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Public Librarians' Adoption of Technology in Two Southeastern States

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This is to certify that the doctoral dissertation by

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2020

Abstract

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by

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MA, Higher Education, Ashford University, 2012

BA, Anthropology, Pennsylvania State University, 2011

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Educational Technology

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Abstract

Public libraries have become community hubs of technology, changing the responsibilities of public librarians. The problem is a gap between public library technology needs, the skills librarians have with technologies, and the strategies they use to acquire skills. The purpose of this predictive, sequential, explanatory mixed method study was to examine public librarians' attitudes about learning new technology and their behavioral intention to adopt it. Two frameworks guided this study: the unified theory of acceptance and use of technology model and the diffusion of innovations theory. Quantitative data (N= 202) were collected by survey and analyzed through multiple linear regression analysis, which determined predictive relationships between determinants of technology use and moderating variables. Findings revealed that the performance expectancy, effort expectancy, social influence, and facilitating conditions significantly affected the behavioral intention to use technology. The moderating variables of age, gender, experience, and voluntariness did not have significant impact. Twelve qualitative interviews inductively analyzed produced 4 themes of learning needs, learning strategies, barriers, and motivation. Findings have implications for social change because library stakeholders can have access to more knowledgeable and skilled staff, which will allow them to better serve the public, many of whom rely on library services for accessing social services, acquiring new skills, and locating information.

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Dedication

To my wife, family, friends, and therapist, thank you, thank you, thank you.

Words are barely enough next to the support and love you have shown me along the way.

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The support of my committee chair, Dr. Patricia (Rikki) McGee, and Dr. Dennis Beck, my second committee member was unbelievably valuable. They offered criticism, suggestions, and support that allowed me to make progress and strengthen my dissertation. I also appreciated the help Dr. Crissie Jameson, my university research reviewer, for her review of my study.

Table of Contents

List of Tables v

List of Figures vii

Chapter 1: Introduction to the Study 1

Background 2

Problem Statement 8

Purpose of the Study 10

Research Questions 10

Frameworks for the Study 14

Nature of the Study 17

Definitions 18

Assumptions 20

Scope and Delimitations 21

Limitations 22

Significance 23

Summary 24

Chapter 2: Literature Review 25

Introduction 25

Literature Search Strategy 26

Theoretical Foundation 27

The Unified Theory of Acceptance and Use of Technology 28

The Diffusion of Innovation Theory 38

Literature Review Related to Key Variables and Concepts....54
Technology Adoption from Related Populations....54
How Librarians Learn....71
How Librarians Learn Technology....79
Summary and Conclusions....89
Chapter 3: Research Method....92
Introduction....92
Setting....92
Research Design and Rationale....93
Role of the Researcher....95
Methodology....99
Participant Selection Logic....100
Instrumentation....101
Procedures for Recruitment, Participation, and Data Collection....105
Recruitment and Participation....105
Data Collection....106
Data Analysis Plan....107
Quantitative Components....107
Qualitative Components....113
Quantitative and Qualitative Components....116
Threats to Validity....116
Quantitative and Qualitative Validity....116

Internal Validity Threats 116
External Validity Threats 118
Construct and Statistical Conclusion Validity Threats 118
Issue of Trustworthiness 119
Ethical Procedures 121
Summary 122
Chapter 4: Results 123
Introduction 123
Setting 123
Demographics 124
Data Collection 126
Quantitative Data Collection Procedures 126
Qualitative Data Collection Procedures 127
Data Analysis 127
Quantitative Data Analysis 127
Qualitative Data Analysis 129
Results 131
Quantitative Components 131
Qualitative Components 141
Evidence of Trustworthiness 152
Credibility 152
Transferability 153

Dependability 153
Confirmability 154
Summary 154
Chapter 5: Discussion, Conclusions, and Recommendations Introduction 156
Introduction 156
Interpretation of the Findings 156
Interpretations of Librarian Acceptance and Intention to use Technology 157
Interpretations of How Librarians Learn Technology 159
Interpretations of Learning Supports for Technology 160
Limitations of the Study 162
Recommendations 163
Implications 164
Positive Social Change 164
Implications for Method 165
Implications for Practice 165
Conclusion 166
References 167
Appendix A: Permission to Use UTAUT 193
Appendix B: Copyright Permissions (Venkatesh et al., 2003) 194
Appendix C: UTAUT Questionnaire 195
Appendix D: UTAUT Survey Items Developed by Venkatesh et al. (2003) 199

