EXAMINING THE ROLE OF PURPOSE IN THE ADOPTION OF DIGITAL ASSISTANTS

by

Nathanael Johnson

A Thesis

Submitted to the Faculty of Purdue University

In Partial Fulfillment of the Requirements for the degree of

Master of Arts

Brian Lamb School of Communication

West Lafayette, Indiana

May 2020

THE PURDUE UNIVERSITY GRADUATE SCHOOL
STATEMENT OF COMMITTEE APPROVAL

Dr. Torsten Reimer

Brian Lamb School of Communication

Dr. Howard Sypher

Brian Lamb School of Communication

Dr. Julia Rayz

Department of Computer and Information Technology

Approved by:

Dr. Marifran Mattson

Dedicated to my wife and daughter.

ACKNOWLEDGMENTS

I have deep appreciation committee chair, Dr. Torsten Reimer, who helped me tirelessly through this process and taught me a great deal about how good research is done. I also thank my additional committee members, Dr. Julia Rayz and Dr. Howard Sypher, who offered to me thoughtful assistance in bringing this project to its full fruition.

In addition, I give a heartfelt thank you to my wife Chandler, who encouraged me at every step of the way.

TABLE OF CONTENTS

LIST OF TABLES 6
GLOSSARY 7
ABSTRACT 8
CHAPTER 1. INTRODUCTION 9
CHAPTER 2. STUDY ONE METHOD 19
CHAPTER 3. STUDY ONE RESULTS 24
CHAPTER 4. STUDY ONE DISCUSSION 28
CHAPTER 5. STUDY TWO METHOD 29
CHAPTER 6. STUDY TWO RESULTS 34
CHAPTER 7. STUDY TWO DISCUSSION 39
CHAPTER 8. CONCLUSION 41
APPENDIX A. STUDY ONE DESCRIPTIONS 45
APPENDIX B. STUDY TWO ADDED DESCRIPTIONS 48
APPENDIX C. FREQUENCY DISTRIBUTION CHARTS 51
REFERENCES 53

LIST OF TABLES

Table 1. Main Effect and Interactions – Study One 26
Table 2. Individual Purposes – Study One 26
Table 3. Main Effect and Interactions – Study Two 35
Table 4. Individual Purposes – Study Two 36
Table 5. Purpose Perceptions 37

GLOSSARY

Affective Attitudes: How the object, person, issue, or event makes you feel

Behavioral Intention: A person's subjective probability that he will perform some behavior

Cognitive Attitudes: Thoughts and beliefs about the object, person, issue, or event

Hedonic: Relating to or considered in terms of pleasant (or unpleasant) sensations

Hedonic Motivation: The fun or pleasure derived from using a technology

Performance Expectancy: The degree to which an individual perceives that using a system will help him or her to attain a gain in job performance

Semantic Differential: Measures the connotative or subjective meaning of objects with two descriptions of opposite connotation

Utilitarian: Designed to be useful or practical rather than attractive

ABSTRACT

When do consumers adopt digital personal assistants like Cortana, Siri, or Alexa? This thesis proposes to add to the current technology adoption literature on digital assistants by examining the moderating impact of the purpose for which the device is used. Building on the theory of uses and gratifications, it was expected that devices viewed with high cognitive appraisal would be more likely to be chosen for cognitive purposes than devices viewed with high affective appraisal, while devices viewed with high affective appraisal would be more likely to be selected for affective purposes than devices viewed with high cognitive appraisal. Two experiments were conducted that supported these hypotheses.

CHAPTER 1. INTRODUCTION

Technology-heavy societies of the 21st century offer consumers an abundance of choices of new technologies. A report by the World Intellectual Property Organization (2019) showed that annual patent applications for new technologies now exceeds 3,000,000 per year, with over a million of those applications being granted. The same report also showed that over 500,000 of the patents in 2017 were communication or computer technologies. The constant influx of new technology comes with continuous challenging decisions for consumers having to decide which technologies to use and which to ignore. How does a person make those decisions? A significant portion of scholarly research on technology adoption has focused on consumers' attitudes towards new technologies and has established a link between consumer attitudes and technology choices. Many studies have reported a correlation between attitudes towards new technologies and their adoption; however, there is large variation in the reported strength of this relationship. Drawing on the distinction of cognitive and affective attitudes in social psychology and building on uses and gratification theory, this thesis set out to propose and test a new hypothesis about the role of attitudes in the adoption of new technologies that may explain some of the inconsistent findings in the literature. Specifically, it was expected that if a person plans to use a technology for cognitive purposes, cognitive appraisal would be a stronger predictor of adoption than affective appraisal, but if a person plans to use a device for affective purposes, affective appraisal would be a stronger predictor of adoption than cognitive appraisal. In the remainder of this thesis, literature establishing the link between attitudes and the adoption of new technologies is reviewed first. In a second step, the distinction between cognitive and affective attitudes is introduced. Thirdly, drawing on uses and gratification theory, it is argued that the role of cognitive and affective attitudes may depend on the perceived and planned purpose of a technology. In a fourth step, two experimental studies are described that test the proposed hypothesis. The studies examine whether consumers' planned purpose of a technology moderates the influence of affective and cognitive appraisal factors on the adoption decision. Both studies focus on the adoption of voice-controlled digital assistants, such as Amazon's Alexa.

These digital assistants have begun to diffuse very rapidly in the world. Voicebot.ai (Kinsella, 2019c) reported that from 2018 to 2019, the number of United States owners of Smart Speakers, which include devices like the Amazon Echo and Google Home, but not smartphones, rose from 47 million to 66 million, nearly a quarter of the United States adult population. Including smartphones and other voice assistant-enabled devices, the world-wide total of voice assistants is above 1.5 billion (Kinsella, 2019a). These assistants are used by consumers for a wide variety of purposes. Voicebot.ai (Kinsella, 2019b) revealed eighteen different ways consumers often use Smart Speakers, including news, weather, music, games, setting a timer, communication with others, and following sports, among others.

The Role of Attitudes in the Adoption of New Technologies

A significant portion of technology acceptance literature deals with the influence of attitudes on individuals' decisions to adopt and use technology. Many studies in this realm are rooted in the Technology Acceptance Model (TAM) (Davis et al., 1989; see also Davis, 1989), which seeks to explain behavioral intention to use technology via perceived usefulness, perceived ease of use, and attitudes. The behavioral intention portion of the model demonstrates the model's foundation in the Theory of Reasoned Action (Davis et al., 1989; see also Fishbein & Ajzen, 1980).

Since the development of this model, a large body of research has examined the adoption of different technologies including the described factors. From TAM, a series of other models have emerged that attempt to extend the model or adapt it to more specific types of technology, such as TAM2 (Venketesh & Davis, 2000), TAM3 (Venketesh & Bala, 2008), TAM 2.0 (Yang & Yoo, 2004), UTAUT (Venketesh et al., 2003), and UTAUT2 (Venkatesh et al. 2012). Although not all of these models include attitudes as a predictor of technology adoption, the construct has been included in a large portion of the technology-acceptance literature including recent studies.

These studies have supported the general claim that attitudes are positively related to technology adoption. Recent studies that illustrate this relationship include the adoption of 3D printers (Chatzoglou & Michailidou, 2019), classroom technology (Cullen & Greene, 2011), interactive whiteboards (Erdener & Kandemir, 2019), Facebook (Rosen et al., 2013), agricultural products (Lin & Kuo, 2019), and health technology (Hossain et al. 2019; Seth et al., 2019). However, even though studies typically report a positive association between attitudes and the intention or actual adoption of new technologies, the reported correlations greatly vary. For example, Rezaei et al. (2020) found a correlation between attitudes and adoption of pest management technology of .68, whereas Hagos and Singh (2019) reported a correlation between attitudes and the adoption of mobile technology of -.09.

Some of the reported variation may be explained by the use of a variety of different attitude measures including cognitive as well as affective components. This thesis set out to explore if some of this variation can be explained by differentiating between cognitive and affective attitude appraisal, as opposed to using a single measurement of consumers' attitudes towards a technology, and by incorporating the perceived purpose of the use of the technology as a moderator (see Figure 1). The following sections describe the distinction between cognitive and affective attitudes and introduce the idea that the perceived purpose of the use of a technology may moderate effects of the cognitive and affective appraisal on technology adoption.

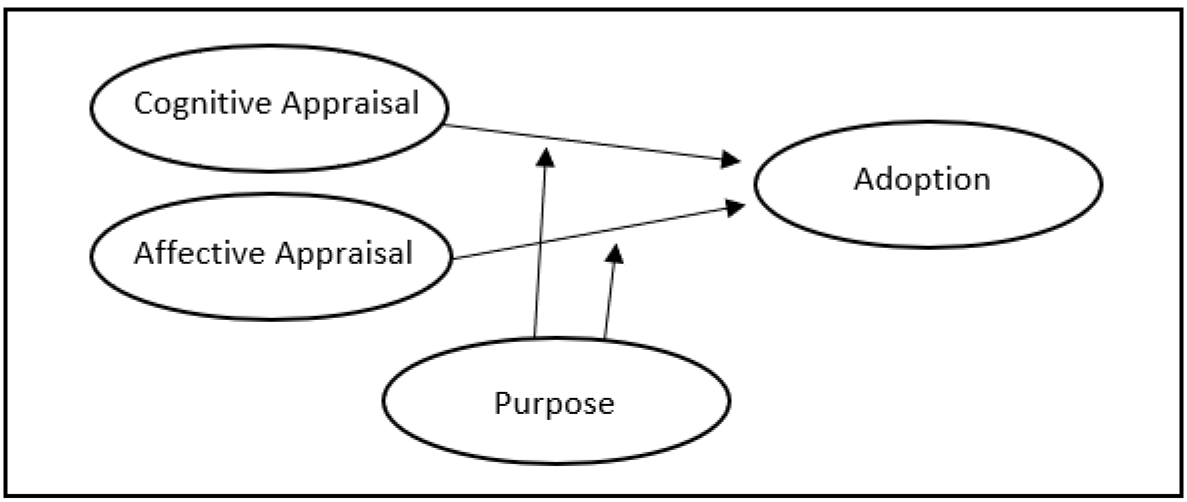


Figure 1

Cognitive and Affective Components of Technology Adoption

Several studies on technology adoption distinguished between cognitive and affective dimensions of attitudes (or related constructs such as performance expectancy and hedonic motivation) in an attempt to increase the predictability of the adoption of a new technology. A measure for the distinction between cognitive and affective attitudes was introduced by Crites et al. (1994). Cognitive attitudes refer to an evaluative belief of an object of its value or usefulness, while affective attitudes address a positive or negative feeling a person has toward an object. Technology acceptance literature has traditionally adapted the scales that are used to measure attitudes to the technology at hand but treated attitudes as a one-dimensional construct—the scales that are used to measure consumers' attitudes typically include items that measure both cognitive and affective components of attitudes. For example, Al-Zaidiyeen et al. (2010) measured teachers' attitudes toward technology in the classroom with items like "Computers make me more productive," which assess an evaluative belief, along with items like "Computers do not scare me at all," which examine an emotional response.

