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Millennials' Acceptance of Voice Activated Shopping

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by

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The rise of voice technologies has changed the way individuals complete tasks and interact with their devices. Retail companies are now offering voice features to shop for products, but there is a gap in literature about consumers' acceptance of using voice technology to make purchases. Previous studies have compared the different brands of voice technologies, investigated privacy issues, or explained the acceptance of voice technology. Millennials' acceptance and shopping through voice technologies have not been researched before. Kääriä (2017) calls for future studies to focus on voice technologies, since the technology is constantly improving, and new forms are entering the market.

Millennials are known to adapt to new technologies quicker and make up a fourth of the spending power (Cutler, 2015; Lissitsa & Kol, 2016). A majority of the cohort has been found to use voice technology daily, but the use of the technology has yet to be studied (Moore, 2018). Thus, this study explains millennials' acceptance of shopping through voice technologies by testing the Technology Acceptance Model (TAM).

The TAM was the theoretical framework for this study (Davis, 1985). The TAM is found to be more accurate than other models in measuring the acceptance of technology and is widely used by researchers (Shamy & Hassanein, 2017). The TAM model includes two main variables, which are perceived ease of use (PEOU) and perceived usefulness (PU) (Davis, 1989). In addition, perceived enjoyment (PE) and

perceived innovativeness (PI) were added by subsequent research (Davis, Bagozzi, & Warshaw, 1992). The relationship of gender, age, and experience to behavior intention (BI) were also added to the model (Venkatesh, Thong, & Xu, 2012), and were incorporated into the current study. The purpose of this thesis was to explain the relationships between PU, PEOU, PE, and PI to BI for millennials.

Data was collected through an online survey created on Qualtrics and disseminated via Amazon Mechanical Turk. A total of 204 surveys were collected and coded for analysis through SPSS. A regression analysis was conducted to investigate the relationships between the TAM variables. Surprisingly, gender was found to influence BI, thus women were more likely to use the technology in the future. Age and level of experience did not influence BI. When testing age, gender, and level of experience against PU, PEOU, PE, and PI no significant relations were found, except for gender on PI. Women thought voice technology was more innovative than men, therefore, gender influenced PI. Respondents found shopping through voice to be useful, enjoyable, and innovative. However, millennials believed it was difficult to use, thus retailers should investigate how to make the technology more intuitive. The results of this study indicate that millennials are accepting of using voice technology to shop and retailers should consider offering the skills to do so.

Dedicated to the memory of Carolyn Jean Anderson

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CHAPTER I

INTRODUCTION

Voice activated technologies have changed the way individuals interact with their devices. Software enables voice activated technology to understand speech and generates a response. A user's question or statement through voice is interpreted by the software, which finds an appropriate response. The software uses machine learning, so it improves every time someone uses it by acquiring consumers' accents and how they speak. Voice activated technology can be activated hands-free or by touch and offers a variety of skills to the user. Some skills include: playing music and games, texting, setting reminders, ordering items and having them shipped to your home, and checking the weather and news. One of the first widely known voice technologies was Siri, created by Apple in 2011. Other companies creating voice activated technology include Amazon, Google, Apple, Microsoft, and IBM. It is estimated that half of all internet searches will be done through voice activated technologies by 2020 (Maney, 2017).

Companies who have their own voice activated technologies have named them and created their own personalities. Amazon Alexa, Google Home, Apple Siri, Microsoft Cortana and IBM Watson are voice technologies widely known throughout the world. Amazon Alexa has become a new popular device since it connects with the user's Amazon account and can make shopping easier. Google Home is a competitor of Amazon Alexa and offers similar features. Considered one of the first voice assistants introduced to the world and widely used is Siri, by Apple. Microsoft created Cortana to keep track of important details across a

variety of devices including Windows, IOS, and Android. IBM put its efforts into Watson which recognizes numerous languages and changes the speech into text. The personality and variety of skills offered by voice assistants add a personal touch to technology that consumers enjoy. In particular, millennials appreciate using voice assistants since it helps make their lives easier by keeping track of their responsibilities. According to a poll by AppDynamics and Wakefield Research, 71% of millennials use voice technology daily (Moore, 2018).

Millennials, aged 25-34, represent approximately 26% of virtual assistant users, and older millennials have been found to use virtual assistants for function over entertainment (Advertising & Marketing, 2017). Millennials spend more money on e-commerce than any other generation despite having lower incomes than other generations (Cutler, 2015). This age group researches products before making purchase decisions even though they make more frequent and impulsive purchases than Generation X (Lissitsa & Kol, 2016). OC&C Strategy Consultants found groceries, entertainment, electronics, and clothing as the most frequently shopped categories through voice technology. Currently, most voice purchases are low consideration goods, which have little financial risk (South China Morning Post, 2018).

Smith (2017) found one-in-five individuals have made a voice purchase through Amazon Echo or another digital home assistant, and another 33% plan to do so in the next year. The market for voice technology is growing and it is projected that 33 million voice devices were available for purchase by the end of 2017 (Graham, 2017). The purpose of this study was to test the Technology

Acceptance Model (TAM) to determine millennials' acceptance of voice activated shopping by relating perceived usefulness (PU), perceived ease of use (PEOU), perceived enjoyment (PE), and perceived innovativeness (PI) to behavioral intention (BI).

Statement of Problem

According to OC&C Strategy Consultants, voice shopping is expected to reach $40 billion annually in the United States compared to the $2 billion today (South China Morning Post, 2018). New technology continues to evolve at a fast pace, causing individuals to be socialized using different methods than in the past. Researchers have investigated the acceptance of voice technologies but have not focused on millennials' acceptance. Millennials are commonly referred to as digital natives and are twice as likely to use voice assistance daily compared to individuals ages 45-64 (Cutler, 2015; Hui & Leong, 2017).

Purpose of Study

The purpose of this quantitative study was to explain the acceptance of voice technologies among millennial consumers. Data was collected through an online survey created on Qualtrics and disseminated via Amazon Mechanical Turk to test the theory of the TAM (Davis, 1985)**.** This theory relates PU, PEOU, PE, and PI to BI.

Significance of Study

The results of this study can benefit the retail industry by providing insight into consumers' acceptance of voice activated technology. The popularity has increased, making voice activated technology an important software to study.

Millennials have been found to use voice technology daily, since they are a tech savvy generation (Cutler, 2015; Hui & Leong, 2017). Retailers who target millennials should observe how they can incorporate the software into their company. It is still unclear how the younger generation integrates the technology into their lives, so additional research needs to be done about how these consumers behave.

Companies have been trying to push consumers to use the software by offering deals to purchase items using voice technologies, but there has been little success. A study by Walker Sands Communications (2017) discovered that 37% of the millennial participants in their study preferred to use voice ordering when purchasing items. Millennials have been found to prefer shopping online, but also desire a personalized experience voice technology can offer ("Walker Sands Communications," 2017). Online shopping is being adopted mostly by the younger generations, but there is a gap in research to their acceptance of using such technologies when shopping. This study is vital to the times, since voice technology popularity is increasing, and numerous companies are starting to realize that they need to implement it to stay competitive.

Technology Acceptance Model

The Technology Acceptance Model (TAM) is derived from the Theory of Reasoned Action and was created by Fred Davis in 1985 (Davis, 1989; Fishbein & Ajzen, 1975; Hubona & Cheney, 1994). Traditionally the TAM focused on two main variables, PEOU and PU (Davis, 1989) with PE and PI added later (Davis, Bagozzi, & Warshaw, 1992). Some researchers have incorporated the relationship

of gender, age, and experience to BI (Venkatesh, Thong, & Xu, 2012). This study investigated the relationship between PEOU, PU, PE, and PI to BI along with the relationship of gender, age, and experience to BI. Millennials' acceptance of voice technologies was the focus of this study, which is why the TAM was chosen.

Gap in Literature

There is a gap in research about consumer shopping through voice technology. Most of the research focuses on the differences between companies that sell voice technology devices to the public or research that addresses privacy issues. Many researchers are concerned with the privacy of voice technology, since the device is always listening. The acceptance of voice technologies through the TAM has also been studied, but did not include millennials' acceptance, level of experience, and age. An individual's level of experience is rarely included as an antecedent variable in studies including the TAM. Research that includes age, level of experience, and gender often do not find them to be statistically significant with the TAM. Kääriä (2017) called for future studies to explain voice technology, since it is constantly improving, new devices are being released, and new skills for the systems are being added. Gathering information on how consumers are using voice technologies for shopping is difficult to gather as this topic is cutting-edge. Amazon Alexa was introduced to the market first, therefore, more research has been done on Alexa. This study addresses the acceptance of shopping through all voice technologies, since there are many brands available for consumers to choose from.

Ethical Considerations

The purpose and procedures of the study were provided to the Institutional Review Board (IRB) at the University of Nebraska-Lincoln to meet protocol. Copies of the recruitment text and electronic informed consent were also given to IRB. These documents are available in Appendix A (Electronic Recruitment text) and Appendix B (Electronic Informed Consent). There are no known risks for the participants for this study, as the topic does not contain sensitive information from the perspective of most individuals. Anonymity was kept by not collecting identifiable information from the survey. The survey questions were also submitted and approved by IRB along with a committee of professors. Appendix C contains the IRB approval letter and the survey questions are available in Appendix E.

Definition of Terms

Artificial Intelligence- An intelligent machine that works and acts similar to humans.

Millennials- Individuals born between 1980 and 2000.