List of Tables

Table 1. Core Constructs of UTAUT and Associated Theory 29

Table 2. Rogers's Diffusion of Innovation Adopter Categorization 39

Table 3. Codes for Moderating Variables 109

Table 4. UTAUT Constructs 111

Table 5. UTAUT Moderating Variables 112

Table 6. Research Questions Related to Theories and A Priori Codes 114

Table 7. Demographics of Surveyed Public Librarians 125

Table 8. Demographics of Interviewed Public Librarians 126

Table 9. Gender Frequencies and Percentages 131

Table 10. Age Range Frequencies and Percentages 131

Table 11. Number of Years with MLIS Degree Frequencies and Percentages 132

Table 12. Voluntariness of Use Frequencies and Percentages 133

Table 13. Coefficients with Collinearity Statistics 133

Table 14. Model Summary 134

Table 15. Descriptive Statistics with Variances 136

Table 16. Descriptive Statistics for Factors Influencing Behavioral Intention 137

Table 17. Model 1 Summary 138

Table 18. ANOVA for Model 1 138

Table 19. Coefficients for Model 1 138

Table 20. Model 2 Summary 140

Table 21. ANOVA for Model 2 140

Table 22. Coefficient for Model 2 140

Table 23. First List of Themes with Definitions 142

Table 24. Second List of Themes with Definitions 146

List of Figures

Figure 1. The UTAUT research model. 30

Figure 2. Adopter categorization based on innovativeness 40

Figure 3. Rogers's (2003) model for the five stages of the innovation decision process . 44

Figure 4. Histogram 135

Figure 5. Normal p-p plot of regression standardized residual..... 135

Figure 6. Scatterplot..... 136

Chapter 1: Introduction to the Study

Over time and with technology, public libraries have expanded their role in the community from expansive stacks of books to digital content and new categories of public service (Jibril, 2013; Tritt & Kendrick, 2014). According to Bertot, Real, Lee, McDermott, and Jaeger (2015), about 68% of public libraries have helped individuals to access and use employment databases, 48% offered programs on how to access and use online business information resources, and 76% helped in accessing, using, and completing e-government programs. Libraries have offered these services in addition to patron computer classes, children and young adult Science, Technology, Engineering, Arts, and Math programs as well as personal device support for access to the library's digital materials or databases (Carson & Little, 2014; Real et al., 2014; Torres-Steele, 2015). Thus, in the early 21st century, public libraries have been in a process of transitioning to ensure that their communities are digitally ready, and this change toward greater community involvement uncovers an opportunity for not only the public library but also the public librarian.

Outside the context of academic requirements for recent graduates of Master of Library Science/Master of Library and Information Science (MLS/MLIS) programs, there is no way to determine the technological competency of public librarians because many librarians attained degrees in library science many years prior to the American Library Association (ALA) standards and the infusion of technology into libraries. Although some research about public librarians' professional development and workplace learning has been conducted in the past (Shonrock, 2007; Shonrock & Mulder, 1993; Warnken,

2004), there is lack of current research that has addressed how librarians learn on the job to develop technology competency (Belzowski, Ladwig, & Miller, 2015; Deissler, Ding, Neumann, & Kophcha, 2015). The literature is limited and dated, offering mostly discussion of external sources for independent unpaid training or are examples from academic librarianship (DeCesare, 2014; Hook, Bracke, Greenfield, & Mills, 2003; Moorefield-Lang, 2017; Schamchuk, 2015). Research focused on public librarians' technology skills and understanding can identify a potential need for workplace education that would help public libraries and their constituency and contribute information to the current knowledge base for public librarianship.

This chapter provides background of the research related to this study, the problem statement, the purpose of the inquiry, research questions, and hypotheses. Next are the theoretical framework, the nature of this study, and the working definitions related to the research. The chapter also reviews the assumptions, limitations, scope, and delimitations of the study. Discussed last are the significance of the research and the potential positive social change implications.

Background

A public librarian's standard professional credential is a MLS or a MLIS from the ALA accredited school (ALA, 2015). The ALA-accredited degrees have had various names such as Master of Information Studies, Master of Information, Master of Librarianship, or Master of Library and Information Studies (ALA, 2015). The degree name is determined by the university or college's program, but the ALA's Committee for Accreditation evaluates programs based on their commitment to the Standards for

Accreditation of Master's Programs in Library and Information Studies, not based on the name of the degree (ALA, 2015). Not all degree seeking students must attend an ALA accredited MLS/MLIS program; however, the ALA (2007) has suggested that this may significantly limit employment opportunities. Many public libraries require an ALA accredited degree for certain staff positions in a public library.