Some research explicitly distinguished between the two constructs of cognitive and affective attitudes or related constructs. For example, UTAUT2 (Venkatesh et al., 2012) contains two constructs that are conceptually similar to cognitive and affective attitudes. One is performance expectancy, measured in their original study with items like "Using mobile Internet increases my productivity," and the other is hedonic motivation, measured by items like "Using mobile Internet is fun." It is apparent from examining the survey items that performance expectancy is conceptually similar to the concept of cognitive attitudes and that hedonic motivation is conceptually similar to the concept of affective attitudes. Other examples of the use of similar constructs include McLean and Osei-Frimpong's (2019) distinction between utilitarian and hedonic benefits, and Pagani's (2011) distinction between cognitive and affective components. All the described scales have in common that they distinguish between two dimensions of attitudes or beliefs and include items that measure to what extent participants *like* the new technology and are, thus, arguably measuring attitudes.

Although relatively few studies have used the specific terms and scale on cognitive and affective attitudes developed by Crites et al. (1994), several studies have examined how related concepts predict technology adoption. Does the separation of cognitive and affective attitude appraisal increase the predictability of the adoption of new technologies? The answer to this question is not conclusive. Similar to the results of using a single measure of attitudes, the results of studies differentiating between cognitive and affective dimensions of attitudes are also mixed. On one hand, Yang and Yoo (2004) found that only cognitive attitudes were a significant predictor of spreadsheet technology adoption. On the other hand, Pagani (2011) found that in the adoption of mobile TV services, the cognitive component was not a significant predictor of adoption. In yet other studies, such as Hoffman et al. (2016), cognitive and affective components were both significant predictors of technology adoption. Using the terms performance expectancy and hedonic motivation from the UTAUT2 model, a variety of articles have found both to be substantial predictors of technology adoption (Gunasinghe et al., 2019; Lin et al., 2019; Venkatesh et al., 2012). However, other studies using the same model found hedonic motivation to be more important than performance expectancy (Moorthy et al., 2019).

Purpose as a Moderator

Why do studies vary to what extent cognitive or affective components predict the adoption of new technologies? Whether it is cognitive or affective appraisal that primarily predict the adoption of a new technology may depend on the perceived purpose of the technology. A person’s intended purpose for a device—the way in which they plan to use the device—may moderate the relationship between cognitive and affective components and the adoption of technology.

This possible explanation is primarily rooted in uses and gratifications theory (UGT) (Katz et al., 1973), which provides a rationale for why purpose may moderate adoption behaviors. Katz et al. argued that people all have different reasons to use media and technology because they all have different needs to gratify. Specifically, people are likely to use media and technology that matches the needs and wants that they have. While some technologies are more geared toward utility (such as information technologies or a word processor), other technologies are more entertainment-oriented (such as a gaming console or a gaming app). In addition, there is also a third class of technologies that may be used to both for work and entertainment. Examples for the latter class of technologies are smartphones and personal computers, as they may be used both to accomplish tasks like sending an email and to browse the web for fun. In a similar line of thinking, Rogers (1995) discusses innovations, which he also refers to as technologies, in a way that suggests that technology can serve different purposes, depending on the situation in which it is used and the goals of the user. He argues that all technology has both a hardware component and a software component. The hardware is the materials of the technology and how it is made, while the software component is the knowledge necessary to use the innovation. As with any other technology, digital assistants have hardware components, which includes the programming on the device, but the software component, as Rogers conceptualizes it differently from our typical conception of the term, is the determination of how the device is used, which can vary across different situations. In this sense, it may be argued that even though the hardware is the same for each digital assistant, consumer purpose may impact its software, or the way it is used and the reasons for using it. Even at face value, it is easy to imagine how a person might make different choices in technology based on the purpose for which they intend to use the technology.

Technology Usable for both Cognitive and Affective purposes

Illustrating the aforementioned third type of technology which may be used in both an affective and cognitive way, fulfilling multiple types of needs, a qualitative study of UGT (Florenthal, 2018) revealed themes in students' motivation to use mobile technology in the classroom. The five themes that emerged were (a) knowledge acquisition and learning; (b) expression of self and others; (c) interaction, engagement, and enjoyment; (d) convenience; and (e) annoyance. This study provides an example of a technology where variables like entertainment, enjoyment, annoyance, and expression of self, which are affective components, along with knowledge acquisition and learning, which may be taken as a cognitive factor, are all dimensions of students' motivations to use the technology.

The current project focuses on a related technology—digital assistants—that can also serve both for fun and for work. For example, Amazon's Alexa is a voice-controlled digital assistant, an artificial intelligence that is built into several Amazon products, such as the Amazon Echo, Fire Tablet, and FireTV. As a recent technology, and a part of the Internet of Things, studies of Alexa and other assistants' adoption have come as some of the latest research on technology adoption. Studies focusing on the adoption of Alexa and other digital assistants have identified a number of variables that are associated with the intended or actual usage of assistants: the relative advantage, complexity, and emotions (Gaisser & Utz, 2020), performance, and price (Burbach et al. 2019), as well as privacy concerns (Chung et al., 2017; Furey & Blue, 2018). Digital assistants can be used for a variety of different purposes. Lopatovska et al. (2018) examined the ways in which users of Alexa utilized the AI, finding ten common classifications for usage: check weather, find facts, listen to news, control other devices, set reminder/calendar, play music, set a timer, tell a joke, play a game, and check the time. This list contains items that are task-oriented, fun-oriented, or a mixture of the two, which suggests that consumers may use Alexa in a utilitarian way, a hedonic way, or both ways.

Overview of Current Research

The current project aims to test the idea that the perceived purpose of a device moderates the effects of cognitive and affective appraisal on the adoption and usage of a technology. Indirect support for this claim comes from a recent study by McLean and Wilson (2019) who looked at consumers' online shopping experiences. The authors did not study the actual adoption of technology; however, their paper sheds light on the concept of purpose as a moderator while exploring online shopping experiences from a technology adoption perspective, examining differences between shoppers who use the site for purposeful shopping and those who are simply browsing for fun. In their study, interactivity and vividness were more important in predicting perceptions of usefulness in a utilitarian usage situation, while interactivity, vividness, and novelty influenced enjoyment during hedonic use. McLean and Wilson (2019) observed that interactivity, vividness, and novelty, when predicting usefulness and enjoyment, respectively, were moderated by the purpose of use. Although the shopping experience did not change in terms of technology, user experience did change because of the intention of the consumer. This study illustrates that the purpose for which technology is used can affect consumer perceptions about technology. Based on these results, it may be expected that the purpose of a technology may also affect the intention or actual adoption of a technology.

Additional preliminary and indirect evidence for this claim comes from studies that looked at technology adoption and use for specific technologies. Van der Heijden (2004) reports a study in which usage of a pleasure-oriented system was more strongly predicted by perceived enjoyment than by perceived usefulness. Van der Heijden reasoned that the adoption factors of pleasure-oriented systems are different from the adoption factors for utilitarian-oriented systems. Davis et al. (2013) tested the same idea studying the use of video games, observing that hedonic motivation significantly predicted usage, but not utilitarian motivation. A major limitation of the studies by Van der Heijden (2004) and Davis et al. (2013) consists in studying technologies that are clearly designed to serve one particular purpose. However, most technological devices can be used for a variety of different purposes. The current study aims to directly test the idea that the perceived purpose may moderate effects of cognitive and affective appraisal on technology adoption. Building on these findings, this thesis set out to propose and test the following two main adoption hypotheses.

H1: If the perceived purpose of a voice-controlled digital assistant is to have fun, affective appraisal will affect the adoption of the assistant more strongly than cognitive appraisal.

H2: If the perceived purpose of a voice-controlled digital assistant is to get tasks done, cognitive appraisal will affect the adoption of the assistant more strongly than affective appraisal.

CHAPTER 2. STUDY ONE METHOD

The purpose of this study was to test whether devices viewed with high affective appraisal but low cognitive appraisal would be more likely to be chosen for affective purposes than devices with low affect but high cognitive appraisal, and also whether devices with high cognitive appraisal but low affective appraisal would be more likely to be chosen for cognitive purposes than those with lower cognitive appraisal but high affective appraisal. By experimentally manipulating the affective and cognitive perceptions of several different devices and providing either fun- or task-oriented purposes to the participants, we were able to examine these hypotheses closely.

Sample. 345 participants were recruited through Amazon's MTurk to take a survey administered through Qualtrics. Of the 345 participants, seventeen responses, twelve self-reported males and five self-reported females, were removed for failing to pass reverse coding attention checks, leaving 328 usable responses. 185 respondents indicated that they were male, while 141 indicated that they were female, and two chose not to indicate gender. Participants' ages ranged from 22 to 70 years (M = 36.83, SD = 10.54). 80% of participants indicated that they had at least a bachelor's degree.

