the use or disuse of these devices have been found. One of the more interesting findings was that the effect of human values did not just apply to the physical devices but also referred to the manufacturer of the device.

This implies that if a company wants to consider the values of their target audience in their development they must consider how they are perceived, from data and business practices all the way to public opinion. While this is not an unusual finding, brand loyalty and company practices influencing buying behavior has been a factor in purchasing decisions for many generations of technology (Sasmita and Mohd Suki, 2015), it is a notable factor to consider during the development and marketing processes. By keeping the values of the intended consumer in mind, the developed technology will meet the desires of the audience better, resulting in more purchasing of the device and better public opinions of the technology.

Of course, the functionality of the technology also plays a large factor as to whether or not the technology will be a viable product. For the case of AI personal assistants this is a two-factor problem. The first is whether or not the technology is functional at the base

level, the voice recognition. As a major selling point of these devices is hands free assistance, if the AI cannot work hands free, it does not meet its main purpose. This also has multiple factors in viability.

While it is true the most important factor is the basic recognition, the technologies ability to understand natural language, or how individuals actually speak, also determines whether or not the device can recognize the task at hand. For example, if an individual uses certain terminology for a basic task for which the device is not programmed, such as not using a programmed phrase to ask for directions, then it has the potential of not being able to meet its purpose by not being able to start the function that leads to giving directions due to it not matching the exact programmed phrase.

There is also the matter of what functionality the devices are able to offer. As discussed above, there are some expected functions that the devices cannot do to the detriment of their overall reputation. A prominent example was the fact that the Google Assistant is not able to work with everything in the Google suite of products. An expectation when buying something in a family of products is that all of the products will be able to work together. That is why some individuals will purchase everything by a brand (outside of brand loyalty). This was something noted by multiple interview participants, and something that sticks out as a fairly sizable problem with the Google Assistant's usage.

The other big factor in the use of these AI personal assistants, and indeed with most new technology in the current internet age, is the divide between privacy and security and convenience. In an age where targeted ads are everywhere, data is collected from

everything. The comfort level in this fact determines what a person is willing to opt into or avoid. As evidenced by the incredibly negative backlash to the Facebook and Cambridge Analytica scandal described in the beginning of this paper, perceived misuse of an individual's data (even if they agree to giving the data away) affects the relationship between the individual and the party that misused the data. Depending on the size of the perceived breach of trust, the damage to that relationship can be irreparable.

It is currently unknown what the effects will be of the mass giving of information to corporations. We are already seeing some changes, like the fact that targeted ads have taken over the advertising field online, but the long-term repercussions have yet to be determined. It should be noted that there are times where there is no ability to exclude personal data from the reach of a corporate entity, such as with the Equifax breach in 2017 (Zou, and Schaub, 2018). In that instance, the credit bureau's access to individual's personal data was required. In America you cannot keep your data away from these agencies. Because of that, the public has been quite willing to continue letting the agency have their data without calling for change, as there is nothing the public can do to force the companies to change.

There was considerable concern and outrage in response to the breach, but at the time of this writing all public talk of this issue has died off, instead the focus is on Facebook (Zou, and Schaub, 2018). That is often the case with many of these big privacy and security breaches. The perceived inability to make direct change keeps many from believing that they can do anything at all, which typically leads to empathy or the idea that this is just the



current state of the world. In that instance, the mindset is not if the data will be lost, but when. This mindset was also seen in the participants in the interviews, as they viewed that the data collection was just the way things had to be in order to use the technology.

Whether that is true or not, and that varies depending on your point of view, this is a mindset that is prevalent and it is unknown whether or not that is a good thing. This does mean that individuals are more willing to try new technologies that require the use and collection of personal data, but also means that these companies are having less oversight in regard to public opinion. We have hit a point where most socially connected technology and websites include collection of some kind of data. In order to use these sites and technology the user must agree to give this data away. The user can always refuse and try to find other options that do not gather that data. But is that always going to be possible?

This line of thinking is out of the realm of the study in this report, but it is something that should be considered when developing technology in the future. As humanity moves forward and the world changes, humanity's values change as well. There are also other factors such as national cultural values and religious values that can influence the values discussed in this paper. Therefore, some of the things discussed in this paper may not stand the test of time. However, something that has always remained true is the fact that values do affect how humans interact with the world, and especially with new developments, industries, and technologies.