Additionally, there are 21 outlying universities in 15 states that are not ALA accredited (ALA, 2007). The unaccredited universities are instead members of the Association for Library & Information Science Education and/or the National Council of the Accreditation of Teacher Education has accredited their college of education that offer a master's degree with a specialty in school library media. The ALA, through the American Association of School Librarians, works with National Council of the Accreditation of Teacher Education to identify programs that meet American Association of School Librarians guidelines for the education of school library media specialists (ALA, 2007). However, unless a public librarian has a background in education, this type of credential may not apply to many public library employee applicants.

ALA-accredited training programs, despite national standards, vary across states, reflecting a lack of consistency in librarian education. The ALA (2015) standards for accreditation of MLS/MLIS studies delineates an accredited program curriculum with few requirements. These open requirements are then mixed with diverse career pathways within ALA-accredited programs such as academic librarianship, archival studies, book arts, children's services, cultural heritage information management, digital libraries, health sciences librarianship/health informatics, information systems design/analysis,

knowledge management, law librarianship/legal information services, management and administration, music librarianship, and others (ALA, 2018). Considering the many academic specializations and changes in program requirements, each generation of public librarians with MLS/MLIS accreditation enters the profession with gaps in technology experience and knowledge because programs do not have unified or standardized requirements regarding technology. Thus, even when a librarian is MLS/MLIS endorsed, library administrators cannot count on consistent technology competency.

There are no national standards for public librarians, but once a public librarian has earned an MLS/MLIS from an accredited university and is employed as a public librarian, state standards govern them (ALA, 2015). According to the state library websites for the libraries included in the current study, public librarians working in State A follow the standards set by State A State Library Department and State B follow the State B State Library Department. The State A state library standards designate staff levels based on the serviceable population and set specific guidelines follow. It is then up to the individual librarians to adhere to state guidelines, follow employer instructions, and decide what skill sets need professional development throughout their career.

Despite the need for librarians to update their skills, library professionals have been slow to recognize a need for technology preparedness by staff. In 2009, the ALA Council named “technological knowledge and skills” as one of the core competencies for all MLS/MLIS graduates (ALA, 2013). Because the only standard requirement for employment as a public librarian is the MLS/MLIS, with no requirement of prior experience, most MLS/MLIS graduates have the credentials for a career in the field.

Universities across the United States have addressed a documented gap in the skills taught in MLS/MLIS programs and the technology skill set expected by employers, addressing a need identified by earlier research (Becker, Grandall, Fisher, Blakewood, Kinney, & Russell-Sauvé, 2011; Del Bosque, & Lampert, 2009; Fortney, 2009; Gorman, 2004; Martzoukou & Elliott, 2016; Singh & Mehra, 2012). However, professional development has become the responsibility of the individual public librarian, though professional associations and external training providers most often provide profession training (U.S. Department of Labor, 2017). Because public librarians play a key role in mediating between users and technology, the responsibility requires constant training and updating of their technical skills (ALA, 2013; Shahbazi & Hedayati, 2016; Tritt & Kendrick, 2014). Thus, there is a need for public librarians to be skilled with current technologies.

In addition to normal operating procedures, public libraries must plan for continual change as technology updates, improves, and evolves within their community (Ayre, 2016; Beyene, 2018; Hildreth & Sullivan, 2015; Kendrick, Tritt, & Leaver, 2013; Moorefield-Lang, 2015; Pedersen, 2016). Because of this there has been ample research on the integration of technologies in public libraries and the changes made to accommodate future technology (Beyene, 2018; Cancro, 2016; Cohron, 2015; Hardesty, 2016; Liu & Hsu, 2018; Radsliff-Rebmann, Te, & Means, 2017; Thompson, 2015). Many have noted changes to the physical appearance of the library, programming decisions, and expanding collection of digital materials (Colegrove, 2017; Cushing, 2016; McAllen, Downs, & Ascani, 2017; Martzoukou & Elliott, 2016; Real, Carlo, Bertot, & Jaeger,

2014). Additional changes to their technology infrastructure include ongoing computer literacy classes, business management classes, coding/programming classes and access to 3D printers, mobile hotspots, mobile devices, and various other technologies that could support the community (Colegrove, 2017; Cushing, 2016; Graubard & LeClerc, 2017; Pedersen, 2016).