Procedure and Design. Participants were presented with a survey that introduced to them four supposedly new personal digital assistants. Two of the device descriptions were designed to trigger high affective appraisal but low cognitive appraisal, and the other two were designed to trigger high cognitive appraisal but low affective appraisal. In the remainder, we refer to the high affective appraisal devices as affective devices and the high cognitive appraisal devices and cognitive devices. Each participant received a complete pair comparison, pairing each of the six devices together for eight different tasks. These eight tasks were eight different purposes for which the devices might be used. These eight purposes contained four affective purposes and four cognitive purposes. Thus the independent variables were appraisal and purpose. Each participant made a total of six times eight choices for a total of 48. Appraisal contained two types of attitude: affective appraisal and cognitive appraisal. Purpose contained two levels as well: affective purposes and cognitive purposes. In addition, because digital assistants are not new and many participants will have experience with them already, which could impact the findings, experience and pre-established ideas about the purpose of digital assistants in general were also measured.

Four unique descriptions of hypothetical personal digital assistants were created (See appendix A) as part of this study. In the designing of the descriptions, relevant correlates of hedonic motivation, namely mobile skillfulness (Wong et al., 2015), effort expectancy (Herrero & San Martín, 2017), social influence (Koenig-Lewis et al., 2015), and unobtrusiveness (Segura & Thiesse, 2015), along with relevant correlates of performance expectancy, namely perceived value (Alalwan et al., 2016) and job performance (Muhammad et al., 2018), were used as source material for the development of the descriptions. In addition, language was chosen that reflected the cognitive and affective word pairs, respectively, from Crites et al. (1994).

To not confound the manipulation of cognitive and affective appraisal with the perceived purpose of the devices, the descriptions of the four devices were specifically designed to avoid reference to specific uses of the devices or draw unneeded attention to features of the devices. Instead, the descriptions focused on aspects that are more general and not function-specific.

Measurements. ***Digital Assistant Experience***. Two items were adopted from the Pew Research Center (2017), asking participants to indicate their experiences with digital assistants. A yes or no question asked whether they have used an assistant before, and the second item, "How often do you use digital assistants, such as Apple's Siri, Amazon's Alexa, or Google's Assistant?" measured participants' level of usage of the devices on a scale from "Not at all" to "Several times a day." In addition, these three new items were created: "How often do you feel like you use voice-controlled digital assistants?," "In the past 30 days, approximately how many times have you used a voice-controlled digital assistant?," and "When you use a voice-controlled digital assistant, how long do you normally spend using it?"

Affective Appraisal. Affective appraisal contained two measurements: hedonic motivation and affective attitudes. Hedonic motivation was measured with items adapted from Venkatesh et al. (2012). These items were on a seven-point Likert scale from strongly agree (7) to strongly disagree (1), with neither agree nor disagree (4) in the middle. The three items were "Using [device name] would be fun," "Using [device name] would be enjoyable," "Using [device name] would be very entertaining." These items obtained sufficient reliability for all four descriptions ($\alpha = .90$, $\alpha = .90$, $\alpha = .89$, $\alpha = .89$).

Additionally, affective attitudes were measured with a semantic differential from Crites et al. (1994) and include four word-pairs: hate/love, sad/delighted, annoyed/happy, and disgust/acceptance. These word pairs were assessed by allowing participants to choose on a seven-point scale which word is a more appropriate fit to their opinions about each device. An answer of one indicated a commitment to one word entirely, while an answer of seven indicated a commitment to the opposite word. Half of the items had the positive word as a one and half the items had the positive word as a seven. The four items are "I would (love/hate) having [device name]," "I would be (delighted/sad) to need to use [device name]," "Using [device name] would make me (annoyed/happy)," and "I would view [device name] with (disgust/acceptance)." These items obtained sufficient reliability for all four descriptions ($\alpha = .82$, $\alpha = .81$, $\alpha = .81$, $\alpha = .81$).

Cognitive Appraisal. Cognitive appraisal contained two measurements: performance expectancy and cognitive attitudes. Performance expectancy was measured with items adapted from Venkatesh et al. (2012). These items were measured on a seven-point Likert scale from strongly agree (7) to strongly disagree (1), with neither agree nor disagree (4) in the middle. The three items are “I would find [device name] useful in my daily life,” “Using [device name] would help me accomplish things more quickly,” and “Using [device name] would increase my productivity.” These items obtained sufficient reliability for all four descriptions ($\alpha = .90$, $\alpha = .90$, $\alpha = .88$, $\alpha = .90$).

Cognitive attitudes were measured with a semantic differential from Crites et al. (1994), which includes four word-pairs: useless/useful, foolish/wise, harmful/beneficial, and worthless/valuable. Just as the affective attitudes, cognitive attitudes were measured by allowing participants to choose on a seven-point scale which word was a more appropriate fit to their opinions about each device. An answer of one indicated a commitment to one word entirely, while an answer of seven indicated a commitment to the opposite word. As an attention check, half of the items had the positive word as a one and half the items will have the positive word as a seven. The four items were: “[device name] would be (useless/useful),” “It would be (foolish/wise) to own [device name],” “Having [device name] around would be overall (harmful/beneficial),” and “[device name] would be (valuable/worthless).” These items obtained sufficient reliability for all four descriptions ($\alpha = .81$, $\alpha = .82$, $\alpha = .79$, $\alpha = .82$).

Adoption of the Devices. To examine the choices that participants made in using the devices, eight unique general purposes for the devices were presented to the participants. There were four affective purposes: 1) a toy for kids to play with, 2) social entertainment for guests, friends, and family, 3) personal entertainment for streaming media like music, movies, and TV shows, and 4) companionship; and there were four cognitive purposes: 1) to control lights, security, and sound around the house, 2) practical help around the house like lists, timers, alarms, and reminders, 3) community and world engagement for news, culture, local traffic, and weather, and 4) communication with friends and family. For each of these eight purposes, two of the devices were presented between which the participants chose with the item “If I were getting a digital assistant for [purpose] I would choose _______”. Each of the four devices was paired with each of the other three devices, for a total of six pair comparisons. Results are reported with four pair comparisons, as two of the comparisons compare the affective devices or cognitive devices with each other, respectively.

Purpose of Digital Assistants. To check whether participants perceive that digital assistants are generally purposed for either utilitarian or hedonic usage, these two items were created “Digital assistants are intended for ______” and “Which of the following statements best describes how you use (would use) digital assistants?”

CHAPTER 3. STUDY ONE RESULTS

The names of the digital assistants were presented with different descriptions across four different experimental conditions to prevent name bias from confounding the results. The results have been aggregated across the four conditions. Results have also been aggregated across the descriptions, such that the two descriptions intended to trigger high affective appraisal are combined, and the two descriptions intended to trigger high cognitive appraisal are combined.

Experience and Purpose of Assistants. 92% of participants indicated that they had used digital assistants in the past, with 72% indicating they use digital assistants at least once a week. Overall, participants said that digital assistants are intended more for getting tasks done than for having fun on a seven-point scale with four being neutral, ($M = 5.19$, $SD = 1.35$), $t(321) = 15.83$, $p < .001$.

Manipulation check. The hypotheses predicted that devices that are viewed with higher affective appraisal would be more likely to be chosen for affective purposes and that devices that are viewed with higher cognitive appraisal would be more likely to be chosen for cognitive purposes. Affective appraisal was measured in two different ways: affective attitudes and hedonic motivation. As expected, participants' reported hedonic motivation toward the affective devices was significantly higher ($M = 5.41$, $SD = 1.16$) than the cognitive devices ($M = 5.08$, $SD = 1.14$), $t(327) = 6.91$, $p < .001$). Thus the manipulation check was successful as indicated by hedonic motivation. The measurements for affective attitudes did not show a difference between the affective devices ($M = 4.83$, $SD = 1.14$) and the cognitive devices ($M = 4.85$, $SD = 1.09$), $t(327) = -.34$, $p = .738$. Hedonic motivation and affective attitudes were also moderately correlated, $r(656) = .632$, $p < .001$.

As affective appraisal was measured in two different ways, cognitive appraisal was also measured in two different ways: cognitive attitudes and performance expectancy. As expected, participants' expectancy about the performance of the cognitive devices (M = 5.36, SD = 1.14) was significantly higher than their expectancy about the performance of the affective devices (M = 5.07, SD = 1.25), $t(327) = -6.21$, $p < .001$. Thus, the manipulation of cognitive appraisal was successful, as indicated by the performance expectancy. Participants' cognitive attitudes toward the cognitive devices (M = 4.96, SD = 1.17) were also significantly higher than toward the affective devices (M = 4.7, SD = 1.17), $t(327) = -5.88$, $p < .001$. Additionally, performance expectancy was moderately correlated with cognitive attitudes, $r(656) = .658$, $p < .001$.

Purposes and Choices. There were four purposes that were intended to be affective purposes: a kids' toy, social entertainment, personal entertainment, and companionship; and there were also four purposes that were intended to be cognitive purposes: controlling lights and security, practical help like lists and timers, local news and traffic, and communication with friends and family. The hypotheses predict that the affective devices will be chosen at a higher frequency for affective purposes, and the cognitive devices will be chosen at a higher frequency for cognitive purposes. As expected, there was a significant interaction indicating that affective devices were preferred for the affective purposes, and the cognitive devices were preferred for the cognitive purposes, $\chi^2(1, N = 10{,}409) = 393.29$, $p < .001$ (see Table 1). Across all eight purposes with four pair comparisons for a total of 32 choices for each participant, there was no main effect for preference for either of the devices, $\chi^2(1, N = 10{,}409) = 3.32$, $p = .068$, but affective devices were chosen more overall.

Table 1. Main Effect and Interaction (Chi-Square)

	Affective Purposes	Cognitive Purposes
Affective Devices	3155	2143
Cognitive Devices	2050	3061
Main Effect of Devices	$\chi^2(1, N = 10{,}409) = 3.32, p = .068$	
Interaction Effect	$\chi^2(1, N = 10{,}409) = 393.29, p < .001$	

Table 2 contains the results for each of the eight individual purposes separately. All four of the affective purposes showed that the affective devices were chosen a significant majority of the time, which supported the first hypothesis, although the personal entertainment purpose was a much weaker effect than the others. In addition, although three of the cognitive purposes supported the second hypothesis, the communication purpose did not.