Smart Speakers- A speaker with a built-in virtual assistant such as the Google Home, Amazon Alexa, and Apple HomePod.

Technology Acceptance Model- a research model is derived from the Theory of Reasoned Action (Fishbein & Ajzen, 1975). For this study TAM relates attitude, age, and gender to PEOU, PU, PE, PI, and BI (Davis, 1989).

Voice Shopping- Purchasing products through voice technologies using one's voice.

Voice Activated Technology – Available in many different forms such as a feature on a smart phone, computer, or sold as a device and responds to commands when it is called by name (e.g. Amazon Alexa, Apple HomePod, Apple Siri, Bixby, Google Home, Microsoft Cortana) (Advertising & Marketing, 2017; Stucke & Ezrachi, 2016).

Virtual Assistant- A program that understands the user's voice to preform commands and complete tasks (Amazon Alexa, Apple's Siri, Google Assistant, and Microsoft Cortana).

Voice Commands- Enabled through verbal instructions by users to tell the voice activated technology what they want (i.e. shopping, playing music, controlling smart home devices, setting alarms and reminders, making calls, sending messages, checking the weather, checking the news, and searching online).

CHAPTER II

REVIEW OF LITERATURE

Voice technologies are offered by many brands and are available in various forms, with home devices being the most popular. Artificial intelligence is used to make voice technologies seem human through skills and interactions with the technology. Voice technology can make consumers' lives easier by setting reminders, giving brief updates about the weather, answering questions, and much more. Millennials enjoy the skills and personality of voice technologies and a majority use it daily (Moore, 2018). The present study is interested in millennials' acceptance of voice technology, making the TAM the best model to use for measuring acceptance of the technology (Davis, 1989; Hubona & Cheney, 1994; Shamy & Hassanein, 2017).

Voice Technologies

Voice technologies allow the user to control the system verbally and provides a suitable response in return (Khan & Das, 2018). The technologies incorporate virtual assistants that have human-like qualities, making them a digital butler to the user by personalizing information to individual needs. Amazon Alexa, Apple's Siri, Google Assistant, and Microsoft Cortana are examples of virtual assistants available on voice activated devices. The virtual assistants can help the user complete daily tasks quicker through single or multiple voice commands, freeing up the user's time. There are many different forms of voice technology that are available. A timeline of available voice technologies for consumers is available in Figure 2.1. The top products in the

voice technology market are Amazon Alexa, Google Home, IBM Watson, Microsoft Cortana, and Apple Siri.

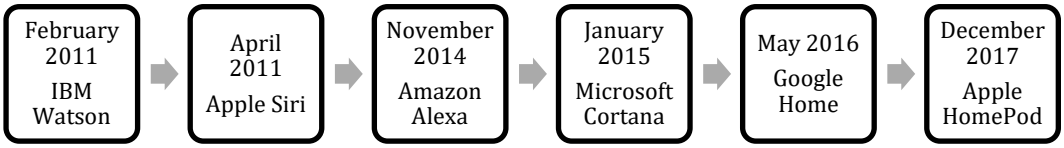


Figure 2.1 Timeline of Available Voice Technologies

Amazon Alexa. Amazon has created the Echo which features Alexa, a hands-free voice activated assistant that helps with everyday tasks. Alexa can read the news, control smart home devices, set alarms, play music, shop for the user, state the weather, estimate travel time to a location with the current traffic, and complete many other functions (Lopez, Quesada, & Guerrero, 2018; Stucke & Ezrachi, 2016). Alexa is connected to the consumer's Amazon Prime account and can order products through voice commands and have it shipped to the customer's door in no more than two days (Baig, 2016). Amazon Prime members who order via Alexa receive discounts to entice shopping through voice (Smith, 2017). Amazon Alexa has apps called "Skills" that the competitors have not yet incorporated into their devices (Rash, 2017). The "Skills" apps allow brands to connect with consumers, such as Tide's app educating customers on how to remove over 200 types of stains. Nestle also has the "GoodNes" skill that explains to the user step by step cooking instructions as they go hands-free (Graham, 2017). The Amazon Echo is currently the top selling voice control device (Rash, 2017). During Black Friday and Cyber Monday in 2017, the Echo Dot was the best-selling item on Amazon.com (Halzack, 2017).

Google Home. Google has a hands-free device called Google Home that mimics its search engine and starts working with the command “Okay Google” (Noda, 2017). Users can ask their Google Home about facts, set reminders, and book reservations (Lopez et al., 2018). With a Samsung SmartThings kit, Google Home can control lights, the thermostat, lock and unlock doors, open the garage door, and other tasks using a voice command (Stucke & Ezrachi, 2016; Noda, 2017). The voice technology also acts as a digital butler by helping with homework, finding out when a package will arrive, and playing music (Stucke & Ezrachi, 2016). The Google Home has learned a total of 119 human languages, which allows numerous people to utilize this technology. Walmart and Google Home have partnered, in order to stay competitive with Amazon, by allowing users to shop Walmart directly from their home with Google Home (Maney, 2017).

IBM Watson. IBM has created Watson, a voice activated technology that can interpret high or low-quality audio, recognize seven languages, search recordings for content, and transcribe phone calls, lectures, or meetings (IBM, n.d.). Recently, Watson has become more accurate, as the word error rate has decreased from 8% to 7% (Hui & Leong, 2017). In 2017, the IBM Watson Trend was released. The model interprets conversations people have on social media or face-to-face by recognizing their context and tone. In addition, Watson will show the user the trending products for Christmas and also acts like a personal shopper (Koulopoulos, 2017).

Microsoft Cortana. Microsoft Cortana can be found on devices that use Microsoft Windows such as phones, computers, and the newly released Harman Kardon INVOKE, which is a home speaker with Cortana intelligence. Large corporations have partnered with Microsoft Cortana to create everyday skills. The everyday skills are divided into the following categories; forget about forgetting, organizing and tracking, and quick answers (Microsoft, n.d.). Microsoft has improved its voice technology by decreasing the word error rate by almost 6% (Maney, 2017).

Apple Siri. Apple released Siri in 2011 so users could speak to their phone and find out definitions and communicate (Maney, 2017). Siri is mainly used to communicate with others by sending text messages or calling people (Lopez et al., 2018). Siri also has the ability to call 911 during an emergency, whereas the other devices have not reached this point. What sets Siri apart from other voice activated technology is that Siri integrates humor by telling jokes and responds with personality by creating a conversation (Baig, 2016).

Apple released the HomePod, a wireless smart speaker for the home, to the public in December 2017 for $349. This smart speaker has a high-end price point for the market. Many critics were not impressed with the HomePod, as they believed it was not as ‘smart’ as its competitors Google Home and Amazon Alexa. Apple recently released an update so the HomePod can now give news updates, send messages, make phone calls, find your iphone, control smart home devices, and play Apple Music (Apple, 2017; Hartmans, 2018). Apple was one of the large companies last to offer a home speaker with voice technology.

Voice technology devices are becoming more common in households and used by many generations. Millennials have been discovered to use voice technology more frequently and desire the technology to help them discover, explore, and buy new products. They enjoy innovative technologies, especially the convenient shopping through voice technology in their home or vehicles (Bernard, 2018). A report created by App Dynamics found that millennials find voice assistants comforting (Moore, 2018).

Millennials

Millennials are defined as individuals born between 1980 and 2000, and they are different stages in life, ranging from college-aged to young professionals. They are currently the most educated generation but have been found to have higher levels of student debt. Millennials grew up during a time of economic growth, technology improving rapidly, and pop culture having strong influences on them. Brands were also incorporated in their everyday lives and shopping was an experience rather than for utilitarian reasons. Technology improved immensely as millennials were growing up, therefore they can adopt new technologies quickly. The rise of reality television and social media have influenced their purchasing habits and influences their values (Lissitsa & Kol, 2016).

Millennials have different purchasing behaviors than previous generations and are considered a materialistic generation. They enjoy displaying their wealth through their appearance and the experiences they indulge in. Millennials are just starting their careers and have a low income, but a great amount of their financial support comes from their parents (Kim & Jang, 2014). To save money, many

millennials still live at home with their parents or pay rent for their home. They have a lower income, since they are just starting their professional careers or are still in school. They contribute to one-fourth of the spending power, making millennials a generation who retailers must target. In contrast to their low incomes, millennials spend the most on online shopping compared to other generations (Cutler, 2015).

Online Shopping. Technology is constantly improving, and consumers now expect a pleasurable and purposeful online shopping experience (Blazquez, 2014). This study focuses on millennials, who prefer online shopping compared to going to a brick and mortar store. Millennials have high expectations for web design, as they want the website to entertain them, but also want the shopping experience to be easy to navigate and purchase items (Bilgihan, 2016). Online shopping benefits consumers by being convenient, saving time, offering a large selection, and providing access to product information (Ozen & Engizek, 2012). Online shopping can be done on the go or anytime of the day, which is helpful to young consumers who are pressed for time (Mostafavi, Hamedani, & Slambolchi, 2016).

According to Nielsen (2019), millennials are more likely to research fast-moving consumer goods, such as food or cleaning products, online than other generations. Almost 50% of their online shopping is done on their laptops followed by their smart phones at 40%. A survey conducted by First Insight, investigated gender differences and found men shop online more than women (Petro, 2019). Faqih's (2016) study explaining gender differences on shopping

online also proved men to shop more frequently. Men are more likely to research products and compare prices through Amazon.com or on their smart speakers than females (Petro, 2019). Many researchers have also found men to have a higher behavioral intention for online shopping than women (Chen, Yan, Fan, & Gordon, 2015; Hasan, 2010).