Some older research has taken into consideration the changes technology has had on the role of a public librarian (Carson & Little, 2014; Chan, 2014; Real, et al., 2014; Sanders, 2013; Shonhe, 2019; Tritt & Kendrick, 2014). For example, Carson and Little (2014) examined the relationship of gendered stereotypes entrenched in the use of technology and how this applied to librarians who were not willing to use technology. Additionally, examining a dataset of recorded reference librarian transactions, Chan (2014) found that there was a gap in the estimated skill level and preferred capability. Other research has verified the findings of Chan recommending that more technology training for front line librarians is key to the library's charge to improve digital literacy (Real et al., 2014; Sanders, 2013; Tritt & Kendrick, 2014). Public librarians are ready to adopt information and communications technologies in library services (Shonhe, 2019), but research is needed to examine whether librarians have the skills necessary to use many new technologies.

As detailed in Chapter 2, my review of research literature examined the possible effect of certain variables on technology use. The variables of age, gender, voluntariness, and experience have been found to moderate the effects of performance expectancy, effort expectancy, social influence, and facilitating conditions that influence the

behavioral intention to use various technologies (Awwad & Al-Majali, 2014; Dečman, 2015; Farag, Park, & Kaupins, 2015; Isaias, Reis, Coutinho, & Lencastre, 2017; Jung & Lee, 2015; Khan, Masrek, Mahmood, & Qutab, 2017; Khechine, Lakhal, Pascot, & Bytha, 2014; Potnis, Demissie, & Deosthali, 2017; Yusof, Qazi, & Inayat, 2017; Yuvarj, 2016). Each of the studies used these variables to identify gaps in technology adoption. However, no research considered all variables considered in this study.

Despite changes to library technology and expectations of librarian's role, there is a gap in the research about librarians' preparation for ongoing technological changes. Some research has documented that public librarians do not have the skills needed to use these new technologies (Kendrick et al., 2014; Martzoukou & Elliott, 2016; Tritt & Kendrick, 2014). Other research on small rural libraries has reported that they have limited budgets, stagnant salaries, inadequate access, and significant challenges as the duties of the modern librarian have continued to evolve (Kendrick et al., 2014; Tritt & Kendrick, 2014). Both current MLS/MLIS program students and staff members have been shown to have limited technology capabilities; however, research has not shown what technology skills librarians had or perceived to have or how they felt about acquiring these skills (Martzoukou & Elliott, 2016). Additionally, there is a possible effect on the behavioral intention to use new technology with the moderating variables of age, gender, voluntariness, and experience; they moderated the constructs of performance expectancy, effort expectancy, social influence, and facilitating conditions (Awwad & Al-Majali, 2014; Dečman, 2015; Farag, Park, & Kaupins, 2015; Isaias, Reis, Coutinho, & Lencastre, 2017; Jung & Lee, 2015; Khan, Masrek, Mahmood, & Qutab, 2017; Khechine,

Lakhal, Pascot, & Bytha, 2014; Potnis, Demissie, & Deosthali, 2017; Yusof, Qazi, & Inayat, 2017; Yuvarj, 2016). To address the gap in understanding regarding public librarians' technology skills, this study will develop a deeper understanding of public librarians' perceptions about supports for technology adoption and determine predictive relationships between technology supports and behavioral intention to adopt new technology.

Problem Statement

The path toward accommodating digital upgrades in public libraries has evolved from the basic computer literacy (Jibril, 2013) to include emerging technologies, technocentric scheduled programming, technology classes, device support, and more online access (Bertot et al., 2015; Beyene, 2018; Cancro, 2016; Chan, 2014; Cohron, 2015; Colegrove, 2017; Cushing, 2016; Hardesty, 2016; Liu & Hsu, 2018; Martzoukou & Elliott, 2016; McAllen et al., 2017; Radsliff-Rebmann et al., 2017; Thompson, 2015; Tritt & Kendrick, 2014). This includes expansive digital books, DVDs, CDs, newspapers, and magazine collections (Ayre, 2016; Billington, 2017; Tritt & Kendrick, 2014; King, 2018). Alongside the immense digital collections are the analog collections of books, magazines, newspapers, CDs, DVDs, and archival collection (Bertot et al., 2015). These supports, services, technologies, and materials are aspects of the job that public librarians face every day. However, continuing education and training are not national requirements for librarians to receive credentials (ALA, 2015).