Table 2. Individual Purposes (Chi-Square)

	Kids' Toy	Social Entertainment	Personal Entertainment	Companion
Affective Devices	840	854	701	760
Cognitive Devices	461	448	599	542
Chi-square	$\chi^2(1, N = 1301) = 110.41, p < .001$	$\chi^2(1, N = 1302) = 126.6, p < .001$	$\chi^2(1, N = 1300) = 8.00, p = .005$	$\chi^2(1, N = 1302) = 36.50, p < .001$
	Lights and Security	Practical Help	News and Traffic	Communication
Affective Devices	477	490	530	646
Cognitive Devices	823	811	772	655

Table 2. (Continued)

Chi-square	$\chi^2(1, N = 1300) = 92.09, p < .001$	$\chi^2(1, N = 1301) = 79.20, p < .001$	$\chi^2(1, N = 1302) = 44.98, p < .001$	$\chi^2(1, N = 1301) = .062, p = .803$

CHAPTER 4. STUDY ONE DISCUSSION

This study sheds light on purpose as a moderator for the adoption of technology, specifically for digital assistants. The hypotheses predicted that high affective appraisal would be related to the adoption of digital assistants when the perceived purpose of the device is to have fun, whereas high cognitive appraisal would be related to the adoption of digital assistants when the perceived purpose was to complete tasks. There was no significant difference among the devices overall in which participants preferred, in that they did not prefer the affective or cognitive devices across all purposes. This shows that neither the affective devices nor the cognitive devices were viewed as inherently better than the others.

Examining the four affective purposes and the four cognitive purposes separately, there was a strong interaction in the direction that the hypotheses predicted: the affective devices were chosen more for fun purposes, and the cognitive devices were chosen for task purposes. In this experiment, it is clear that the choices participants made about which device they preferred depended on how the device would be used. In other words, the predictions made by the model of whether participants would choose an affective device or a cognitive device were moderated very strongly by the given purpose.

This interaction effect held for seven of the eight purposes as hypothesized. One purpose, communication with friends and family, did not match the predicted pattern like the other purposes did. This was an unexpected result. However, we theorized in retrospect that participants may not have viewed this as a task-oriented purpose like we did. Therefore, as part of the second study, we sought to also examine how participants viewed each of these purposes, whether as fun purposes or task purposes.

CHAPTER 5. STUDY TWO METHOD

The first study was intended to test the general hypothesis that the way a digital assistant is used moderates the effects of cognitive and affective appraisal on the adoption of a digital assistant. The second study was designed to replicate the findings of the first study and to test an extension to the main hypothesis.

The proposed extension for the hypothesis is that the purpose for which a device is used may also moderate the importance of effort expectancy in predicting the adoption of digital personal assistants. Venkatesh et al. (2012) used effort expectancy as a predictor of technology adoption along with performance expectancy and hedonic motivation. Effort expectancy is distinguished from performance expectancy in that while performance expectancy is about the usefulness and benefit a person perceives in a device, effort expectancy refers to a person's expectation for how difficult a technology will be for them to use. It is a construct created from a combination of *perceived ease of use* from TAM (Davis et al., 1989), *complexity* from Innovation Diffusion Theory (Moore & Benbasat, 1991), and *complexity* from the Model of PC Utilization (Thompson et al., 1991).

As a term, effort expectancy was created by Venkatesh et al. (2003) for the UTAUT model and was found in that paper to be associated with behavioral intention to adopt four different workplace technologies in four different work settings. More recent examples of studies testing effort expectancy include the adoption of e-Learning (Gunasinghe et al., 2019), social media apps (Chua et al., 2018), and social recommender systems (Oechslein et al., 2014), all of which found an association between adoption of the technology and effort expectancy. Specifically, Gaisser and Utz (2020) noted that complexity is a significant theme related to the adoption of digital assistants, complexity being a part of the inspiration for the term effort expectancy. Study 2 aimed to replicate the test of Hypotheses 1 and 2 and to further examine purpose as a moderator of technology adoption by testing whether purpose moderates the relationship between effort expectancy and the adoption of digital assistants. For the second study, the following new hypothesis is proposed.

H3: The perceived purpose of the voice-controlled digital assistant will moderate the impact of effort expectancy on the adoption of the assistant.

Sample. 351 participants were recruited through the MTurk system to take a survey administered through Qualtrics. Ten participants, seven self-reported males, two self-reported female, and two who chose not to indicate gender, were removed as a result of failed reverse coding attention checks, leaving 341 responses used in the data analysis. 205 participants reported as male, while 135 participants reported as female, and one chose not to answer. The participants' reported ages ranged from 18 to 72 (M = 36.26, SD = 10.62). 76% of respondents indicated that they had at least a bachelor's degree.

Procedure and Design. As in the first study, participants were presented with a survey that introduced them to four supposedly new digital assistants, two designed to trigger high affective appraisal and two designed to trigger high cognitive appraisal. Participants viewed each of the four digital assistants in a complete pair comparison – six total pair – for eight different purposes, which were either affective or cognitive purposes. Thus each participant made a total of 48 choices in the pair comparisons.

In addition to repeating the manipulation from study one, the descriptions for the second study also include a manipulation of effort expectancy. Some descriptions describe a very easy setup process that can be aided by downloading an app onto a smartphone, while other descriptions indicate that consumers will need to register their device, create an account over the phone through a customer service line, and take extended time to learn how to use the device. The descriptions from Study 1 were used as the low-effort devices, and four new descriptions (See appendix B) were added as high-effort devices. The four new descriptions are only different from the low-effort devices in the manipulation of effort expectancy.

In addition, measures of participant perceptions of the eight provided purposes were added to assess the manipulation of purpose more carefully.

Measurements. The same measures as in Study 1 were used in addition to several new items.

Digital Assistant Experience. Two items were adopted from the Pew Research Center (2017), asking participants to indicate their experiences with digital assistants, along with items created for this study. In addition, the three items created for the first study were used again.

Affective Appraisal. Affective appraisal contained measurements for both hedonic motivation and affective attitudes. The same three adapted from Venkatesh et al. (2012) for measuring hedonic motivation were used from the first study. These three items obtained sufficient reliability for all four descriptions ($\alpha = .90$, $\alpha = .93$, $\alpha = .93$, $\alpha = .94$).

Affective attitudes were measured with the adapted semantic differential from Crites et al. (1994), including the four word-pairs: hate/love, sad/delighted, annoyed/happy, and disgust/acceptance. These four items obtained sufficient reliability for all four descriptions ($\alpha =$ 87, $\alpha = .86$, $\alpha = .90$, $\alpha = .86$).

Cognitive Appraisal. As in study 1, cognitive appraisal contained measurements for both performance expectancy and cognitive attitudes. Performance expectancy was measured with the three items adapted from Venkatesh et al. (2012). The three items obtained sufficient reliability for all four descriptions ($\alpha = .90$, $\alpha = .93$, $\alpha = .93$, $\alpha = .92$).

Cognitive attitudes were measured with the semantic differential from Crites et al. (1994) that includes four word-pairs: useless/useful, foolish/wise, harmful/beneficial, and worthless/valuable. These four items obtained sufficient reliability for all four descriptions ($\alpha = .87$, $\alpha = .87$, $\alpha = .87$, $\alpha = .86$).

Adoption of the Devices. To examine the choices that participants made in using the devices, the eight unique general purposes for the devices were presented to the participants.

Purpose of the Devices. To check whether participants perceive that digital assistants are generally for hedonic or utilitarian usage, the two items from the first study were used.

Effort Expectancy. Three items were adapted from Venkatesh et al. (2012) dealing with effort expectancy. The items are “Learning how to use [device name] would be easy for me,” “My interaction with [device name] would be clear and understandable,” and “It would be easy for me to become skillful at using [device name].” The items were measured on a seven-point Likert scale, from strongly disagree (1) to strongly agree (7). Dissimilar to some of the other items, lower effort expectations are a higher number on this scale. These items obtained sufficient reliability for all four low-effort expectancy descriptions ($\alpha = .78$, $\alpha = .89$, $\alpha = .83$, $\alpha = .92$) and all four high-effort expectancy descriptions ($\alpha = .86$, $\alpha = .84$, $\alpha = .87$, $\alpha = .83$).

Perception of the Eight Purposes. To provide insight into how participants thought about each of the eight purposes provided, eight items were added that asked whether they thought the purposes were fun purposes or task purposes. The eight items are “Using a digital assistant as a kids’ toy is a (fun purpose/task purpose),” “Using a digital assistant for social entertainment for guests, friends and family is a ______,” “Using a digital assistant for personal entertainment for streaming media like music, movies, and TV shows is a ______,” “Using a digital assistant as a companion is a ______,” “Using a digital assistant as a way to control lights, security, and sound is a ______," "Using a digital assistant to keep lists, timers, alarms, and reminders is a ______," "Using a digital assistant to keep up with news, culture, local traffic, and weather is a ______," "Using a digital assistant to communicate with family and friends is a ______."

CHAPTER 6. STUDY TWO RESULTS

As in the first study, the names of the digital assistants were presented with different descriptions across four different experimental conditions to prevent name bias from confounding the results. The results have been aggregated across the four conditions. Results have also been aggregated across the descriptions, such that the two descriptions intended to trigger high affective appraisal are combined, and the two descriptions intended to trigger high cognitive appraisal are combined.

Experience and Purpose of Assistants. 90.6% of participants indicated that they had used digital assistants in the past, with 71.8% indicating they use digital assistants at least once a week. Overall, participants said that digital assistants are intended more for getting tasks done than for having fun, with four being neutral on a seven-point scale ($M = 5.01$, $SD = 1.35$), $t(340) = 13.78$, $p < .001$.

Manipulation Check. The hypotheses predicted that the high affective appraisal devices would be more likely to be chosen for affective purposes and that high cognitive appraisal devices would be more likely to be chosen for cognitive purposes. Affective appraisal was measured in two different ways: hedonic motivation and affective attitudes. Participants' reported hedonic motivation toward the affective devices was significantly higher ($M = 5.34$, $SD = 1.29$) than toward the cognitive devices ($M = 4.91$, $SD = 1.27$), $t(340) = 8.13$, $p < .001$), as expected. This shows a successful manipulation of affective appraisal, as measured by hedonic motivation. However, affective attitudes for the affective devices ($M = 4.95$, $SD = 1.22$) was not significantly different from the cognitive devices ($M = 4.93$, $SD = 1.17$), $t(340) = .365$, $p = .715$. Hedonic motivation and affective attitude measurements were moderately correlated, r(682) = .740, $p < .001$.