Shopping through voice technology can provide some of the same benefits of online shopping by providing a convenient and unique experience to users. Voice technology can be an extension of omnichannel retailing by providing services on another device. There are many research articles describing the acceptance of online shopping, but there is a gap in voice technology. The TAM applies to a variety of technologies and is the best model to measure acceptance. This study will explain millennials acceptance of shopping through voice technology using the TAM.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was created by Fred Davis in 1985 (Chuttur, 2009) and was derived from the Theory of Reasoned Action (Fishbein & Ajzen, 1975). This model is frequently-used and supported by other researchers, as it can measure the acceptance of technology better than other methods (Davis, 1989; Hubona & Cheney, 1994; Shamy & Hassanein, 2017). It is also believed TAM is useful across many technologies and populations (Venkatesh, 2000), which is tested in this study.

The two main variables tested by researchers are perceived ease of use (PEOU) and perceived usefulness (PU), which previous studies have found to

help explain consumers' adoption of technology (Davis, 1989). The model has evolved over time, as Venkatesh et al. (2012) incorporated the relationship of gender, age, and experience to behavioral intention (BI) in the model. Davis et al. (1992) added perceived enjoyment (PE) to the model, and recently, researchers have included perceived innovation (PI). The TAM helps measure the acceptance of using new technology, such as voice activated technology. The relationship between PU, PEOU, PE, and PI will be related to BI to use voice technology.

Age. This study focuses on millennials, individuals born between 1980 and 2000, since they are the first high tech-savvy generation. Millennials grew up using technology their entire lives, as they are comfortable trying new technologies and find it easy to learn (Lissitsa & Kol, 2016; Venkatesh et al., 2012). Millennials enjoy different types of voice technologies, as it is very convenient for their busy life.

Venkatesh et al.'s (2012) research found younger individuals accept and use new technologies easier than older consumers, showing age has an impact on BI. Kääriä's (2017) study on voice technology found the opposite relationship. Age was not statistically significant on BI. In 2013, Tarhini, Hone, and Liu explained the relationship of age between PU, PEOU, and BI for e-learning. Younger users, when compared to older users, had a stronger relationship between PU and BI. Older users had a stronger relationship between PEOU and BI, since they might be more unfamiliar with the technology (Tarhini et al., 2014). Age has also been found to be associated with innovativeness (Lee, Cho, Xu, & Fairhurst, 2010).

Based on this literature, the following hypotheses were created:

H1: Younger millennials will have a greater Behavioral Intention to purchase via voice than older millennials.

H4a: Younger millennials will have a greater Perceived Usefulness to purchase via voice than older millennials.

H4b: Younger millennials will have a greater Perceived Ease of Use to purchase via voice than older millennials.

H4c: Younger millennials will have a greater Perceived Enjoyment to purchase via voice than older millennials.

H4d: Younger millennials will have a greater Perceived Innovativeness to purchase via voice than older millennials.

Gender. Gender roles tend to increase with age and become more defined, which leads to different motivations to use technology. Previous studies have found that men are task and function oriented, whereas women focus on the process and try to reduce the effort of the learning curve for new technology (Chen et al., 2015; Venkatesh et al., 2012). More guidance is needed for women when learning difficult technology (Wang & Hsieh, 2015). In contrast, Kääriä's (2017) research found that gender did not influence any of the main constructs of the TAM, which indicates there is no significant difference of technology use based on gender. Faqih and Jaradat's (2015) study did not find any significant relationships when comparing gender to the other variables, as they stated the narrowing gender gap may be the reasoning to these findings. Since other existing

literature found different impacts, this study will further examine the variable of gender.

Females are typically making most of the shopping decisions, although males are known to shop online more often (Faqih, 2016). Literature looking at how gender influences technology use is inconsistent, therefore should be further investigated. Venkatesh et al. (2012) combined age, experience, and gender and found a significant effect on BI, PU, and PEOU. When looking at the gender differences to adopt a new technology, males are influenced by PU whereas females are motivated by PEOU (Agudo-Peregrina, and Chaparro-Pelaez, 2015; Constantiou, 2012; Hasan, 2010; Venkatesh et al., 2012). In Faqih's (2016) research investigating online shopping, females put more importance on PEOU than males. Contrasting previous literature, Faqih (2016) did not find gender to influence on PU when shopping online. In 2017, Lin et al. explained the effect of gender on social networking sites and found both gender users' satisfaction was based on PE. For perceived innovativeness, Lee et al. (2010) found a relationship of gender to technology innovativeness. Previous literature has proven men to have a more positive behavior toward innovation as well as a higher degree of innovativeness than women. When men and women were asked to assess their PI, men perceived themselves as more innovative (Constantiou, 2010). Research is still limited on PI, as many studies using the TAM do not include the variable. For BI, Chen et al.'s (2015) research found males were more likely to re-purchase when shopping online than females.

Based on this literature, the following hypotheses were created:

H2: Females will have a greater Behavioral Intention to purchase via voice than males.

H5a: Females will have a greater Perceived Usefulness to purchase via voice than males.

H5b: Females will have a greater Perceived Ease of Use to purchase via voice than males.

H5c: Females will have a greater Perceived Enjoyment to purchase via voice than males.

H5d: Females will have a greater Perceived Innovativeness to purchase via voice than males.

Level of Experience. Experience is defined as the amount of time a user has from initial use of a technology. Users with more experience tend to have a greater level of familiarity, develop habits, and have their own opinions about the technology (Venkatesh et al., 2012). Voice assistant technology has been around for a few years and more people are embracing technology each day. There is a learning curve with adopting this new technology and the amount of experience will affect future use. The more knowledge a user has, the less complex they will view the technology (McConnell, 2009). This also pertains to their comfort level and how well they know how the product works (Durodolu, 2016). Coskun-Setirek and Mardikyan's (2017) study calls for future research on experience's influence on the acceptance of voice technology.

According to Venkatesh et al. (2012), experience affects future BI, PEOU, and PU. Habits are created with the more experience an individual has using voice

technologies, which has an effect on BI (Moorth & Vu, 2015). Lin, Featherman, & Sarker (2017) found men who have more experience on social networking sites will continue to use it. Individuals are more comfortable with the technology as experience increases and strengthens the relationship between cues as well as behavior (Venkatesh et al., 2012). More experience creates a greater familiarity, an increase in knowledge, and a routine behavior with the technology (Moorth & Vu, 2015). Lin et al., (2017) measured experience to PU and PE, which was not statistically significant. In 2014, Daim, Basoglu, Kargin, & Phan's research on mobile services described experience to have a positive effect on usefulness. Technology that is perceived to be innovative can cause stress to individuals with little experience (Renko & Druzijanic, 2014).

Based on this literature, the following hypotheses were created:

H3: Behavioral Intention will be significantly higher among individuals with a high level of experience of voice activated technology than those with a low level of experience.

H6a: Perceived Usefulness will be significantly higher among individuals with a high level of experience of voice activated technology than those with a low level of experience.

H6b: Perceived Ease of Use will be significantly higher among individuals with a high level of experience of voice activated technology than those with a low level of experience.

H6c: Perceived Enjoyment will be significantly higher among individuals with a high level of experience of voice activated technology than those with a low level of experience.

H6d: Perceived Innovativeness will be significantly higher among individuals with a high level of experience of voice activated technology than those with a low level of experience.

Perceived Ease of Use (PEOU). The performance of the system outweighing the amount of effort to use the technology is defined as PEOU (Davis, 1985). The technology must benefit users to encourage future use, otherwise they will get frustrated and most likely not use it in the future. Voice activated technology can be frustrating to users, since the software is new. Frustration can arise if the software does not understand the individual or cannot find the answer, which can affect future intention to use the technology (Domina, Lee, & MacGillivray, 2012).

Most voice activated technologies have a learning curve for the users, making it important to be easy to learn (Coskun-Setirek & Mardikyan, 2017). Various companies are trying to make using technology easier by-simply stating the technology's name to activate it (Venkatesh et al., 2012). Users implementing voice technology will focus on saying the correct statements to get the technology to do certain skills and desire the technology to respond quickly (Coskun-Setirek & Mardikyan, 2017). The technology must easily understand the user's voice, language, and have a broad skill set, so there's less effort required by the user and the user will perceive usefulness of the technology (Kääriä, 2017).

In studies investigating voice technology, PEOU has also been found to be a strong influence on PU (Coskun-Setirek & Mardikyan, 2017; Kääriä, 2017; Moorthy & Vu, 2015). The relationship between PEOU and PU has been statistically significant in many studies, because the easier a technology is to use, more useful it is (Venkatesh, 2000).

Prior research on voice technology found PEOU to be a significant predictor of BI (Coskun-Setirek & Mardikyan, 2017; Kaaria, 2017; Moorthy & Vu, 2015; Simon & Paper, 2008). Kääriä's (2017) research on voice technology discovered BI increased when individuals only needed minimum effort to use the technology. There has been a call for further research on PEOU on voice technologies, since the technology is always improving (Moorthy & Vu, 2015).

Several articles helped form the succeeding hypotheses:

H7: Perceived Ease of Use will have a positive influence on Perceived Usefulness.

H9: Perceived Ease of Use will have a positive influence on Behavioral Intention to Use.