## **LIMITATIONS OF THE RESEARCH**

The research methodologies conducted in this study have their faults. The survey and the interview are limited by utilizing both self-reporting and self-selection, which is unavoidable in a free society. The survey was distributed using the social media of the primary researcher and the public email system of the University of Texas at Austin's School of Information. The interviewees were selected from the pool of participants in the survey, and the sample size of the research overall was limited in scope and time.

## **Further Directions**

As mentioned in the limitations, this study was limited in scope. In order to get findings that can apply to a larger swath of the population, a larger and more varied population must be tested. This study was American focused, and the values identified do lean towards American values. In order to gain a worldwide perspective, studies of this nature in the future should be distributed to a larger and more diverse worldwide audience. Future research should aim to get a better understanding from a wider population. By seeking to gain perspectives from a wider population, future research will better reflect the views of the majority and be able to be viewed as more representative in nature.

This study also had an inherent socio-economic bias, as AI personal assistants are still currently attached to luxury and expensive technology, such as newer smartphones and laptops and the physical devices. Their values may not line up with the values of those in differing socio-economic classes, as different socio-economic classes have different perspectives and focuses that are reflected in their overall values. There is likely going to be a differing opinion, and indeed different use cases, for these AI personal assistants as those with a lower socio-economic status have different needs that influence what they do and do not purchase.

Another interesting domain for future research would be a comparison between the AI personal assistants that are on their own hardware and those that are software on other devices. For example, Google Assistant exists on the Google Home physical device and on Android devices. Is there a difference in the use of these devices based upon human values?

General information in this study would say yes, as the physical devices are constantly on, but not always collecting data, and that is a privacy concern. How willing an individual is to give up personal privacy does directly relate to their individual values. How much that is a factor in choosing one over the other is unknown.

Ultimately, there is still much left to be researched into how human values affect the use of these AI personal assistants. This study is just the beginning of analysis into this relationship. As our world becomes more interconnected, understanding how humanity reacts to new technology, and indeed reacts to the continued use of technology, will become more important with the passing of time. It will be important for more than just the developer of these technologies who need to understand the users to understand what will be purchased. It will also be important to gain a better understanding of humanity as a whole; specifically, how the integration of technology at this level will impact the future expectations and values of humanity.

We have already started to see the younger generations embrace the sharing of their lives on social media, and indeed seeing them give the data that those websites require. Currently whether or not this is a negative change is unknown. Certainly the positives of these newer technologies like worldwide communication for free and hands free communications are positive, but is the exchange of data equivalent to those positives? That is yet to be determined, and likely won't be determined for quite some time. However, diving into that realm of research can only help our understanding as a whole.

## Appendix A- The Survey

Q1 You have been asked to participate in a research study on artificial intelligence personal assistants. The purpose of this study is an analysis of the use of artificial intelligence (AI) personal assistants such as Siri and Alexa. These assistants have become a critical component of many technologies, and yet there is not a large amount of research on the factors that influence how they are used. This study will examine the role that human values play on the use of these assistants.

To participate, you must be at least 18 years old. Your participation is voluntary. There are no foreseeable risks to participating in this study. The possible benefits of participation are that you will be given a copy of the final report if requested, which can provide greater knowledge about the use of artificial intelligence personal assistants.

Your privacy and the confidentiality of your data will be protected throughout the study. All data collected will be anonymized to remove any connection between the participants on this study and the data for the final report.

- I agree and want to continue with this survey
- I disagree want to exit this survey

Q2 What is your age bracket?

- 18 - 24
- 25 - 34
- 35 - 44
- 45 - 54
- 55 - 64
- 65 - 74
- 75 - 84
- 85 or older

Q3 What is your level of education?

- Less than high school
- High school graduate
- Some college
- 2 year degree
- 4 year degree
- Professional degree
- Doctorate

Q4 What is your gender identity?

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Q5 In which industry do you work or wish to work? Or in which area are you studying?

- Health and Social Care
- Education
- Science, Technology, Engineering, and Math
- Galleries, Libraries, Archives, and Museums
- Federal, State, and Local Government
- Business and Finance
- Retail and Hospitality
- Automotive and Manufacturing

Q6 What is your ethnicity?