As affective appraisal was measured in two different ways, cognitive appraisal was also measured in two different ways: cognitive attitudes and performance expectancy. Participants' expectancy about the performance of the cognitive devices (M = 5.31, SD = 1.25) was significantly higher than their expectancy about the performance of the affective devices (M = 4.92, SD = 1.35), $t(340) = -7.16$, $p < .001$. This manipulation of cognitive appraisal was successful, by the performance expectancy measurements. In addition, participants' cognitive attitudes toward the cognitive devices (M = 5.15, SD = 1.22) was significantly higher than toward the affective devices (M = 4.83, SD = 1.23), $t(341) = -6.63$, $p < .001$. Performance expectancy was significantly correlated with cognitive attitudes, $r(682) = .788$, $p < .001$.

The effort expectancy manipulation did not reveal any significant effects, with the high effort devices (M = 5.49, SD = 1.11) not significantly different from the low effort devices (M = 5.58, SD = 1.01), $t(340) = -1.918$, $p = .056$. This manipulation was therefore unsuccessful.

Purposes and Choices. The hypotheses predicted that for the four affective purposes, participants would choose the affective devices at a higher frequency, and for the four cognitive purposes, participants would choose the cognitive devices at a higher frequency. Across all eight purposes, there was a main effect of preference for the affective devices, $\chi^2(1, N = 10{,}906) = 9.51$, $p = .002$. However there also was a significant interaction, where the affective devices were chosen more for the affective purposes, and the cognitive devices were chosen more for the cognitive purposes, $\chi^2(1, N = 10{,}906) = 642.56$, $p < .001$.

Table 3. Main Effect and Interactions (Chi-Square)

	Affective purposes	Cognitive purposes
Affective Devices	3468	1984
Cognitive Devices	2146	3308

Table 3. (Continued)

Main Effect of Devices	$\chi^2(1, N = 10{,}906) = 9.51, p = .002$
Interaction Effect	$\chi^2(1, N = 10{,}906) = 642.56, p < .001$

Table 4 contains the results for each of the eight individual purposes. All four of the affective purposes showed that the affective devices were chosen a significant majority of the time, which again supported the first hypothesis. In addition, although three of the cognitive purposes supported the second hypothesis, the communication purpose did not. The communication purpose actually was significant in the opposite direction from the prediction.

Table 4. Individual Purposes (Chi-Square)

	Kids' Toy	Social Entertainment	Personal Entertainment	Companion
Affective Devices	938	917	761	852
Cognitive Devices	425	445	602	512
Chi-square	$\chi^2(1, N = 1363) = 193.08, p < .001$	$\chi^2(1, N = 1362) = 163.57, p < .001$	$\chi^2(1, N = 1363) = 18.55, p = .005$	$\chi^2(1, N = 1364) = 84.75, p < .001$
	Lights and Security	Practical Help	News and Traffic	Communication
Affective Devices	459	454	507	726
Cognitive Devices	905	909	857	637
Chi-square	$\chi^2(1, N = 1364) = 145.83, p < .001$	$\chi^2(1, N = 1363) = 151.89, p < .001$	$\chi^2(1, N = 1364) = 89.81, p < .001$	$\chi^2(1, N = 1363) = 5.81, p = .016$

In addition to the measurement and manipulation of cognitive and affective appraisal, in this study effort expectancy was also examined. The measurements revealed that the cognitive devices (M = 5.56, SD = 1.02) were viewed as requiring less effort than the affective devices (M = 5.46, SD = 1.04), $t(340) = -2.42$, $p = .016$. However, because the manipulation of effort expectancy was not successful, the hypothesis regarding effort expectancy could not be tested.

To add insight into participants' perceptions about the eight purposes given in the study, questions were added to provide data on whether they perceived them to be task purposes or fun purposes. Table 5 lists the eight purposes and how the participants labeled each of them. The table shows that the four purposes hypothesized as affective, shown in the top row, were also labeled by the participants as affective – or fun – purposes. On the bottom row, the table shows that three of the four purposes were labeled by the participants as anticipated, as cognitive – or task – purposes. The results indicated that participant perceptions of the purposes matched how they were perceived by the researchers with one notable exception: communication with friends and family, $\chi^2(1, N = 341) = 3.19$, $p = .074$. This notable diversion from the researchers' concept matches the results of the pair comparisons.

Table 5. Purpose Perceptions (Chi-Square)

	Kids' Toy	Social Entertainment	Personal Entertainment	Companion
Fun Purpose	303	284	239	258
Task Purpose	38	56	102	83
Chi-square	$\chi^2(1, N = 341) = 205.94$, $p < .001$	$\chi^2(1, N = 341) = 152.89$, $p < .001$	$\chi^2(1, N = 341) = 55.04$, $p < .001$	$\chi^2(1, N = 341) = 89.81$, $p < .001$

Table 5. (Continued)

	Lights and Security	Practical Help	News and Traffic	Communication
Fun Purpose	40	55	73	187
Task Purpose	301	286	268	154
Chi-square	$\chi^2(1, N = 341) = 199.77, p < .001$	$\chi^2(1, N = 341) = 156.48, p < .001$	$\chi^2(1, N = 341) = 111.51, p < .001$	$\chi^2(1, N = 341) = 3.19, p = .074$

CHAPTER 7. STUDY TWO DISCUSSION

The central focus of this second study was to see whether the results of the first study could be successfully replicated. Replicating the methods from the first study, this second study yielded similar findings. There was a small main effect for the devices in this study, in that the affective devices were slightly preferred overall to the cognitive devices, though this preference did not impact the clarity of the interaction. The two main hypotheses were supported in the same manner as the first study, with seven out of the eight purposes clearly supporting the hypotheses. However, the same purpose that did not match the hypotheses in the first study, communication with friends and family, again did not match the hypotheses as predicted.

To understand why this purpose was not successfully predicted in the first study, as was the case in the second study as well, the second study also examined how participants viewed these purposes. Although seven out of the eight were labelled as we anticipated, as fun purposes or task purposes, respectively, the communication with friends and family purpose was split relatively evenly on whether people viewed it as a fun purpose or task purpose. These results not only clarified why we found the results that we did in the pair comparisons, but also further illustrated the very point of this paper, that people have individualized perspectives on media and technology that may impact their choices. Even the way participants viewed the purposes were in this case different from our researcher conceptualization and from each other. Although this purpose did not match our hypothesis as predicted, the matching split of participant choices and participants' labeling of whether a purpose a fun purpose or a task purpose strongly matches with the larger, general hypothesis of the paper – that how a person perceives how a device is to be used impacts adoption factors and choices.

This second study also sought to examine how effort expectancy may be moderated by purpose. Because we were unable to successfully manipulate effort expectancy in this study, the hypothesis could not actually be tested. We did find, however, that the cognitive devices were viewed as requiring less effort than the affective devices. This effect was very small and not hypothesized in the paper. Having found this, we may have expected to see a main effect of preference for the cognitive devices, which did not occur.

It is unclear why the effort expectancy manipulation was unsuccessful. One possibility is that because the manipulation was made at the end of the descriptions, a significant portion of participants may not have read that part of the description. If a large portion of participants did not complete the description thoroughly, they may not have been exposed to the manipulation at all. Another possible explanation may be that the items used to measure effort expectancy focused on usage of the device over time, while the manipulation focused more heavily on difficulty in setting up the devices. This may have led to a mismatch between the manipulation and the measurements.

CHAPTER 8. CONCLUSION

Attitudes have been shown to be related to the adoption of a wide variety of technologies (i.e. Al-Zaidiyeen et al., 2010; Chatzoglou & Michailidou, 2019; Rosen et al., 2013). Although technology adoption research has largely examined attitude as a single construct, we set out to test if measuring cognitive and affective appraisal separately in technology adoption will provide a better understanding of attitude's role in technology adoption by providing understanding for how purpose may moderate adoption behavior. In previous research, the usage of cognitive and affective appraisal factors has yielded mixed results in their impact on technology adoption (i.e. Moorthy et al., 2019; Pagani, 2011; Ramirez-Correa et al., 2019; Yang & Yoo, 2004). The two conducted experiments had the main goal of examining whether the variation in the reported results may be explained by the purpose for which the technology is used. Although some technologies are clearly hedonic or utilitarian in nature, and therefore have different adoption factors (Van der Heijden, 2004), other technologies are not as clearly designed as either hedonic or utilitarian, such as voice-controlled digital assistants like Google Assistant or Amazon's Alexa. Especially when a technology can be used for several purposes, consumers will choose how to use the technology according to their own needs (Katz et al., 1973), and this choice of purpose may impact the relevant factors of adoption of that technology. It was therefore theorized that the purpose a consumer has for a voice-controlled digital assistant will impact his or her perception on what needs the devices will fulfill, which will moderate the strength of relationships between cognitive and affective factors and the adoption of the devices.

The thesis seeks to build on current technology adoption literature in two primary ways. First, it examines the moderating impact of purpose on actual adoption behavior, which would be a theoretical addition that may be applicable across other technologies. Second, it examines a new technology, voice-controlled assistants, which has received only a small amount of attention so far in the adoption literature.

This paper has implications both for academic research in technology adoption and for sellers of technology. For academic research, this paper demonstrates the value of including purpose as a moderator and explanation tool for variation observed in the application of technology adoption models. On a similar note, this paper also shows how ensuring the presence of both cognitive and affective components of attitude can increase researchers' understanding of technology adoption behaviors. The measurements of cognitive and affective appraisal, cognitive and affective attitudes, along with performance expectancy and hedonic motivation, were moderately correlated with each other. This may indicate that the two measurements do not measure exactly the same thing, although they are highly related constructs. Although this paper does not necessarily attempt to measure or otherwise dissect the exact dimensions that these measurements address, it may serve as a launching pad for other research, in that it recognizes their close relationship and strong similarities with each other. This paper also provides an empirical support for Uses and Gratifications Theory, which is often critiqued as a descriptive theory without testable predictions. For sellers of technology, knowing that the impact of various attitudes on adoption behavior may depend on how a person will use the technology could impact advertising strategies. If consumers intend to use a product for a task purpose, then advertisements targeted toward affect and emotions may be less effective than advertisements targeted toward cognitive appraisal. The opposite would also be true.