With the heavy workload and new technology demands, certain demographics like age and years of work experience, may be a factor in the adoption of technology. For

example, librarians who grew up with technology or veteran librarians who have had more opportunities to learn technology in the workplace may be more likely to adopt new technologies. Further, the median age of academic librarians is 46.6 years old (Lewis & Orr, 2018). If it takes 4 years to earn a bachelor's degree followed by 2 to 3 years for an MLS/MLIS, then some librarians, depending upon age, could be decades past their most recent educational training (ALA, 2006, 2008, 2015). Therefore, technological skillsets will vary because the ALA only mandated in 2009 that technological knowledge and skills were core requirements for accredited MLS/MLIS programs (ALA, 2009), though some universities had made progress adopting the technology-related skill sets prior to the 2009 ALA mandates (Becker et al., 2011; Del Bosque & Lampert, 2009; Fortney, 2009; Gorman, 2004; Scripps-Hoekstra, Carroll, & Fotis, 2014; Singh & Mehra, 2012).

The problem is a gap between public library technology needs, the skills librarians have with technologies, and the strategies they use to acquire skills (Goodsett & Koziura, 2016; Martzoukou & Elliott, 2016; Olele, Abraham, & Emasealu, 2015). Thus, public library stakeholders do not understand librarian attitudes about technology adoption and needed supports for skill development. Because professional development related to technology skills has not been a professional requirement for public librarians, although ALA stipulates the need for technology skills, public librarians' technological skill set is unknown. As technologies continue to evolve, libraries need to understand the predictive relationships between public librarian supports for technology adoption and their behavioral intention to adopt new technology.

Purpose of the Study

The purpose of this predictive, sequential, mixed method study was to examine the relationship between public librarians' technology use and their behavioral intention to adopt it. I wanted to understand the predictive relationships between performance expectancy, effort expectancy, social influence and facilitating conditions, and public librarians' behavioral intention to adopt technology. Additionally, the purpose of this study was to develop a deeper understanding of public librarians' perceptions about supports for technology adoption. This involved collecting quantitative data and then explaining the quantitative results as they related to the qualitative data. With the surge of new technologies, it was important to explain public librarian's existing technology needs, expectations, available resources, and skill sets.

Research Questions

Quantitative:

Research Question 1: How does the self-reported level of performance expectancy, effort expectancy, social influence, and facilitating conditions predict public librarians' behavioral intention to use new technology?

Research Question 1a: For public librarians, how does the self-reported level of performance expectancy predict their behavioral intention to use new technology?

H_0: There is no significant predictive relationship between performance expectancy and behavioral intention to use new technology.

H_a: There is a significant predictive relationship between performance expectancy and behavioral intention to use new technology.

Research Question 1b: For public librarians, how does the self-reported level of effort expectancy predict their behavioral intention to use new technology?

H_0: There is no significant predictive relationship between effort expectancy and behavioral intention to use new technology.

H_a: There is a significant predictive relationship between effort expectancy and behavioral intention to use new technology.

Research Question 1c: For public librarians, how does the self-reported level of social influence predict their behavioral intention to use new technology?

H_0: There is no significant predictive relationship between social influence and behavioral intention to use new technology.

H_a: There is a significant predictive relationship between social influence and behavioral intention to use new technology.

Research Question 1d: For public librarians, how does the self-reported level of facilitating conditions predict their behavioral intention to use new technology?

H_0: There is no significant predictive relationship between facilitating conditions and behavioral intention to use new technology.

H_a: There is a significant predictive relationship between facilitating conditions and behavioral intention to use new technology.

Research Question 2: How do the predictive relationships vary by age, gender, voluntariness, and experience?

H_0: The predictive relationships do not vary significantly by age, gender, voluntariness, and experience?

H_a: The predictive relationships does vary significantly by age, gender, voluntariness, and experience?

Research Question 2a: How does the predictive relationship between performance expectancy and public librarians' behavioral intention to use new technology vary by age, gender, voluntariness, and experience?

H_0: The predictive relationship between performance expectancy and public librarians' behavioral intention to use new technology does not vary significantly by age, gender, voluntariness, and experience?

H_a: The predictive relationship between performance expectancy and public librarians' behavioral intention to use new technology does vary significantly by age, gender, voluntariness, and experience?

Research Question 2b: How does the predictive relationship between effort expectancy and public librarians' behavioral intention to use new technology vary by age, gender, voluntariness, and experience?

H_0: The predictive relationship between effort expectancy and public librarians' behavioral intention to use new technology does not vary significantly by age, gender, voluntariness, and experience?

H_a: The predictive relationship between effort expectancy and public librarians' behavioral intention to use new technology does vary significantly by age, gender, voluntariness, and experience?