- White
- Hispanic or Latino
- Black or African American
- Native American or American Indian
- Asian / Pacific Islander
- Other

Q7 Are you familiar with artificial intelligence personal assistants (such as Siri or Alexa)?

- Yes
- No

Q8a Have you personally used one or more artificial intelligence personal assistants?

- Yes
- No

Q8b If so which ones?

---

Q9 Please read each description and think about how much each of the following statements is or is not like you.

	Very much like me				Not like me at all
Thinking up new ideas and being creative is important to me. I like to do things in my own original way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is important to me to be rich.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I want to have a lot of money and expensive things.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



I think it is important that every person in the world be treated equally. I believe everyone should have equal opportunities in life.

It's very important to me to show my abilities. I want people to admire what I do.

It is important to me to live in secure surroundings.

I avoid anything that might endanger my safety.

I like surprises. It is important to me to have an exciting life.

I believe that people should do what they're told. I think people should follow rules at all times, even when no-one is watching.

It is important to me to listen to people who are different from myself. Even when I disagree with them, I still want to understand them.

It is important to me to be humble and modest. I try not to draw attention to myself.

Enjoying  
life's  
pleasures is  
important to  
me. I like to  
'spoil'  
myself.

It is  
important to  
me to make  
my own  
decisions  
about what I  
do. I like to  
be free to  
plan and to  
choose my  
activities for  
myself.

It's very  
important to  
me to help  
the people  
around me. I  
want to care  
for their well-  
being.

Being very successful is important to me. I like to impress other people.

It is important to me that the government insure my safety against all threats. I want the state to be strong so it can defend its citizens.

I look for adventures and like to take risks. I want to have an exciting life.

It is important to me always to behave properly. I want to avoid doing anything people would say is wrong.

It is important to me to get respect from others. I want people to do what I say.

It is important to me to be loyal to my friends. I want to devote myself to people close to me.

I strongly believe that people should care for nature.

Looking after the environment is important to me.

Tradition is important to me. I try to follow the customs handed down by my religion or my family.

I seek every  
chance I can  
to have fun.

It is  
important to  
me to do  
things that  
give me  
pleasure.

Q10a Would you be willing to participate in a 30-minute interview to further discuss your use of artificial intelligence personal assistants?

- Yes
- No

Q10b Please provide your name, email address, and phone number so I can contact you regarding your participation in this study.

This information will not be shared with others and is only collected for the purpose of contacting you.

- Name \_\_\_\_\_
- Email address \_\_\_\_\_
- Phone number \_\_\_\_\_



## **Appendix B- The Interview Instrument**

### Participant Interview Script

Objective: The purpose of this study is to determine if human values affect the use and perceptions of artificial intelligence (AI) personal assistants.

Goals: Conduct an interview to determine how the participant uses, modifies, and perceives the AI personal assistants.

Answer the following questions:

How do they use the AI personal assistants?

Why do they use them?

Do they prefer one AI over another?

Are they satisfied with their AI?

Prior to Interview:

- 1) Have copy of interview script for note taking
- 2) Have audio recording software open

**BE SURE TO RECORD**

Introduction

First, would you be willing to let me record this audio from this session? You are going to talk faster than I can take notes, so the audio will be used to get a full understanding of your responses. The recording will only be used internally within the research team. Do I have your consent to record the audio of this session?

As I mentioned previously, I am a graduate student in the Texas iSchool working on a Masters Report on artificial intelligence personal assistants.

Today I am going to ask you some background questions to begin to learn about your personal experience using these AI assistants and your impressions of them.

Do you have any questions before we begin?

#### AI Questions

In your survey, you mentioned that you currently use <list AI assistant(s)>. Could you please tell me more about what tasks you use each of these AI assistants for? (go through each)

Could you please tell me more about the context in which you use each AI assistant, such as the device and location? (go through each)

Could you please tell me about your level of satisfaction with each AI assistant? (go through each)

Which AI assistant do you use most frequently, and why?

You also indicated that you no longer use <list AI assistant(s), if applicable>. Could you please describe what tasks you used each of these AI assistants for, and why you stopped using it? (go through each)

Can you think of a time where using \_\_\_ was a worthwhile experience? Can you walk me through that experience? (go through each, both current and former)

Can you think of a time where using \_\_\_\_ was frustrating? Can you walk me through that experience? (go through each, both current and former)

Overall, would you consider yourself satisfied with the AI assistants that you currently use?