This paper comes with several limitations that should be carefully considered when discussing its implications. First, the unsuccessful manipulation of effort expectancy disallowed for any examination of that variable in the second study. Second, the use of Amazon's

Mechanical Turk reduces the randomness of our sample, so caution should be taken generalizing across other populations. Third, this study did not use an absolute judgment of adoption, but instead did a pair comparison that forced participants to choose one or the other. They did not have the opportunity to choose whether they wanted a digital assistant at all. Finally, the forced choice with guided purposes gave participants a specific purpose to think about. It is yet unclear whether this consciousness about purpose would be as keen or clear in a natural adoption decision situation. This significant limitation should cause readers to understand the results of this paper more as a proof of concept than anything else.

Future research on the moderating impact of purpose in technology adoption should use absolute judgment decisions to examine how purpose may moderate the willingness of participants to adopt digital assistants at all, rather than a forced choice pair comparison. In addition, future research may also branch out and examine different technologies other than digital assistants, to see whether the moderation holds in other contexts. Third, if sellers of technology wish to use this moderation to inform their selling and advertising practices, future research will also need to find a way to establish patterns of how people use technology. As it is, this paper and other literature do not provide a theoretical framework for predicting what the perceived purpose of a technology might be for an individual consumer. Fourth, future research may dig into the dimensions of attitude measured by the performance expectancy, hedonic motivation, affective attitude, and cognitive attitude measures. Fifth, future research may examine the communication with friends and family purpose and examine how participants view it. It may be that communication as a fun purpose or task purpose may depend on whom the consumer is calling. For example, communication with friends and family may be more fun-oriented, while work-related communication may be a task purpose. Finally, future research should also examine consumers' conscious awareness of purpose in natural decision making situations for technology adoption.

APPENDIX A. STUDY ONE DESCRIPTIONS

Affective Device #1

- Introducing the newest member of your family, Arthur! Manufactured in San Francisco, CA, and a top-selling, popular item since hitting the market, Arthur's charming personality provides a delightful interaction experience for you and your family. As a voice-controlled digital assistant, Arthur listens for you to say his name and ask him a question, tell him to remember something, or give him something to do. Arthur is easily available, in stock at most major electronics retailers or online. With a smooth, natural way of speaking, Arthur will convince you that he's a person too! Perhaps the most fun feature that gives Arthur his engaging character is the wide variety of personalities, including accents from all over the world, celebrities, politicians, and all your favorite movie and TV characters. Just choose a personality and Arthur becomes that person in all your interactions. Just say "Arthur, become Morgan Freeman," and that's all it takes! Arthur will even respond to his new name! So sit back, relax, and enjoy your time with your family's new friend, Arthur. Connect Arthur to your home via a wireless network connection or with Bluetooth. Purchase includes the device, a standard power cord with surge protection, and setup instructions. Download the app to pair with Arthur for easier setup and remote control over your device's functions!

Affective Device #2

- Are you looking for an extra burst of fun to come into your home? Is your home becoming a little dull and boring? Jemma specializes in adding excitement to your life! In comparison to other digital assistants, Michigan-manufactured Jemma brings smiles and laughter like no other, loving to party and entertain anyone and everyone. Jemma is available at most major electronics retailers and online as well. As a voice-controlled digital assistant, Jemma listens when you say her name and is always ready to answer your questions, remember a list, or do whatever it is you have in mind. You'll find that there's simply no end to the amount of fun you can have with Jemma around. Jemma has both wireless network and Bluetooth connectivity capability for integration into your home. If you're looking for some extra intrigue and excitement to add to your home, Jemma is the device for you. Setup instructions are included along with the device and a surge protected power cord. For easier setup and remote control over your device, download the companion app for your smartphone!

Cognitive Device #1

- As digital assistants go, Alice is friendly to simplicity. Manufactured in Des Moines, and New York City, New York, Alice doesn't need all the bells and whistles that come with other devices. She is designed to execute simple commands with precision and speed, bringing practicality and usefulness to the table. Alice is always ready to respond to her name and answer your questions, remember your shopping lists, or do something for you, as is standard with voice-controlled digital assistants. Alice is available online or in store at your local electronics store. Alice brings with her a high level of security, realized in built-in firewalls against hacking, passcodes required for making any significant changes to the device, the ability to disallow purchases from being made, and even a personalized wake-up word to ensure that only you know how to get her attention. Without needing the extra features, Alice is by a significant margin the most cost-effective device among the competitors. With both Bluetooth and wireless network connection capability, Alice will be able to easily connect to the internet and to any other smart device in your home.

If you’re looking for a smart purchase and a useful assistant, look no further than Alice. Easy setup instructions included with device and standard surge-protected power cord. On your smartphone, you can find Alice’s companion app to help with the setup and help with remote control of the device!

Cognitive Device #2

- The most advanced technology brings the best digital assistant experience, and Mason brings his A game. In particular, Mason perfects the art of context awareness, which means that he can interpret what you are asking for, even with vague or confusing commands, based on what else you’ve spoken about in conversation. Mason can be easy purchased online or at an electronics store near you. Mason is always ready to complete his role as a voice-controlled digital assistant, listening for his name so he can remember your list, answer your questions, or complete your job for him. Manufactured in Tallahassee, Florida, Mason also retains information from commands he did not understand to ask clarification questions to get it right. This highly adaptable and valuable device is also able to interact with any other smart device on the market, even those that are designed for other digital assistants, so compatibility is a non-issue. Connect Mason to your home with effortless integration via Bluetooth or a wireless network. The most advanced tech is the best tech, and that’s what Mason is. Purchase includes instructions and power cord with standard surge protection. Setup and remotely control your device by downloading the companion app for your smartphone!

APPENDIX B. STUDY TWO ADDED DESCRIPTIONS

Affective Device #1

- Introducing the newest member of your family, Arthur! Manufactured in San Francisco, CA, and a top-selling, popular item since hitting the market, Arthur's charming personality provides a delightful interaction experience for you and your family. As a voice-controlled digital assistant, Arthur listens for you to say his name and ask him a question, tell him to remember something, or give him something to do. Arthur is easily available, in stock at most major electronics retailers or online. With a smooth, natural way of speaking, Arthur will convince you that he's a person too! Perhaps the most fun feature that gives Arthur his engaging character is the wide variety of personalities, including accents from all over the world, celebrities, politicians, and all your favorite movie and TV characters. Just choose a personality and Arthur becomes that person in all your interactions. Arthur will even respond to his new name! So sit back, relax, and enjoy your time with your family's new friend, Arthur. Connect Arthur to your home via a wireless network connection or with Bluetooth. Purchase includes the device, a standard power cord with surge protection, and free access to a 1-week online course to learn to fully use your device. To setup your device, contact customer service to create a new account, then register your device online with the device identification number.

Affective Device #2

- Are you looking for an extra burst of fun to come into your home? Is your home becoming a little dull and boring? Jemma specializes in adding excitement to your life! In comparison to other digital assistants, Michigan-manufactured Jemma brings smiles and laughter like no other, loving to party and entertain anyone and everyone. Jemma is available at most major electronics retailers and online as well. As a voice-controlled digital assistant, Jemma listens when you say her name and is always ready to answer your questions, remember a list, or do whatever it is you have in mind. You'll find that there's simply no end to the amount of fun you can have with Jemma around. Jemma has both wireless network and Bluetooth connectivity capability for integration into your home. If you're looking for some extra intrigue and excitement to add to your home, Jemma is the device for you. The device comes with a surge protected power cord and a full 80-page instruction manual to help you learn to use your device to the fullest. To setup your device, create an account and register your device by calling the customer service line.