Perceived Usefulness (PU). Voice technology devices help with chores around the house, such as grocery lists, ordering items, playing music, and many more skills. PU is defined by how helpful a technology is to someone's life through its performance (Davis, 1985). How productive the voice activated technology is to the user determines the PU (Coskun-Setirek & Mardikyan, 2017). PU is measured by how the technology helps the user's daily life, accomplishes important tasks, completes tasks quickly, and increases productivity (Coskun-

Setirek & Mardikyan, 2017; Kääriä, 2017). Voice activated technologies that can offer customized skills to the user's needs will leave a positive PU. Some of the skills include helping with homework, aiding with meal preparation, and ordering items off a shopping list.

Previous research on voice technology has explained PU to be statistically significant or have a positive effect on BI (Coskun-Setirek & Mardikyan, 2017; Kääriä, 2017; Simon & Paper, 2008). Kääriä (2017) found PU to have the highest effect on BI for voice assistants when compared to other TAM variables. Tarhini et al.'s (2014) research on e-learning also found PU to have the strongest relationship on BI.

Based on this literature, the hypothesis was created:

H8: Perceived Usefulness will have a positive influence on Behavioral Intention to Use.

Perceived Enjoyment (PE). PE is the pleasure and satisfaction the user has from using voice activated technology (Agarwal & Karahanna, 2000). How helpful the voice assistant technology was on providing clear answers or the ease of starting the device can impact the PE (Smith, 2017). Voice assistant technologies that sound lifelike and are personable can help the user feel at ease, so they enjoy the technology more (Kääriä, 2017). The amount of time someone integrates the technology into their daily life improves the quality of the voice assistant, which leads to the consumer becoming emotionally attached (Sim, 2017). The more skills the voice technology possesses can increase the user's enjoyment, since a range of activities can be completed by the device. Individuals

will accept the technology if it is enjoyable and functions correctly (Domina et al., 2012).

In 2017, Coskun-Setirek and Mardikyan's research on voice technologies, PE was found to be statistically significant for BI. Research on the effect of PE on BI for voice technology is limited, as other studies leave out PE in their TAM (Kääriä, 2017). Praveena and Thomas (2014) conducted research on the acceptance of the social media site Facebook and found PE to be statistically significant on attitude. Attitude determines an individual's BI to use a system in the future but is different from measuring the actual BI for PE.

Based on this literature, the hypothesis was created:

H10: Perceived Enjoyment will have a positive influence on Behavioral Intention to Use.

Perceived Innovativeness (PI). The desire to try a new technology before other users is defined as PI (Rogers, 1983). Individuals who are attracted to use new technologies are more likely to have a positive PI. These individuals are tech savvy and are early adopters to new technology when compared to their peers (Agarwal & Karahanna, 2000). They also purchase new products more often and quicker than their peers (Li, Zhang, & Wang, 2015). Innovative technologies allow users to be more engaged in the shopping process, increase productivity, and make the process more convenient (Grewal, Roggeveen, & Nordfalt, 2016; Koo, Kim, & Nam, 2017). Voice technology is an innovative product that helps the user save time and offers a variety of services. There are many forms and brands of voice technology products for consumers to choose from, which makes

it an appealing innovative technology. Consumers who believe the technology is cutting-edge will most likely use it in the future.

Hausere, Tellis, and Griffin's (2006) research found innovativeness as a primary driver of the adoption and diffusion of new products (Li et al., 2015). In 2014, Renko and Druzijanic's study described PI to be statistically significant to BI. Li et al. (2015) called for future studies to explain the relationship between innovativeness and adoptions towards new products. Research on this variable is limited, since PI has been newly added to the TAM.

Based on this literature, the hypothesis was created:

H11: Perceived Innovativeness will have a positive influence on Behavioral Intention to Use.

Behavioral Intention (BI). BI means a user has a pleasant experience with a technology and will most likely use it in the future (Shamy & Hassanein, 2017). Individuals using voice technology will have a positive BI if the technology understands the user's speech and responds to their question or statement correctly. BI has been found to be an excellent predictor of system use (Coskun-Setirek & Mardikyan, 2017; Simon & Paper, 2008). Shamy & Hassanein (2017) found PE and BI to be statistically significant. Coskun-Setirek and Mardikyan's (2017) voice technology research study found their hypothesis of BI to have a positive significant impact on actual use.

CHAPTER III

STUDY DESIGN AND METHODS

The study design included a survey created on Qualtrics, which was disseminated through MTurk. The survey included 35 Likert-type questions on a five-point continuum adopted from previous TAM studies. A regression statistical analysis was conducted through SPSS and the Nebraska Evaluation and Research Center (NEAR) was consulted to help analyze the data.

Theoretical Framework. The existing TAM was adapted to include relationships between age, level of experience, and gender on the PU, PEOU, PE, and PI to BI when using voice activated technologies. Figure 3.1 demonstrates the relationships between variables in the conceptual model for this study (Davis, 1985).

In 1985, Davis created the TAM to measure the acceptance of technology and is frequently used today (Davis, 1989; Hubona & Cheney, 1994; Shamy & Hassanein, 2017). PU and PEOU were the two original variables (Davis, 1989) of the model with PE added later (Davis et al., 1992) to describe the BI of new technologies. In literature, PU is commonly explained to be the strongest variable and PE is constantly the weaker variable of user acceptance for various forms of technology (van der Heijden, 2004). In 1992, Davis added the relationship of PE and PI to BI through more research. This study also included the antecedent variables of age, level of experience, and gender. Venkatesh, Morris, Davis, and Davis (2003) created the Unified Theory of Acceptance and Use of Technology (UTAUT), which is where the antecedent variables were derived.

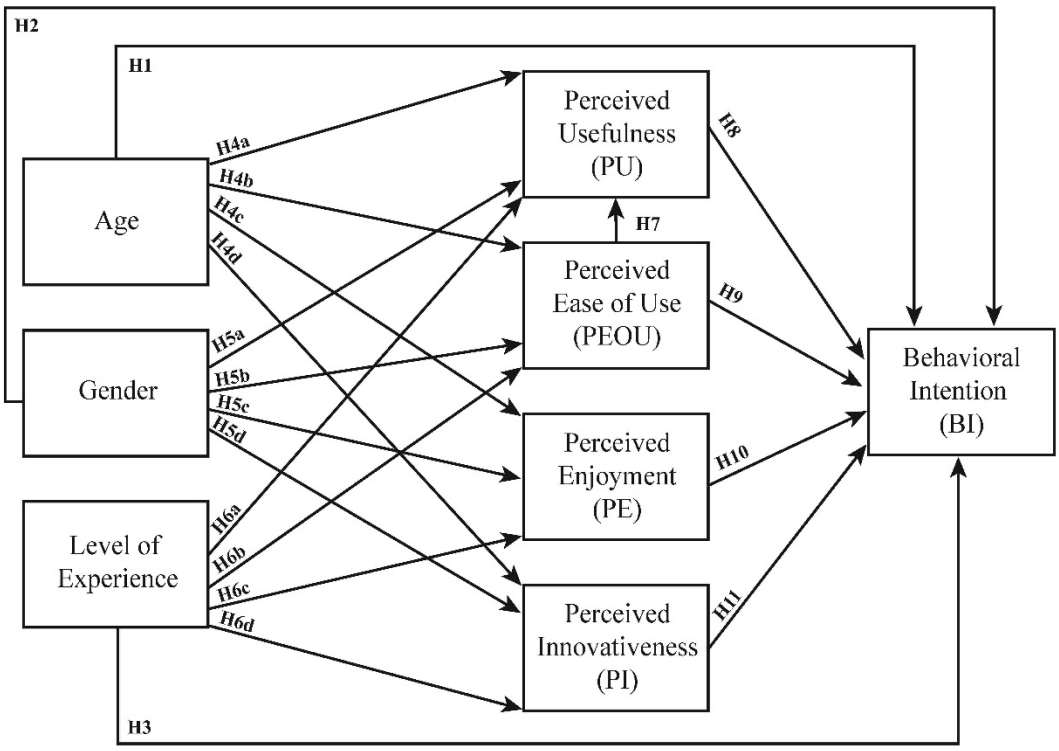


Figure 3.1 The Technology Acceptance Theoretical Model

Eight models were combined to create the UTAUT model, therefore some of the main variables are the same as the TAM. The UTAUT model compares age, level of experience, and gender to BI (Kääriä, 2017). The relationships between the variables were tested by disseminating a survey to millennials who use voice technology.

The survey was created through Qualtrics and given through MTurk. Participants were asked basic background questions about their age, ethnicity, socioeconomic status, and experience with voice technology. The main portion of the survey used Likert-type questions on a five-point continuum that measured the PU, PEOU, PE, PI, and BI toward shopping using voice-activated technology.

MTurk has various users from the United States, which provided a fairly representative sample from the population. In December 2015, it was estimated that Amazon Mechanical Turk had 750,000 unique users. The average user spends around 30 minutes per day on the website and visits the site at least eight times a month (Hitlin, 2016). The sample size for the study was 200 participants with an alpha of 0.05 or confidence level of 95% and margin of error of 5%.

Design

The survey was disseminated through Qualtrics and participants were recruited through MTurk. Participants found the opportunity to participate in the survey through a posted task notification on MTurk. Task notifications include the title of the survey, recruitment text, and survey link. The survey link brought participants directly to the electronic informed consent form. Once the electronic consent form is accepted, the participant was able to complete the survey. Previous studies have compared voice technology devices, but this study asked participants their opinions of the technology and intention for future use using Likert-type questions. Once a sample of 200 participants was met, the data was coded for a regression analysis using SPSS.