What would you change about \_\_\_ so that it better fit your needs?

What additional AI assistants would you like to have, or what features could be added to one of the existing AI assistants?

Are there any other questions that I should have asked, or is there anything else that you would like to tell me about this topic?

Does the manufacturer of the device that contains the AI assistant matter to you?

Conclusion

Thank you so much for sharing your thoughts and experiences with me. All of this information will be kept private and secure. All publications using this information will use pseudonyms so that your identity will be kept confidential. I will be happy to share the results of the study with you once I have completed it. If you have any further questions, or concerns, please feel free to e-mail me at any time.

## Works Cited

1. Ahmadian, M., & Lee, O. K. D. (2017). AI-Based Voice Assistant Systems: Evaluating from the Interaction and Trust Perspectives.
2. Augusto, J. C., & McCullagh, P. (2007). Ambient intelligence: Concepts and applications. *Computer Science and Information Systems*, 4(1), 1-27.
3. Baran, N. (1995). Computers and capitalism: A tragic misuse of technology. *Monthly review*, 47(4), 40.
4. Bias, R. G., Marty, P. F., & Douglas, I. (2012). Usability/user-centered design in the iSchools: Justifying a teaching philosophy. *Journal of Education for Library and Information Science*, 274-289.
5. Bohac, A., & Keck, M. (2018). Amazon Alexa: The Best Personal Assistant or an Eavesdropping Witch.
6. Borning, A., Friedman, B., Davis, J. L., Gill, B. T., Kahn Jr, P. H., Kriplean, T., & Lin, P. (2009). Public participation and value advocacy in information design and sharing: Laying the foundations in advance of wide-scale public deployment. *Information Polity*, 14(1, 2), 61-74.
7. Bonfrer, I., Figueroa, J. F., Zheng, J., Orav, E. J., & Jha, A. K. (2018). Impact of Financial Incentives on Early and Late Adopters among US Hospitals: observational study. *bmj*, 360, j5622.

8. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.
9. Castelfranchi, C. (2000). Artificial liars: Why computers will (necessarily) deceive us and each other. *Ethics and Information Technology*, 2(2), 113-119.
10. Chou, C. Y., Chan, T. W., & Lin, C. J. (2003). Redefining the learning companion: the past, present, and future of educational agents. *Computers & Education*, 40(3), 255-269.
11. Ertel, W. (2018). *Introduction to artificial intelligence*. Springer.
12. Fast facts. (n.d.). Retrieved from <https://www.nuance.com/about-us/fast-facts.html>
13. Fleischmann, K. R. (2013). Information and human values. *Synthesis Lectures on Information Concepts, Retrieval, and Services*, 5(5), 1-99.
14. Friedman, B., Kahn, P., & Borning, A. (2006). Human-computer interaction in management information systems: Foundations, chapter Value Sensitive Design and information systems. Armonk, New York, 348-372.
15. Friedman, B., & Kahn Jr, P. H. (2007). Human values, ethics, and design. In *The human-computer interaction handbook* (pp. 1223-1248). CRC Press.
16. Gallagher, S., & UTC. (2018, March 24). Facebook scraped call, text message data for years from Android phones [Updated]. Retrieved from <https://arstechnica.com/information-technology/2018/03/facebook-scraped-call-text-message-data-for-years-from-android-phones/>

17. Granville, K. (2018, March 19). Facebook and Cambridge Analytica: What You Need to Know as Fallout Widens. Retrieved from <https://www.nytimes.com/2018/03/19/technology/facebook-cambridge-analytica-explained.html>
18. Hindy, J. (2017, August 29). Google Assistant vs Siri vs Bixby vs Amazon Alexa vs Cortana - Best virtual assistant showdown! Retrieved from <https://www.androidauthority.com/google-assistant-vs-siri-vs-bixby-vs-amazon-alexa-vs-cortana-best-virtual-assistant-showdown-796205/>
19. Hendler, J., & Mulvehill, A. M. (2016). Augmenting Human Capabilities with AI. In *Social Machines* (pp. 98-112). Apress.
20. Hirschberg, J., & Manning, C. D. (2015). Advances in natural language processing. *Science*, 349(6245), 261-266.
21. Jackson, C., & Orebaugh, A. (2018). A study of security and privacy issues associated with the Amazon Echo. *International Journal of Internet of Things and Cyber-Assurance*, 1(1), 91-100.
22. Jadeja, M., & Varia, N. (2017). Perspectives for Evaluating Conversational AI. arXiv preprint arXiv:1709.04734.
23. Li, D., Rau, P. P., & Li, Y. (2010). A cross-cultural study: Effect of robot appearance and task. *International Journal of Social Robotics*, 2(2), 175-186.