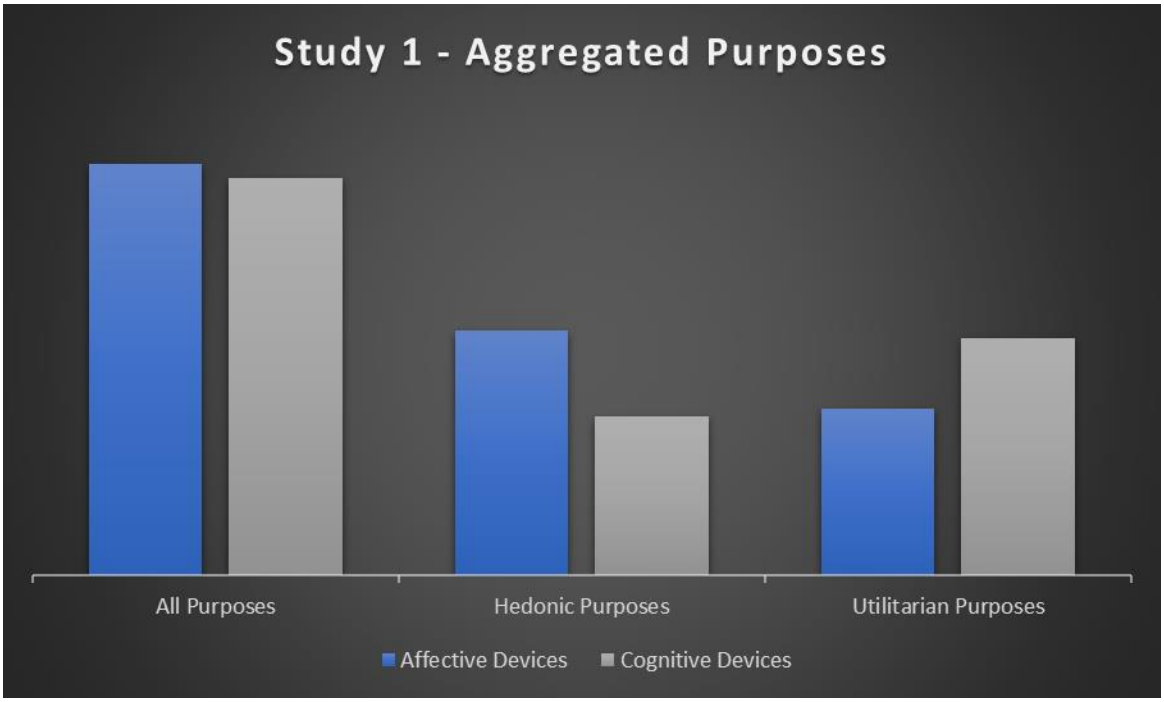
Cognitive Device #1

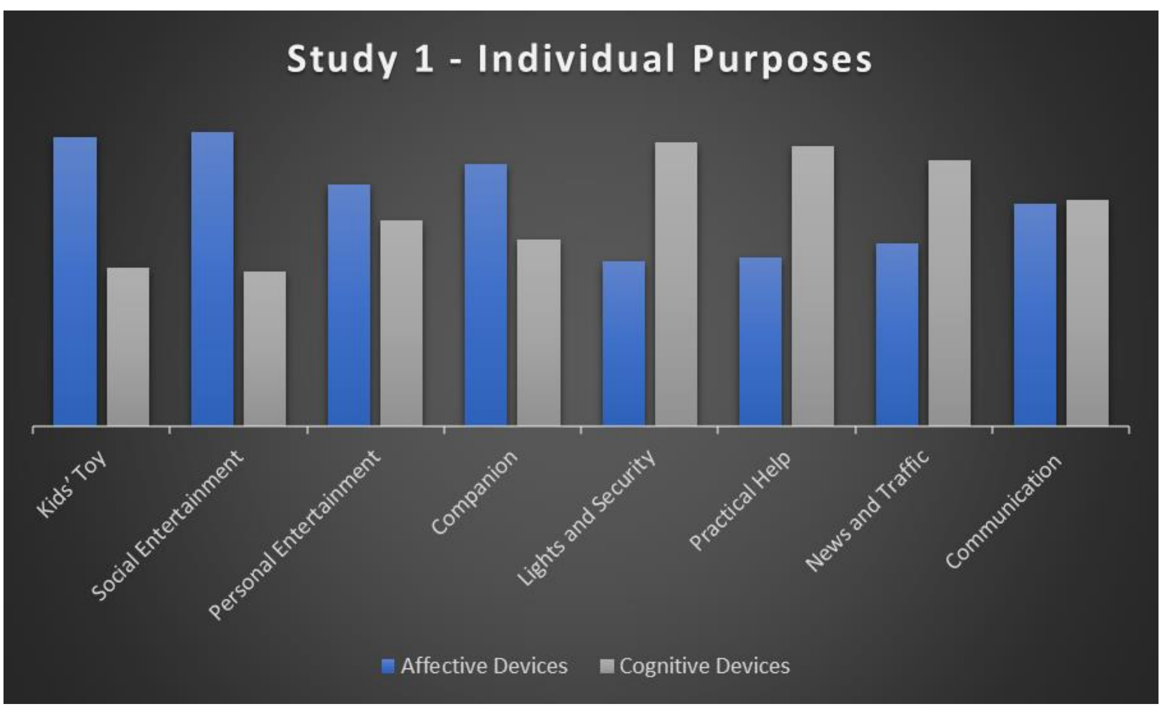
- As digital assistants go, Alice is friendly to simplicity. Manufactured in Des Moines, and New York City, New York, Alice doesn't need all the bells and whistles that come with other devices. She is designed to execute simple commands with precision and speed, bringing practicality and usefulness to the table. Alice is always ready to respond to her name and answer your questions, remember your shopping lists, or do something for you, as is standard with voice-controlled digital assistants. Alice is available online or in store at your local electronics store. Alice brings with her a high level of security, realized in built-in firewalls against hacking, passcodes required for making any significant changes to the device, the ability to disallow purchases from being made, and even a personalized wake-up word to ensure that only you know how to get her attention. Without needing the extra features, Alice is by a significant margin the most cost-effective device among the competitors. With both Bluetooth and wireless network connection capability, Alice will be able to easily connect to the internet and to any other smart device in your home. If you’re looking for a smart purchase and a useful assistant, look no further than Alice. Device and standard surge-protected power cord are included with the purchase. In addition, you’ll receive access to a free, 1-week online course to teach how to full use the device. To setup and use Alice, contact customer service to create an account and register your device with the identification number provided.

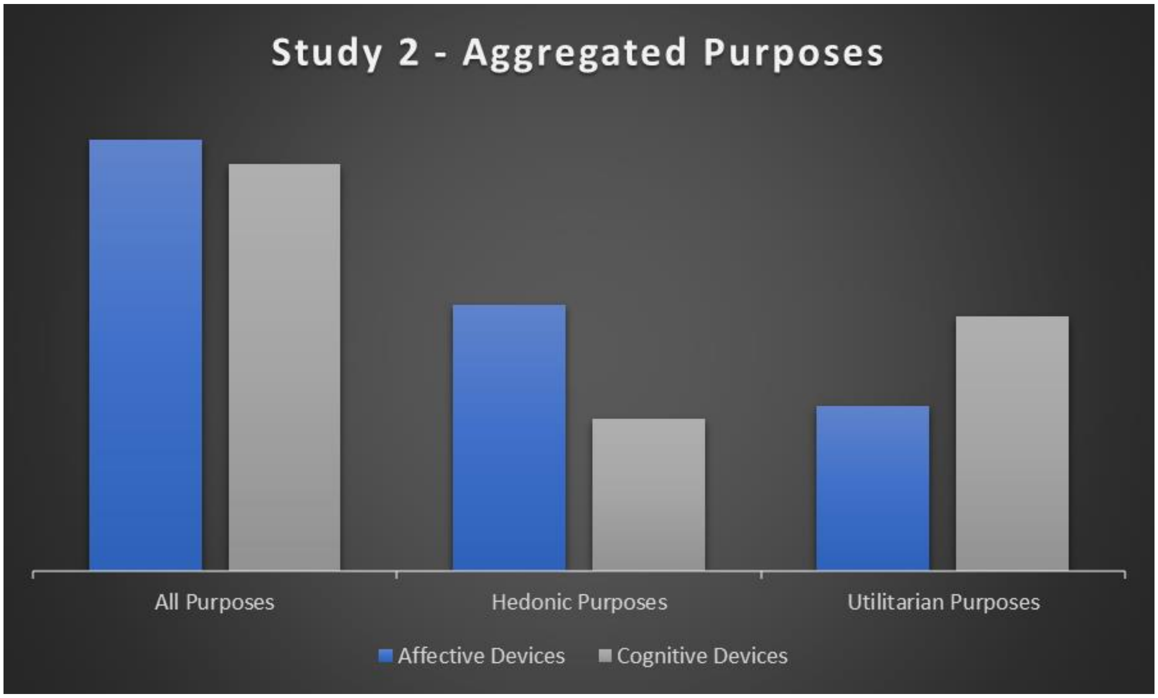
Cognitive Device #2

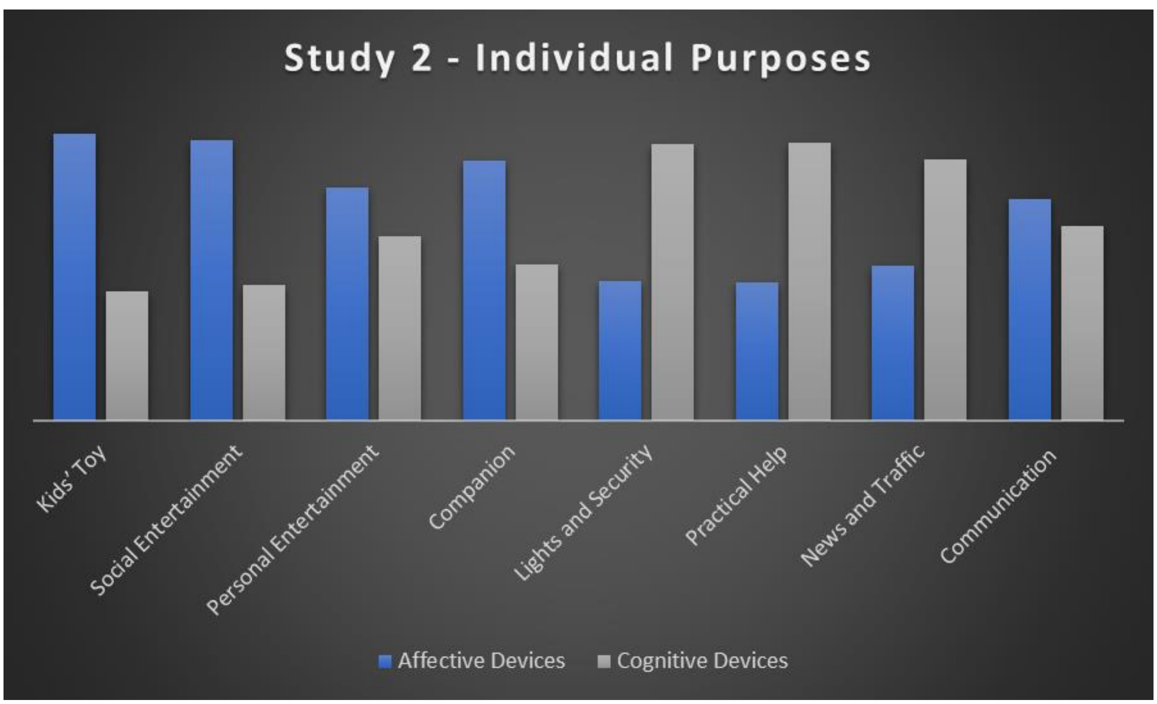
- The most advanced technology brings the best digital assistant experience, and Mason brings his A game. In particular, Mason perfects the art of context awareness, which means that he can interpret what you are asking for, even with vague or confusing commands, based on what else you’ve spoken about in conversation. Mason can be easy purchased online or at an electronics store near you. Mason is always ready to complete his role as a voice-controlled digital assistant, listening for his name so he can remember your list, answer your questions, or complete your job for him. Manufactured in Tallahassee, Florida, Mason also retains information from commands he did not understand to ask clarification questions to get it right. This highly adaptable and valuable device is also able to interact with any other smart device on the market, even those that are designed for other digital assistants, so compatibility is a non-issue. Connect Mason to your home with effortless integration via Bluetooth or a wireless network. The most advanced tech is the best tech, and that’s what Mason is. Purchase includes power cord with standard surge protection and a full, 80-page manual to teach you how to do everything on your device. Setup your device by calling customer support and providing the device’s identification number to register and create a free account.