Research Question 2c: How does the predictive relationship between social influence and public librarians' behavioral intention to use new technology vary by age, gender, voluntariness, and experience?

H_0: The predictive relationship between social influence and public librarians' behavioral intention to use new technology does not vary significantly by age, gender, voluntariness, and experience?

H_a: The predictive relationship between social influence and public librarians' behavioral intention to use new technology does vary significantly by age, gender, voluntariness, and experience?

Research Question 2d: How does the predictive relationship between facilitating conditions and public librarians' behavioral intention to use new technology vary by age, gender, voluntariness, and experience?

H_0: The predictive relationship between facilitating conditions and public librarians' behavioral intention to use new technology does not vary significantly by age, gender, voluntariness, and experience?

H_a: The predictive relationship between facilitating conditions and public librarians' behavioral intention to use new technology does vary significantly by age, gender, voluntariness, and experience?

Qualitative:

Research Question 3: What are public librarians' perceptions regarding technology adoption supports?

Research Question 4: What are public librarians' perceptions regarding how these technology adoption supports may connect to their behavioral intentions?

Frameworks for the Study

With an existing gap between library technology needs and the skills taught about using existing or new technologies, it is important to understand the technology skillset of public librarians (Goodsett & Koziura, 2016; Martzoukou & Elliott, 2016; Olele et al., 2015). Two frameworks helped to reveal how and why librarians chose to learn new technologies: the theory of adoption and diffusion of innovation (Rogers, 2003) and the unified theory of acceptance and use of technology (Venkatesh, Morris, Davis, & Davis, 2003). Researchers have used these frameworks to measure, describe, and predict technology acceptance and adoption for professionals in multiple sectors. This section provides an overview of these two theories used to analyze the data.

The diffusion of innovations theory describes two adopter groups: individuals and organizations (Rogers, 2003). When referring to individual behavior with technological change, there is a continuum of adopter categories to indicate the degree to which individuals embrace technology and the roles people perform in the adoption process. According to the theory, adoption in an organization requires that the innovation must either be adopted initially by the individual and then by different organizational branches, or the individual progresses through the implementation stages to utilize the technology previously adopted by the organization. Rogers claimed that individuals tend to adopt at a later decision stage than the organization. Individual adoption is influenced by relative advantage, compatibility, complexity, observability, and trialability. The dilemma for

public libraries is that they have invested in the future of libraries by adopting new technologies without strategic planning for individual adoption even though public librarians have seen technology reshape and redefine their roles (Carson, 2014; Chan, 2014; Cherinet, 2018; Ratledge, & Sproles, 2017; Real et al., 2014; Sanders, 2013; Tritt & Kendrick, 2014). By using the diffusion of innovations theory as a framework, the study will provide clarification of the factors influencing the application of innovations, which is a key to understanding the aspects and predictability of resistance or acceptance and thus adoption of technology.

Researchers have not often used diffusion of innovation in studies focused on librarians' use of technology. Instead they have focused on the adoption of specific library services and innovations as well as their effect on librarians. For example, Stock-Kupperman (2015) explored a framework for collaboration training and Katuli-Munyoro and Mutala (2018) investigated lack of awareness and attitude of library and information science faculty had toward the importance of technology. Chapter 2 provides an overview of research that has used diffusion of innovation in conjunction with other theories.

Also part of the framework for this study, the unified theory of acceptance and use of technology (UTAUT) model elaborates on the adoption process through the role of intention to practice (Venkatesh et al., 2003). Venkatesh et al. created the UTAUT to understand the use of information technology (computers, mobile devices, software, and internet related activities) as a dependent variable. UTAUT theorists have identified eight models that specified intention as the key dependent variable: theory of reasoned action, technology acceptance model (TAM), motivational model, theory of planned behavior

(TPB), combined TAM and TPB, model of PC utilization, innovation diffusion theory, and social cognitive theory. These models hypothesized between two and seven determinants of acceptance, for a total of 32 constructs. Four constructs were determined to be direct determinants of user acceptance and usage behavior: performance expectancy, effort expectancy, social influence, and facilitating conditions. This included four moderating variables of experience, voluntariness, gender, and age. This study considered public librarians' intention to use new technologies with a correlational analysis of their perception of the skills they must support learning evolving technologies.

There was a lack of research using UTAUT with librarians, but some researchers have studied adoption in a library setting with a focus on library services and patron use of these services. For example, Zainab, Kiran, Karim, and Sukmawati (2018) investigated librarians' acceptance of Radio-frequency Identification based Library Management System. Additionally, Chang, Lou, Cheng, and Lin (2015) integrated UTAUT and library website service quality. Additional researchers have explored other tools or services detailed in Chapter 2.