Participants

Participants were recruited through MTurk and compensated $0.10 for their time. The age range obtained was 21-36 years old for participants, since millennials were the focus of this study. An equal number of males and females were recruited for this study. Participants were required to have used voice

technology prior to filling out the survey, which was determined through a screening question.

Survey Instrument Design

A survey with 35 Likert-type scale questions were adapted from previous uses of the TAM model. Appendix D includes a summary of previous survey instruments, and the instrument for this study is available in Appendix E. The Likert-type scale questions for each variable in the TAM model were on a five-point continuum of "Strongly Agree" to "Strongly Disagree." Participants were also asked about their voice technology experience using questions from Moorthy and Vu's (2015) research on voice technology. Basic demographic information including age, gender, ethnicity, and annual household income were asked at the end.

To measure PEOU, four measures were adapted from Agarwal and Karahanna's (2000), van der Hejden (2004), and Venkatesh's (2000) research. An example of a survey question includes "It is easy to learn how to use voice activated technology." These measures have yielded a coefficient alpha of $0.81 \leq \alpha \leq 0.90$ in past research studies.

To measure PU, ten measures were adapted from Agarwal and Karahanna's (2000) and van der Hejden's (2004) research. An example survey question for this variable includes "I find voice technology useful in my shopping activities." These measures have yielded a coefficient alpha of $0.90 \leq \alpha \leq 0.93$ in past research studies.

To measure PE, three measures were adapted from Rese, Schreiber, and Baier (2014) and Pantano, Rese, and Baier's (2017) research. An example of a survey question includes "I am positive about voice activated technology." These measures have yielded a coefficient alpha of $0.89 \leq \alpha \leq 0.93$ in past research studies.

To measure PI, four measures were adapted from Agarwal and Karahanna's (2000) research. An example of a survey question includes "I like to experiment with new technologies." These measures have yielded a coefficient alpha of $\alpha = 0.87$ in past research studies.

To measure BI, eight measures were adapted from Agarwal and Karahanna's (2000) and Venkatesh's (2000) research. An example of a survey question includes "I intend to search for retailers who have voice shopping." These measures have yielded a coefficient alpha of $0.81 \leq \alpha \leq 0.97$ in past research studies.

IRB approval was obtained before the survey was disseminated via Amazon Mechanical Turk. MTurk did not collect any identifiable information for this survey and only the researcher had access to the data. All data was kept in a password-protected folder on UNL's box drive on a password-protected computer belonging to the researcher. The data will be destroyed three years after the study is complete.

Statistical Analysis

Data was automatically coded through the Qualtrics program and exported into a Microsoft Excel spreadsheet. The Excel spreadsheet was uploaded, and

statistical analyses were conducted using the SPSS program. A regression statistical test was conducted. A confidence level of 95% and probability of less than or equal to .05 was used, as this is considered statistically significant. The NEAR Center was consulted twice to help analyze the data.

CHAPTER IV

RESULTS

Participants were recruited virtually by MTurk, with a total of 244 surveys collected and 204 deemed useable. The response rate cannot be determined due to MTurk's structure. The informed consent was shown before they could proceed and surveys with one or more answers left blank or failed to meet the age requirement were discarded. Only completed surveys qualified for the $0.10 compensation. A handful of respondents did not understand two of the experience questions "*Have you purchased a product through voice activated technology?*" and "*How often do you purchase products through voice activated technology?*" Respondents who answered *'No'* to purchasing through voice did not select *'Never'* for how often they purchase through voice technology. Others who had purchased through voice answered *'Never'* for how often they purchased through voice technology. All responses were automatically coded for analysis.

Respondents entered their age through a text box and during the analysis, the answers were divided into two categories. The first category included ages 21-28 (42.6%) and the other category of ages 29-36 (57.4%). The range of the two age categories were equally divided, and Singal (2017) divided millennials into the same age ranges. Respondents were almost equally split with male comprising of 54.9%, females 44.1%, and would rather not specify 1.0%. Half of the respondents were White or Caucasian (52.9%), followed by Asian or Asian Pacific (33.8%), and American Indian or Alaska Native (7.8%). The range for

household income was almost evenly split between under $10,000 to $70,000. A breakdown of the participants' demographics is available in Table 3.1.

Table 3.1 Demographic Characteristics of Respondents.

Variable	Categories	Frequencies	Percent
Age	21-28	87	42.6%
	29-36	117	57.4%
Gender	Male	112	54.9%
	Female	90	44.1%
	Would Rather Not Specify	2	1.0%
Ethnicity	African American	11	5.4%
	American Indian or Alaska Native	16	7.8%
	Asian or Asian Pacific	69	33.8%
	Native Hawaiian or other Pacific Islander	0	0.0%
	White or Caucasian	108	52.9%
Household Income	Under $10,000	34	16.7%
	$10,001-$30,000	56	27.5%
	$30,001-$50,000	38	18.6%
	$50,001-$70,000	42	20.6%
	$70,001-$90,000	23	11.3%
	$90,001-$110,000	3	1.5%
	$110,001 or above	8	3.9%

Note. N= 204

The survey began with a question asking about participants' experience with voice technology. Participants indicated they used multiple voice technology devices, as 439 devices were selected out of the 204 useable surveys. The popular devices were Amazon Alexa (28.9%), followed by Apple Siri (23.5%), Google

Home (23.2%), and Microsoft Cortana (17.1%). Respondents have used voice technology for an extended period of time, as 43.6% utilized it for 1-2 years, 23.0% for more than 3 years, and 23.0% for more than 1 month but less than 1 year. The top skills were playing music (15.3%), online searching (11.5%), making calls (11.2%), checking the weather (11.1%), and setting alarms (10.9%). Surprisingly, shopping (7.7%), checking the news (7.6%), and controlling smart home devices (6.1%) were the least popular skills. Participants' were almost split with 54.9% stating they have not used voice technology to shop and the other 45.1% had purchased through voice. The respondents who had not purchased through voice covered 54.9% of the *'Never'* category for how often they shopped through voice. A majority of respondents who had purchased via voice use the skill a few times per year (21.1%) trailed by once per month (12.3%). A breakdown of voice activated experience is available in Table 3.2.

Table 3.2 Voice Activated Technology Experience

Variable	Categories	Frequencies	Percent
Voice Technologies Used (439)	Amazon Alexa	127	28.9%
	Apple Siri	103	23.5%
	Apple HomePod	3	0.7%
	Google Home	102	23.2%
	Samsung Bixby	26	5.9%
	IBM Watson	3	0.7%
	Microsoft Cortana	75	17.1%
How long?	Less than 1 week	8	3.9%
	Less than 1 month	13	6.4%

	More than 1 month but less than 1 year	47	23.0%
	1-2 years	89	43.6%
	More than 3 years	47	23.0%
Skills used (1,001)	Shopping	77	7.7%
	Playing Music	153	15.3%
	Controlling Smart Home Devices	61	6.1%
	Setting Alarms	110	10.9%
	Setting Reminders	92	9.2%
	Making Calls	112	11.2%
	Sending Messages	94	9.4%
	Checking the Weather	111	11.1%
	Checking the News	76	7.6%
	Online Searching	115	11.5%
Purchased through voice activated technology	Yes	92	45.1%
	No	112	54.9%
How often?	Several times per day	4	2.0%
	Once a day	3	1.5%
	One or two times per week	10	4.9%
	Three to five times per week	7	3.4%
	Once per month	25	12.3%
	A few times per year	43	21.1%
	Never	112	54.9%

Note. N= 204

Reliability. Participants were first asked about their voice technology experience using questions from Moorthy and Vu's (2015) research. A survey

with 29 Likert-type scale questions were adapted from previous uses of the TAM model. The Likert-type scale questions for each variable in the TAM model were on a five-point continuum of "Strongly Agree" to "Strongly Disagree." The reliability for each scale in the study is available in Table 3.3. Basic demographic information including age, gender, ethnicity, and annual household income were asked at the end of the survey.

Table 3.3 Cronbach's Alphas for Variables

Variables	BI	PEOU	PU	PE	PI
M	2.6979	2.0931	2.8574	2.2925	2.4400
SD	.97559	.69430	1.01883	.75228	.61619
Cronbach's α	.930	.835	.955	.706	.798

Four measures were adapted from Agarwal and Karahanna's (2000), van der Hejden (2004), and Venkatesh's (2000) research to measure PEOU. An example of a survey question for this variable includes "It is easy to learn how to use voice activated technology." High reliability was found for PEOU (4 items: α=.835).

Ten measures were adapted from Agarwal and Karahanna's (2000) and van der Hejden's (2004) research to measure PU. An example of a survey question for this variable includes "Using voice activated technology enhances my productivity." High reliability was found for PU (10 items: α=.955).

Three measures were adapted from Rese et al. (2014) and Pantano et al. (2017) research to measure PE. An example of a survey question for this variable includes "Shopping through voice technology is a nice gimmick" is an example of a survey question for this variable. Reliability was found for the measure PE (3 items; α =.706).