24. Luxton, D. D., June, J. D., Sano, A., & Bickmore, T. (2015). Intelligent Mobile, Wearable, and Ambient Technologies for Behavioral Health Care. *Artificial Intelligence in Behavioral and Mental Health Care*, 137.
25. Maheswaran, R. T., Tambe, M., Varakantham, P., & Myers, K. (2003, July). Adjustable autonomy challenges in personal assistant agents: A position paper. In *International Workshop on Computational Autonomy* (pp. 187-194). Springer, Berlin, Heidelberg.
26. Malsch, T. (2001). Naming the unnamable: Socionics or the sociological turn of/to distributed artificial intelligence. *Autonomous agents and multi-agent systems*, 4(3), 155-186.
27. Mariana Mazzucato; Financing innovation: creative destruction vs. destructive creation, *Industrial and Corporate Change*, Volume 22, Issue 4, 1 August 2013, Pages 851–867, <https://doi.org/10.1093/icc/dtt025>
28. Musil, S. (2017, December 19). Law enforcement requests for Facebook user data up 21 percent. Retrieved from <https://www.cnet.com/news/law-enforcement-requests-for-facebook-user-data-up-21-percent/>
29. Nguyen, Q. N., & Sidorova, A. (2017). AI capabilities and user experiences: a comparative study of user reviews for assistant and non-assistant mobile apps.
30. Orr, D. A., & Sanchez, L. (2018). Alexa, did you get that? Determining the evidentiary value of data stored by the Amazon® Echo. *Digital Investigation*, 24, 72-78.

31. Ramakrishnan, A. K., Preuveneers, D., & Berbers, Y. (2013, December). A loosely coupled and distributed Bayesian framework for multi-context recognition in dynamic ubiquitous environments. In *Ubiquitous Intelligence and Computing, 2013 IEEE 10th International Conference on and 10th International Conference on Autonomic and Trusted Computing (UIC/ATC)* (pp. 270-277). IEEE.
32. Sasmita, J., & Mohd Suki, N. (2015). Young consumers' insights on brand equity: Effects of brand association, brand loyalty, brand awareness, and brand image. *International Journal of Retail & Distribution Management*, 43(3), 276-292.
33. Schwartz, S. H. (2007). Value orientations: Measurement, antecedents and consequences across nations. *Measuring attitudes cross-nationally: Lessons from the European Social Survey*, 161-193.
34. Suarez, F. F., Utterback, J., Von Gruben, P., & Kang, H. Y. (2018). THE HYBRID TRAP: Why Most Efforts to Bridge Old and New Technology Miss the Mark. *MIT Sloan Management Review*, 59(3), 52-57.
35. Verma, N., Fleischmann, K. R., & Koltai, K. S. (2017). Human values and trust in scientific journals, the mainstream media and fake news. *Proceedings of the Association for Information Science and Technology*, 54(1), 426-435.
36. Wernick, C., & Gries, C. I. (2017). Economic aspects of embedded SIM for the telecommunications consumer segment.
37. Wetmore, J. M. (2007). Amish technology: Reinforcing values and building community. *IEEE Technology and Society Magazine*, 26(2), 10-21.



38. Zaleski, E. H. (2017, April 20). Juicero Inc: Silicon Valley startup horrified by discovery of basic fault with \$400 juicer. Retrieved from <https://www.independent.co.uk/news/business/juicero-inc-silicon-valley-startup-basic-fault-400-juicer-doug-evans-investors-a7692616.html>
39. Zou, Y., & Schaub, F. (2018, April). Concern But No Action: Consumers' Reactions to the Equifax Data Breach. In Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems (p. LBW506). ACM.