By utilizing the diffusion of innovations theory and the UTAUT, this study found an answer to the central research questions. The UTAUT instrument provided data that helped to explain and potentially predict public librarians' intention to use new technology. The diffusion of innovation theory, through analysis of semistructured interviews, provided a deeper look into the quantitative results and elaborated on the possible reasons for the results, particularly as it relates to the characteristics of

workplace technology innovations. In Chapter 2, I will discuss the conceptual frameworks of the study more thoroughly.

Nature of the Study

In this sequential, explanatory, mixed method study, I collected data from 1,246 surveys across State A and State B and conducted 12 interviews with public librarians to present a picture of librarians' existing technology learning needs, expectations, available resources, and what best supports technology adoption. I intended to determine predictive relationships between technology supports and behavioral intention to adopt new technology. By utilizing a sequential mixed method, I provided a practical synthesis of quantitative and then qualitative data to deliver the most informative and balanced view of the topic (Tashakkori & Teddlie, 2010). I measured the factors of technology acceptance quantitatively by the UTAUT survey, and I qualitatively explored preferred training supports and behavioral intentions through interviews guided by the diffusion of innovations theory.

The dependent variable examined in this study was the behavioral intention to use technology. I used a quantitative survey based on the UTAUT's original model. To create the model, Venkatesh et al. (2003) empirically tested several constructs from eight previously established TAMs (Ajzen, 1991; Bandura, 1986; Davis, Bagozzi, & Warshaw, 1989; Davis et al., 1992; Fishbein & Ajzen, 1975; Taylor & Todd , 1995; Thompson, Higgins, & Howell, 1981), which researchers had previously used to explain the behavioral intention to use technology. The researchers determined that performance expectancy, effort expectancy, and social influence are determinates of behavior intention

to use of technology. Venkatesh et al. found behavioral intention along with facilitating conditions were direct factors of use behavior which were moderated by the demographic variables of age, gender, experience, and voluntariness. I used multiple linear regression to analyze this quantitative data.

I also examined the perception of useful supports during technology adoptions in the qualitative phase of the study. I used semistructured interviews of purposefully selected librarians who have responded to the quantitative survey. I used Rogers's (2003) diffusion of innovations theory, included in the UTAUT model, to inform interview questions and subsequent analysis for further exploration of technology adoption supports. I analyzed interview responses first coding with a priori codes detailed in Chapter 3, then open coding, and finally organizing coded material thematically. I used Rogers's perceived characteristics of innovations—relative advantage, compatibility, complexity, observability, and trialability—to code supports identified as useful for the public librarians during technology adoption.

Definitions

Behavioral intention: The extent to which participants believe they will adopt a technology soon (Davis, 1989).

Children's librarian: A children's librarian serves the needs of children from birth to age 12 when they transition to young adult librarians (ALA, 2016).

Digital divide: The digital divide explains the gap between people who can easily use and access technology and those who cannot (Cohron, 2015).

Effort expectancy: This is the degree of ease associated with using a technology. It includes constructs from the perceived ease of use of TAM/TAM2, the complexity from model of PC utilization, and ease of use from diffusion of innovation (Davis et al., 1989; Rogers, 2003; Thompson, Higgins, & Howell, 1991; Venkatesh et al., 2003).

Facilitating conditions: The belief that there are adequate resources for training and support. This definition carries concepts of three different constructs: perceived behavioral control from (TPB/DTPB and combined TAM and TPB), facilitating conditions of model of PC utilization, and compatibility of diffusion of innovation (Ajzen, 1991; Rogers, 2003; Taylor & Todd, 1995; Thompson et al., 1991; Venkatesh et al., 2003)

Public librarian: In this study, a public librarian is any person who has earned an MLS/MLIS degree from a college or university accredited by the ALA and is employed by a public library (Goodsett & Koziura, 2016).

Performance expectancy: This is the degree to which an individual believes that using the technology will them attain gains in job performance. It includes five constructs of perceived usefulness in TAM/TAM2 and combined TAM and TPB, the extrinsic motivation of motivational model, job-fit from model of PC utilization, relative advantage of diffusion of innovation, and outcome expectations from social cognitive theory (Bandura, 1996; Davis et al., 1989, 1992; Rogers, 2003; Taylor & Todd, 1995; Thompson et al., 1991; Venkatesh et al., 2003)

Public librarian: A public librarian, in this study, is any person who has earned an MLS/MLIS degree from a college or university accredited by the ALA and is employed by a public library (Goodsett & Koziura, 2016).