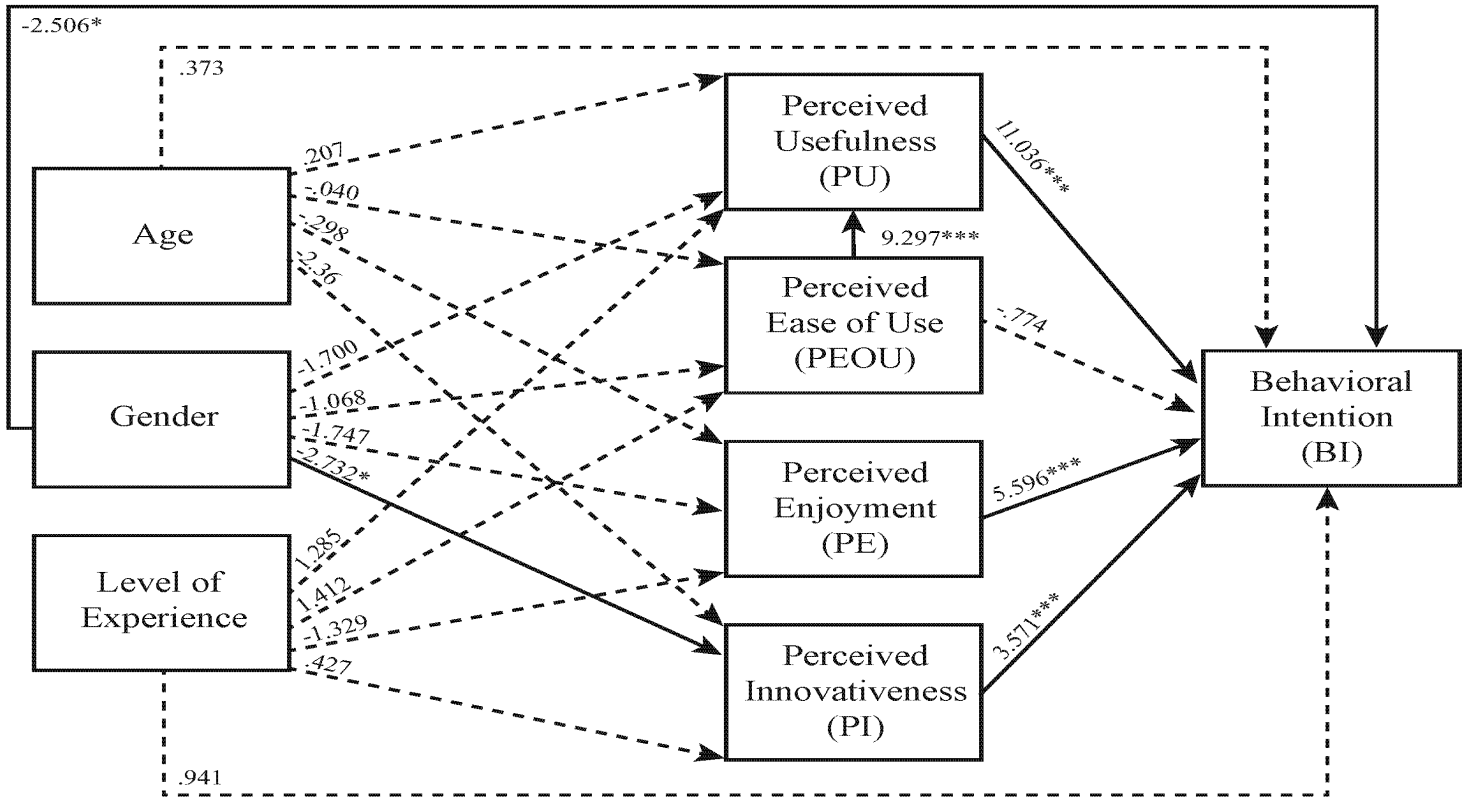
Four measures were adapted from Agarwal and Karahanna's (2000) research to measure PI. "I like to experiment with new technologies" is an example of a survey question for this variable. The measure for PI wasn't initially as high as desired (4 items: α=.550). To increase the reliability of PI, one item was removed (3 items: α=.798).

Eight measures were adapted from Agarwal and Karahanna's (2000) and Venkatesh's (2000) research to measure BI. "When shopping in the future, I would try to use voice activated technology" is an example of a survey question for this variable. High reliability was found for the BI measure (8 items: α=.930).

Weak collinearity was noticed between PEOU, PE, and PI in this study. Through further investigation and typical statistical standards, the relationship between the variables was not found to be problematic collinearity. Therefore, PEOU, PE, and PI were kept as separate, as they are main variables.

Hypotheses Testing

Testing H1, H2, and H3: Influences on BI. The results of the multiple regression indicate age, gender, and level of experience on BI explain 2.2% of the variance (R^2=.022, F(3,198)=2.539, p>0.05). Age (*t*=.373, p>0.05) and level of experience (*t*=.941, p>0.05) were not found to influence BI. Age was divided into two categories—ages 21-28 representing younger millennials, which was dummy coded as 0 and older millennials ages 29-36 was dummy coded as 1. Experience was condensed from five categories into four, as the choices *'less than 1 week'* and *'less than 1 month'* were combined due to the low selection of these choices. In contrast, gender (*t*=-2.506*, p<0.05) was found to influence BI toward using



Note. *p<0.05, ***p<.001

Fig. 2. Theoretical model significant relationships.

voice activated technology to shop. Gender was dummy coded to 1 for males and 0 for females. The results indicated females were found to be more likely than males to use voice technology in the future. Therefore, H2 was supported, while H1 and H3 were rejected.

Testing H4a, H5a, H6a: Influences on PU. The results of the multiple regression indicate age, gender, and level of experience on PU explain 0.9% of the variance (R^2=.009, F(3,198)=1.620, p>0.05). Age (*t*=0.207, p>0.05), gender (*t*=-1.700, p>0.05), and level of experience (*t*=1.285, p>0.05) were not found to influence PU. Therefore, H4a, H5a, and H6a were not supported.

Testing H4b, H5b, H6b: Influences on PEOU. The results of the multiple regression indicate age, gender, and level of experience on PEOU explain 0% of the variance (R^2=.000, F(3,198)=1.028, p>0.05). Age (*t*=-0.040, p>0.05), gender (*t*=-1.412, p>0.05), and level of experience (*t*=-1.068, p>0.05) were not found to influence PEOU. Therefore, H4b, H5b, and H6b were not supported.

Testing H4c, H5c, H6c: Influences on PE. The results of the multiple regression indicate age, gender, and level of experience on PEOU explain 0.9% of the variance (R^2=.009, F(3,198)=1.628, p>0.05). Age (*t*=-0.298, p>0.05), gender (*t*=-1.747, p>0.05), and level of experience (*t*=-1.329, p>0.05) were not found to influence PE. Therefore, H4c, H5c, and H6c were not supported.

Testing H4d, H5d, H6d: Influences on PI. The results of the multiple regression indicate age, gender, and level of experience on PEOU explain 2.4% of the variance (R^2=.024, F(3,198)=2.613, p>0.05). Age (*t*=0.236, p>0.05) and level

of experience (t=0.427, p>0.05) were not found to influence PI. Surprisingly, gender (t=-2.732, p<0.05) was found to influence PI. Therefore, females find shopping through voice activated technology more innovative than men. Thus, H4d and H6d were rejected, while H5d was supported.

Testing H7: Influences on PU. The results of the multiple regression indicate PEOU and PU explain 29.6% of the variance (R^2=.296, F(1,202)=86.443, p<0.001). PEOU was found to influence PU toward using voice activated technology to shop (t=9.297***, p<0.001). Therefore, H7 was supported.

Testing H8, H9, H10, and H11: Influences on BI. The results of the multiple regression indicate PEOU, PU, PE, and PI explain 71.4% of the variance (R^2=.714, F(4,199)=127.691, p<0.001). PEOU (t=-.774, p>0.05) was not found to influence BI. In contrast, PU (t=11.036***, p<0.001), PE (t=5.596***, p<0.001), and PI (t=3.571***, p<0.001) were found to influence BI toward using voice activated technology to shop. Therefore, H8, H10, and H11 were supported, while H9 was rejected.

CHAPTER V

DISCUSSION AND CONCLUSION

Discussion

Age, gender, and level of experience were tested against PEOU, PU, PE, and PI. The only significant relationship found was between gender and PI. Previous literature on the relationship of age, gender, and level of experience on the main TAM variables is limited, dated, and contradicts one another. The millennial generation was split into two separate groups for the analysis portion of this study into younger and older millennials. The age difference between the two millennial groups could have been too close, thus comparing two different generations may produce alternative results. Venkatesh et al. (2012) compared younger individuals to older consumers and did not narrow the findings by generation. Therefore, more research should be done investigating age by generations against the main TAM variables.

Gender did not influence PU, PEOU, or PE in this study. Previous studies have explained men to put more influence on PEOU than women (Kim, 2010; Ong & Lai, 2006; Wang & Hsieh, 2015). In contrast, other researchers have found females to put more importance on PEOU when compared to males (Agudo-Peregrina, and Chaparro-Pelaez, 2015; Constantiou, 2012; Faqih, 2016; Hasan, 2010; Venkatesh et al., 2012). When investigating the TAM variable PU, males were more influenced by the benefits of the technology than females (Agudo-Peregrina, and Chaparro-Pelaez, 2015; Constantiou, 2012; Hasan, 2010; Venkatesh et al., 2012). Faqih (2016) and Zhou and Feng's (2017) research

explaining online shopping parallels with this study, as gender was not found to influence on PU. Corresponding to this study, Zhou and Feng (2017) did not find gender to influence PE. However, other researchers have explained gender to influence PE, as men thought the technology was more entertaining than women (Lin et al., 2017; Papastergiou & Solomonidou, 2005). The findings of this study indicate gender should be further researched as the literature is inconsistent. The gender gap is narrowing, which may be the reason for no significant relationships found between PU, PEOU, and PE on gender (Faqih & Jaradat, 2015).