APPENDIX C. FREQUENCY DISTRIBUTION CHARTS






Study 2 - Aggregated Purposes
All Purposes
Hedonic Purposes
Utilitarian Purposes
Affective Devices
Cognitive Devices


Study 2 - Individual Purposes
Kids' Toy
Social Entertainment
Personal Entertainment
Companion
Lights and Security
Practical Help
News and Traffic
Communication
Affective Devices
Cognitive Devices

REFERENCES

Alalwan, A. A., Dwivedi, Y. K., & Williams, M. D. (2016). Customers' intention and adoption of telebanking in Jordan. *Information Systems Management, 33,* 154-178.

Al-Zaidiyeen. N. J., Mei, L. F., & Fook, F. S. (2010). Teachers' attitudes and levels of technology use in classrooms: The case of Jordan schools. *International Education Studies, 3,* 211-218.

Blut, M., Wang, C., & Schoefer, K., (2016). Factors influencing the acceptance of self-service technologies: A meta-analysis. *Journal of Service Research, 19*, 396-416.

Burbach, L., Halbach, P., Plettenberg, N., Nakayama, J., Ziefle, M., & Valdez, A. C. (2019). *"Hey, Siri", "Ok, Google", "Alexa". Acceptance-relevant factors of virtual voice-assistants.* Paper presented at 2019 IEEE, International Professional Communication Conference (ProComm). Aachen, Germany.

Chatzoglou, P. & Michailidou, V. N. (2019). A survey on the 3D printing technology readiness to use. *International Journal of Production Research, 57,* 2585-2599.

Chua, P. Y., Rezaei, S., Gu, M. L., Oh, Y., & Jambulingam, M. (2018). Elucidating social networking apps decisions: Performance expectancy, effort expectancy and social influence. *Nankai Business Review International, 9*, 118-142.

Chung, H., Iorga, M., Voas, J., & Lee, S. (2017). "Alexa, can I trust you?" *Computer, 50,* 100-104.

Crites, S. L., Fabrigar, L. R., & Petty, R. E. (1994). Measuring the affective and cognitive properties of attitudes: Conceptual and methodological issues. *Society for Personality and Social Psychology, 20,* 619-634.

Cullen, T. A. & Greene, B. A. (2011). Preservice teachers' beliefs, attitudes, and motivation about technology integration. *Educational Computing Research, 45,* 29-47.

Davis, F. D., Bagozzi, R., & Warshaw, P. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*, 982–1003.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and use acceptance of information technology. *MIS Quarterly, 13,* 319-340.

Erdener, K. & Kandemir, M. A. (2019). Investigation of the reasons for students' attitudes towards the interactive whiteboard use in mathematics classrooms. *International Journal of Research in Education and Science, 5,* 331-345.

Fishbein, M., & Ajzen, I. (1980). *Understanding attitudes and predicting social behavior.* Prentice-Hall, Englewood Cliffs, NJ.

Furey, E. & Blue, J. (2018). *Alexa, emotions, privacy, and GDPR.* Paper presented at 2018 British HCI, Human Computer Interaction, Belfast, UK.

Gaisser & Utz. (2020). *"Hello Alexa!": Smart Speakers as new digital roommates – An analysis of online posts and reviews.* Paper presented at ICA 2020, International Communication Association, Gold Coast, Australia.

Gunasinghe, A., Hamid, J. A., Khatibi, A., & Azam S. M. F. (2019). The adequacy of UTAUT-3 in interpreting academician's adoption to e-Learning in higher education environments. *Interactive Technology and Smart Education.* https://www.emerald.com/insight/content/doi/10.1108/ITSE-05-2019-0020/full/pdf?title=the-adequacy-of-utaut-3-in-interpreting-academicians-adoption-to-e-learning-in-higher-education-environments

Hagos, M. M. & Singh, S. (2019). Adoption of mobile banking technology in pastoral community: A perception based study in afar regional state, *Ethiopia, 8*, 49-59.

Herrero, Á. & San Martín, H. (2017). Explaining the adoption of social networks sites for sharing user-generated content: A revision of the UTAUT2. *Computers in Human Behavior*, *71*, 209-217.

Hossain, N., Yokota, F., Sultana, N., & Ahmed, A. (2019). Factors influencing rural end-users' acceptance of e-health in developing countries: A study on portable health clinic in Bangladesh. *Telemedicine and e-Health*, *25*, 221-229.

Katz, E., Blumler, J., & Gurevitch, M. (1973). Uses and gratifications research. *The Public Opinion Quarterly*, *37*, 509-523.

Kinsella, B. (2019). *Amazon Alexa is available on 100 million devices – Here's why it is actually more and how it stacks up against Apple and Google.* Voicebot.ai. https://voicebot.ai/2019/01/06/amazon-alexa-is-available-on-100-million-devices-heres-why-it-is-actually-more-and-how-it-stacks-up-against-apple-and-google/

Kinsella, B. (2019). *Smart speaker owners agree that questions, music, and weather are killer apps. What comes next?* Voicebot.ai. https://voicebot.ai/2019/03/12/smart-speaker-owners-agree-that-questions-music-and-weather-are-killer-apps-what-comes-next/

Kinsella, B. (2019). *U.S. smart speaker ownership rise 40% in 2019 to 66.4 million and Amazon Echo maintains market share lead says new report from Voicebot.* Voicebot.ai. https://voicebot.ai/2019/03/07/u-s-smart-speaker-ownership-rises-40-in-2018-to-66-4-million-and-amazon-echo-maintains-market-share-lead-says-new-report-from-voicebot/

Koenig-Lewis, N., Marquet, M., Palmer, A., & Zhao, A. L. (2015). Enjoyment and social influence: Predicting mobile payment adoption. *The Service Industries Journal*, *35*, 537-554.

Lin, H., Chi, O. H., & Gursoy, D. (2019). Antecedents of customers' acceptance of artificially intelligent robotic device use in hospitality services. *Journal of Hospitality Marketing & Management.* https://www.tandfonline.com/doi/pdf/10.1080/19368623.2020.1685053?needAccess=true

Lin, H. C., & Kuo, S. H. (2019). How does health consciousness influence attitudes of elderly people towards traceable agricultural products? Perspectives of the technology acceptance model. *Ageing & Society*, 1-14.

Lopatovska, I., Rink, K., Knight, I., Raines, K., Cosenza, K., Williams, H., Sorsche, P., Hircsh, D., Li, Q., & Martinez, A. (2018). Talk to me: Exploring user interactions with the Amazon Alexa. *Journal of Librarianship and Information Science*, 1-14.

Pagani, M. (2011). When usefulness does not matter: Affective versus cognitive components in the adoption of mobile TV services. *International Journal of Mobile Marketing*, *6*, 5-27.

McLean, G. & Osei-Frimpong, K. (2019). Hey Alexa... examine the variables influencing the use of artificial intelligence in-home voice assistants. *Computers in Human Behavior, 99,* 28-37.

McLean, G. & Wilson, A. (2019). Shopping in the digital world: Examining customer engagement through augmented reality mobile applications. *Computers in Human Behavior, 101,* 210-224.

Moore, G. C. & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, *2*, 192-222.

Moorthy, K., Yee, T. T., T'ing, L. C., & Kumaran, V. V. (2019). Habit and hedonic motivation are the strongest influences in mobile learning behaviours among higher education students in Malaysia. *Australasian Journal of Educational Technology, 35,* 174-191.

Muhammad, S. S., Dey, B. L., & Weerakkody, V. (2018). Analysis of factors that influence customers' willingness to leave big data digital footprints on social media: A systematic review of literature. *Information Systems Frontier, 20*, 559–576.

Ramirez-Correa, P., Mariano-Melo, A., & Alfaro-Perez, J. (2019). Predicting and explaining the adoption of social video platforms for learning: The case of Brazilian YouTube users. *Sustainability, 11*, 1-11.

Rezaei, R., Safa, L., & Ganjkhanlo, M. M. (2020). Understanding farmers' ecological conservation behavior regarding the use of integrated pest management - An application of the technology acceptance model. *Global Ecology and Conservation*, *22*, e00941.

Rogers, E. (1995). Diffusion of Innovations. 4th ed. New York: The Free Press.

Rosen, L. D., Whaling, K., Carrier, L. M., Cheever, N. A., & Rokkum, J. (2013). The media and technology usage and attitude scale: An empirical investigation. *Computers in Human Behavior*, *29*, 2501-2511.

Segura, A. S. & Thiesse, F. (2015). *Extending UTAUT2 to explore pervasive information systems.* Paper presented at 2015 ECIS, European Conference on Information Systems, Münster, Germany.

Seth, A., Coffie, A. J., Richard, A., & Stephen, S. A. (2019). Hospital administration management technology adoption: A theoretical test of technology acceptance model and theory of planned behavior on HAMT adoption. *American Journal of Public Health*, *7,* 21-26.

Shin, J., Park, Y., & Lee, D. (2018). Who will be smart home users? An analysis of adoption and diffusion of smart homes. *Technological Forecasting and Social Change, 134,* 246-253.

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS quarterly*, *15*, 125-143.

Van der Heijden, H. (2004). User acceptance of hedonic information systems. *MIS Quarterly, 28,* 695-704.

Venkatesh, V. & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences - A Journal of the Decision Sciences Institute*, *39*, 273-315.

Venkatesh, V. & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*, 186–204.

Venkatesh, V., Thong, J., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, *36*, 157-178.

Wong, C. H., Tan, G. W. H., Tan, B. I., & Ooi, K. B. (2015). Mobile advertising: The changing landscape of the advertising industry. *Telematics and Informatics*, *32*, 720-734.

World Intellectual Property Organization. (2019). *World intellectual property indicators 2019.* [Annual report]. https://www.wipo.int/edocs/pubdocs/en/wipo_pub_941_2019.pdf

Yang, H-D. & Yoo, Y. (2004). It’s all about attitude: Revisiting the technology acceptance model. *Decision Support Systems*, *38,* 19-31.