Findings from this study did not support the relationship between experience, PU, PEOU, and PE for shopping through voice technology. Few studies have explained how the level of experience influences the TAM variables. Venkatesh (2000) proved that level of experience influences PEOU for information technology, and Irani (2000) investigated the relationship between experience and PU to be statistically significant. Experience should continue to be examined, since PEOU and PU has been found to influence the level of experience by other researchers.

Surprisingly, gender influenced PI, as females found voice activated technology more innovative than males. Literature on PI is limited, since it is a new variable to the TAM. Venkatesh et al.'s (2012) study explained that younger men exhibit a greater tendency to seek novelty and innovativeness in technology. Similarly, Constantiou (2010) stated men perceived themselves more innovative than women. Gender is important to test against the main TAM variables, especially PI, as literature is conflicting and limited.

Gender was found to significantly influence BI; therefore, females are more apt to use voice activated technology to shop in the future than males. Previous literature has explained males to have a higher BI to use technology than females, which is the opposite of the findings from this study (Chen et al., 2015; Lissitsa & Kol, 2016; Padilla-Melendez, del Aguila-Obra, & Garrido-Moreno, 2013; Venkatesh et al., 2012; Wang & Hsieh, 2015). Lissitsa and Kol (2016) explained that men are more likely to purchase electric appliances, furniture, and vacations online than women. Different product categories may produce other results for the relationship of gender to BI. Thus, the relationship between gender and BI should be further investigated along with the different product categories.

The relationship of level of experience and age to BI were not found to influence one another. Findings from this study differ from Venkatesh et al.'s (2012) study, where level of experience influenced BI. Irani's (2000) study on Internet communication tools discovered level of experience to be a significant predictor for BI. The high level of experience may not be required for basic skills such as checking the weather, setting alarms and reminders, and playing music for voice activated technology, which may be why the variables were not found statistically significant. Lissitsa and Kol (2016) compared BI among Gen X and Gen Y for online shopping, where the likelihood of online shopping was explained to increase with age. Gen Y's, also known as millennials, shopping needs increased with age, since they are starting families and need more products. Respondents were not questioned about specific retail categories when shopping through voice, which may be why age did not influence BI. Based on the results

of the study, age and level of experience with voice activated technology does not influence future use.

The relationship between PEOU and PU was statistically significant. In studies investigating voice technology, PEOU has also been found to be a strong influence on PU (Coskun-Setirek & Mardikyan, 2017; Kääriä, 2017). The results of this study correspond with the outcomes of previous literature on voice technology, as the technology is becoming easier to operate, making it more useful to users (Venkatesh, 2000). Thus, the impact of PEOU on PU should be added to the TAM.

PU was discovered to positively influence BI when using voice activated technology to shop. The findings in this study parallel the past literature, as many researchers investigating personal assistants and voice activated technology have found PU to influence BI (Coskun-Setirek & Mardikyan, 2017; Simon & Paper, 2008). In Kääriä's (2017) study investigating the acceptance of voice technology, PU had the highest effect on BI. Zhou & Feng's (2017) study parallels other researchers, as PU explained most of the BI when video calling in a work context. Therefore, PU is an important variable in the TAM as many researchers have proven it to explain a large portion of BI.

Prior research on voice technology has found PEOU to be a significant predictor of BI (Coskun-Setirek & Mardikyan, 2017; Kääriä, 2017; Moorthy & Vu, 2015; Simon & Paper, 2008). In this study, however, PEOU was not significant on BI when using voice activated technology to shop. In Koivisto et al.'s (2016) research on mobile Internet acceptance in Saudi Arabia, the

relationship between PEOU and BI was negative. Lim, Osman, Salahuddin, Romle, & Abdullah (2016) explained PEOU to influence online shopping behavior, but the relationship was barely significant. Many research studies on voice activated technology do not investigate shopping through the device, which may be why the findings from this study differ from previous literature. Therefore, researchers should investigate this variable again on voice technology skills such as shopping, since updates to the technologies are constantly being released.

As established in this study, PE was found to have a strong influence on BI. Van der Heijden (2004) discovered PE to be statistically significant on BI and Domina et al.'s (2012) research focusing on shopping in a virtual space had similar findings. PE has been proved to be a strong predictor on BI in previous research studies (Alalwan, Baabdullah, Rana, Tamilmani, & Dwivedi, 2018; Zhou & Feng, 2017). Thus, PE is an important variable within the TAM when using voice activated technology to shop.

The relationship between PI and BI was supported in this study, indicating PI as an important variable to add to the TAM. Different forms of innovativeness have been investigated by researchers, such as personal innovativeness. Koivisto et al. (2016) discovered personal innovativeness to be statistically significant on BI for information technology. In the mobile Internet context, innovativeness influenced BI (Alalwan et al., 2018). Renko and Druzijanic's (2014) research supports the findings, as the relationship between PI and BI was statistically

significant. Findings from this study acknowledged the importance of PI within the TAM model for using voice activated technology to shop.

Limitations

Generalization across other voice technology experiences is a limitation to this study, as there are a variety of devices available and the skills differ on each technology. Karahanna & Straub (1999) believe task-related situations, such as ordering items through voice activated technology, cannot be generalized across populations. The TAM may be considered a limitation, as self-reported intention to use voice technology does not always result in actual use in the future (Agarwal & Karahanna, 2000; Bagozzi, 2007). To address this potential issue, respondents were asked about their experience with voice technologies. Questions about experience included identifying different voice technology devices used, how often the technology is used, and if they had purchased through voice activated technology. The simplicity of TAM has also garnered discussion with the relationship between PU and PEOU on BI which is often disregarded in literature. The TAM was chosen, as it is known to be the best way to measure acceptance of a new technology across different populations.

Amazon's Mechanical Turk can be viewed as another limitation of the study. Concerns of using MTurk include participants having routine exposure to research procedures, the data collection happening in an uncontrolled environment, and deception that may occur by participants (Kan & Drummy, 2018). To lower deception, a small amount of compensation was given along with a broad screening question. The screening question did not limit participants to

the type of voice technology used, which decreased the likelihood of dishonesty. MTurk was found suitable for this study. Future studies may want to consider interviewing participants to gain a better understanding of millennials' acceptance of voice technologies.

Managerial Implications and Suggestions for Further Research

Retailers and researchers can benefit from this study, since voice technology has become newly available to consumers. There has been an increase of voice technologies being purchased and the results of this study indicate millennial consumers are accepting of the technology and some users already shop through voice. Thus, retailers should invest their resources into voice activated technology by offering skills such as shopping through voice. Retailers who add shopping through voice to customers could potentially set themselves apart from their competitors, since the technology is relatively new. Academic researchers can also benefit from this study, as research on voice technology is limited. This study helps fill the gap in literature of millennials' acceptance of using voice technology to shop. The results indicated millennial users are accepting of the technology but find it difficult to use.

Future research studies should investigate the TAM variable PEOU, as updates and use of the technology by others are helping the technology improve. In addition, the TAM variable PI lacks explanation, since many researchers leave this variable out of the model. PI should be closely examined as it was close to multicollinearity and the measures should be further investigated. The relationship of PI on BI was significant; therefore, the variable should be added to the TAM.

Researchers could examine which skills are the most popular on each voice assistant, the various product categories purchased, and the average amount spent for one order. Voice activated technology is new to the market and research about consumers' acceptances of the technology to shop is limited, thus further research should be conducted on this topic.

Conclusion

Retailers may benefit from this research, as more voice activated technology devices are available in the market and the acceptance of these technologies was investigated. The results of this study indicate millennials use voice activate technology and are slowly accepting it to shop. The TAM was tested to compare age, gender, level of experience, PU, PEOU, PE, PI, and BI among one another. Gender was found to influence BI, indicating females are more likely to use the technology when compared to men. Age and level of experience did not influence BI, thus younger and older millennials with different levels of experience do not statistically differ from each other when it comes to intention to use in the future. The relationship between age, gender, and level of experience were studied against PU, PEOU, PE, and PI. All of the relationships were not supported, except gender was found to influence PI. PEOU and PU were found to influence each other. PEOU was not found to influence BI, but the other main TAM variables' relationship with BI were supported. The findings indicate that millennials are accepting of using voice activated technology to shop and retailers should consider creating a skill on the most popular voice activated devices to shop their products.

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Appendices

Appendix A: Electronic Recruitment Text

You have been selected to participate in an online survey about millennials' perceptions of voice technology. Your participation in this study is instrumental to understand the consumers' acceptance of voice activated shopping, as it is estimated that half of all internet searches will be done through voice activated technologies by 2020 (Maney, 2017). The survey will take approximately 15 minutes to complete and you could receive $0.10 in compensation after completing survey. There are no known risks to this study. We greatly value your input and time spent completing this survey.

Appendix B: Electronic Informed Consent

Hello,

IRB#

You have been selected to participate in an online survey about millennials' perceptions of voice technology. Your participation in this study is instrumental to understand the consumers' acceptance of voice activated shopping, as it is estimated that half of all internet searches will be done through voice activated technologies by 2020 (Maney, 2017). The survey will take approximately 15 minutes to complete. We greatly value your input and time spent completing this survey.

In addition, please understand that:

- You must be between the ages of 25-35 years of age to participate.
- Participation in this study is voluntary. You can refuse to participate or withdraw at any time without harming your relationship with the researchers or the University of Nebraska-Lincoln, or in any other way receive a penalty or loss of benefits to which you are otherwise entitled. There are no perceived risks or personal benefits for participants.
- All of your responses will remain confidential and will be kept in a password protected file for three years after the study is complete
- The data collected from the survey will be only used for research objectives and will not be used for any other purposes
- MTurk doesn't share workers personal information with investigators. The Qualtrics Survey Software also ensures anonymity by encrypting data during transit through Transport Layer security and are sent to secure, certified servers.
- The results of this research will benefit marketers, retailers, and consumer behavior researchers
- You will receive $0.10 for participating in the survey. After completing the survey, record the code given on the *Thank you* page and return to MTurk's website. Type the code into the *Provide survey code here* textbox for compensation. Compensation may be denied if the survey is not complete.

By continuing with the survey, you consent to be a participant in this research study.

If you have any questions, comments, or concerns, please send an email to katelynsorensen5@gmail.com. If you would like to speak with someone other than the researchers, please call the Research Compliance Services Office at 402-472-6965 or irb@unl.edu.

Sincerely,

Katelyn Sorensen and Jennifer Jorgensen

Contact:
Katelyn Sorensen, Graduate Student
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Please print or save this page for your records.

[Proceed to Survey Button]

Appendix C: IRB Approval Letter

University of Nebraska Lincoln

Official Approval Letter for IRB project # 18806 - New Project Form

December 18, 2018

Katelyn Sorensen
Department of Textiles, Merchandising & Fashion Design

Jennifer Johnson Jorgensen
Department of Textiles, Merchandising & Fashion Design
HECO 205, UNL, 685830802

IRB Number: 20181218806EX
Project ID: 18806
Project Title: Millennials' Acceptance of Voice Activated Shopping

Dear Katelyn:

This letter is to officially notify you of the certification of exemption of your project for the Protection of Human Subjects. Your proposal is in compliance with this institution's Federal Wide Assurance 00002258 and the DHHS Regulations for the Protection of Human Subjects (45 CFR 46) and has been classified as exempt. Exempt categories are listed within HRPP Policy # 4.001: Exempt Research available at: http://research.unl.edu/researchcompliance/policies-procedures/.

o Date of Final Exemption: 12/18/2018
o Review conducted using exempt category 2 at 45 CFR 46.101
o Funding (Grant congruency, OSP Project/Form ID and Funding Sponsor Award Number, if applicable): Investigators personal funds.

We wish to remind you that the principal investigator is responsible for reporting to this Board any of the following events within 48 hours of the event:
* Any serious event (including on-site and off-site adverse events, injuries, side effects, deaths, or other problems) which in the opinion of the local investigator was unanticipated, involved risk to subjects or others, and was possibly related to the research procedures;
* Any serious accidental or unintentional change to the IRB-approved protocol that involves risk or has the potential to recur;
* Any publication in the literature, safety monitoring report, interim result or other finding that indicates an unexpected change to the risk/benefit ratio of the research;
* Any breach in confidentiality or compromise in data privacy related to the subject or others; or
* Any complaint of a subject that indicates an unanticipated risk or that cannot be resolved by the research staff.

This project should be conducted in full accordance with all applicable sections of the IRB Guidelines and you should notify the IRB immediately of any proposed changes that may affect the exempt status of your research project. You should report any unanticipated problems involving risks to the participants or others to the Board.

Sincerely,

Jenn Klein
for the IRB

Full Accreditation

Appendix D: Previous Survey Instruments

Study	Variables	Survey Instrument(s) Used	Examples	Reliability
Agarwal & Karahanna, (2000)	PEOU, PI, PU, Behavioral Intention	Davis, (1989) (PU and PEOU); Ajzen & Fishbein, (1980) (BI); Agarwal & Prasad (1998) (PI)	"I find the Web easy to use." (PEOU) "Using the Web enhances my productivity." (PU) "I plan to use the Web in the future." (BI) "I like to experiment with new information technologies." (PI)	PEOU α=0.90 PI α=0.87 PU α=0.93 BI α=0.97
Pantano, Rese, & Baier, (2017)	PE	Rese, Schreiber, & Baier, (2014) (PE); Ahn, Seewon, & Han, (2004); Porter & Donthu, (2006) (Attitude)	"The virtual try-on is a nice gimmick." (PE)	PE α=0.93
Rese, Schreiber, & Baier, (2014)	PE	Online reviews (PE); Ahn, Seewon, & Han, (2004); Porter & Donthu, (2006) (Attitude)	"Using IKEA app is really fun." (PE)	PE α=0.89
van der Hejden, (2004)	PEOU, PU	Venkatesh, & Davis, (2000) (PEOU); Chang, & Cheung, (2001); Igbaria, Livari, & Maragahh, (1995) (PE)	"I find <the system> easy to use." (PEOU) "Pleasant-unpleasant." (PU)	PEOU α=0.87 PU α=0.90
Venkatesh, (2000)	Behavioral Intention, PEOU	Davis, (1989); Davis, Bagozzi, & Warshaw, (1989) (PEOU and BI)	"Assuming I had access to the system, I intend to use it." (BI) "I find the system to be easy to use." (PEOU)	α=0.81

Appendix E: Survey Questions

Voice Activated Technology and Shopping

This research is about your perceptions of shopping in through voice activated technologies. This survey is divided into four sections. Thank you in advance for your responses, as they are a true asset to understanding your thoughts on voice activated technology.

Section 1: Voice technology Usage Habits

Please fill out the following information to your knowledge and abilities.

Choose the voice technology you use.

Amazon Alexa	Apple Siri	Apple HomePod	Google Home	Samsung Bixby
IBM Watson	Microsoft Cortona			

How long have you been using voice technology?

Less than 1 week	Less than 1 month	More than 1 month but less than 1 year	1-2 years	More than 3 years

Which skills do you use on your voice technologies?

Shopping	Playing Music	Controlling Smart Home Devices	Setting Alarms	Setting Reminders
Making Calls	Sending Messages	Checking the Weather	Checking the News	Online Searching

Have you purchased a product through voice activated technology?

Yes No

How often do you purchase products through voice activated technology?

Several times per day	Once a day	One or two times per week	Three to five times per week	Once per month
A few times per year	Never			

Section 2: Usefulness of Voice Activated Technology

Please select one answer to each question which best represents your thoughts about voice activated technology and shopping through voice.

[Perceived Ease of Use]	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
I find voice activated technology to be very easy to use.	1	2	3	4	5
Voice activated technology is intuitive to use.	1	2	3	4	5
It is easy to learn how to use voice activated technology.	1	2	3	4	5
I find it easy to get the voice technology system to do what I want it to do.	1	2	3	4	5

[Perceived Usefulness]	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
For me, voice activated technology has great value for shopping.	1	2	3	4	5
Using voice activated technology enhances my effectiveness when browsing.	1	2	3	4	5
Using voice activated technology enhances my productivity.	1	2	3	4	5
I find voice activated technology useful in my shopping activities.	1	2	3	4	5
Using voice activated technology improves my shopping efficiency.	1	2	3	4	5
I can decide more quickly and more easily which product I want to purchase than in the past.	1	2	3	4	5

I can better decide which product I want to purchase than in the past.	1	2	3	4	5
I am better informed about products.	1	2	3	4	5
I can decide more quickly and more easily whether I want to purchase a particular product or not.	1	2	3	4	5
I can better decide whether I want to purchase a particular product or not.	1	2	3	4	5

Section 3: Attitudes on Voice Activated Technology

Please select one answer which best represents your thoughts toward voice activated technology and voice shopping.

[Perceived Ease of Use]	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
Using voice activated technology is really fun.	1	2	3	4	5
Shopping through voice technology is a nice gimmick.	1	2	3	4	5
It is fun to discover through voice technologies	1	2	3	4	5

[Perceived Innovativeness]	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
When I hear about new technologies, I look for ways to experiment with it.	1	2	3	4	5
In general, I am hesitant to try out new technologies.	1	2	3	4	5
Among my peers, I am usually the first to try out new technologies.	1	2	3	4	5
I like to experiment with new technologies.	1	2	3	4	5

Section 4: Intentions toward Voice Activated Technology

Please select one answer which best represents your intentions toward voice activated technology and voice shopping.

[Behavioral Intention]	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
Assuming I had access to voice activated technology, I intend to use it.	1	2	3	4	5
When shopping in the future, I would try to use voice activated technology.	1	2	3	4	5
When shopping in the future, I would give retailers that have voice activated shopping priority over a brick-and-mortar store.	1	2	3	4	5
When shopping in the future, I would give retailers that have voice activated shopping priority over another shop.	1	2	3	4	5
I will recommend using voice activated technology and voice shopping to my friends.	1	2	3	4	5
I will recommend using voice activated technology and voice shopping to my family.	1	2	3	4	5
I will use voice activated technology regularly in the future.	1	2	3	4	5
I intend to search for retailers who have voice shopping.	1	2	3	4	5

Section 5: Demographic Information

Please fill out the following information about yourself.

What is your age?

What is your sex?

Male	Female	Would rather not specify

What is your ethnicity?

African American or Black	American Indian or Alaska Native	Asian or Asian Pacific	Native Hawaiian or Other Pacific Islander	White or Caucasian

What is your household income?

Under $10,000	$10,001-$30,000	$30,001-$50,000	$50,001-$70,000	$70,001-$90,000	$90,001-$110,000	$110,00 or above

Thank you for participating in the survey! You will now proceed to the eye-tracker portion of the study.

If you have any questions or concerns, please contact the IRB at irb@unl.edu or the researcher at katelynsorensen5@gmail.com