Reference librarian: Reference librarians recommend, interpret, evaluate, and/or use information resources to help patrons with specific information needs. Most adults visiting a library will work with a reference librarian (ALA, 2016).

Social influence: Defined as the degree to which an individual perceives it important that others believe they should use the new technology. Multiple models use social influence as a determinant of behavioral intention including theory of reasoned action, TAM2, TPB/DTPB and combined TAM and TPB, model of PC utilization, and diffusion of innovation (Ajzen, 1991; Davis et al., 1989; Fishbein & Ajzen, 1975; Rogers, 2003; Taylor & Todd, 1995; Thompson et al., 1991; Venkatesh et al., 2003).

Technology adoption supports: For this study, supports refers to any resource or professional development activity that contributes to the knowledgeable use of a technology, such as, professional development or professional learning networks (Deissler, Ding, Neumann, & Kopcha, 2015; Kvenild, Tumbleson, Burke, & Calkins, 2016; Moorefield-Land, 2017).

Young adult librarian: A young adult librarian serves the needs of the teen population ages 12 to 18 (ALA, 2016).

Assumptions

This study was based on a few basic assumptions. The first assumption was that the participants completed the survey and participated with the interviews honestly. A

second assumption was that the responses to interviews were based on their experiences as a public librarian. The third assumption was that there was a linear relationship between the outcome variable and the independent variables. There is also multivariate normality, no multicollinearity, and it has homoscedasticity. Having acknowledged these assumptions, I took care not to allow them to influence outcomes and conclusions drawn from the data.

Scope and Delimitations

Specific aspects of the research problem addressed in this study were to identify the public librarians' behavioral intention to adopt new technology and those supports that can support them in this process. I chose this focus to inform administrative leaders on successful technology adoption so that these leaders can understand public librarians' needs and the supports for their professional skill development. The scope of this study included only public librarians who had earned an MLS/MLIS degree accredited by the ALA, because the examination remained specific to the gap in the current literature.

Delimitations are factors that focus the scope of the research (Salkind, 2010). There were several delimitations to this study. First, I limited the study sample to public librarians employed in State A and State B. Thus, the study findings were not generalizable beyond these states or to nonpublic librarians because public librarian experiences may not be representative of all librarians. Second, the research included librarian's reported perceptions of technology supports in public libraries in State B. Therefore, I limited the self-reported data to the participants' ability to accurately report evaluations about themselves. Third, to be able to adequately analyze the amount of

information gathered, it was necessary to choose a set of individuals that was both large enough in number to get sufficient data but still small enough to be manageable. Choosing two states with a total of 583 public libraries and 1,246 public librarians with MLS/MLIS degrees met the methodological requirements. Fourth, I limited the population to the public librarians in four categories: rural, town, suburban, and city. I cannot assume that the results of this study coincided with results from other public libraries throughout the United States or necessarily be generalizable. Fifth, the variables were limited to performance expectancy, effort expectancy, social influence, and facilitating conditions and their influence on behavioral intention to use technology, which were moderated by the variables of age, gender, voluntariness, and experience.

Limitations

There are a few possible limitations to this study. The first limitation for the study was the timeline for surveying and interviewing the participants, which was 2 weeks for the quantitative survey and qualitative interviews scheduled within a 1-month timespan, as a longer period for the data collection would have allowed those with limited time to participate. The second limitation was that some researchers see nonexperimental research as only being useful at the early stages of a line of research (Reio, 2016), thus, it is possible that an experimental design might have revealed other findings. Last, it is not ethical to manipulate an independent variable that would be used in nonexperimental methods when researching such variables.

Significance

This study adds insight into how demographics relate to technology adoption gender, experience, voluntariness, and age (Venkatesh et al., 2003). It also explains how librarians perceive institutional supports as relates to their technology acceptance within an institution as articulated by Rogers (2003) and what libraries can do to support skill development. As key stakeholders, the public library's administration, the board of trustees, and developmental services can make more informed strategic and operational decisions when they understand possible demographics, facilitating conditions, and other factors that influence librarians' technology use. As an example, results from this study could potentially identify librarians in a specific age range who are not comfortable with new technology due to lack of training. It could also positively identify certain librarians with additional experience focused on new technology that could lead technology adoption across the institution through a diffusion process (see Rogers, 2003).

This study is unique in that it addresses an area of research that researchers have not extensively explored; therefore, available research on educational technology and library science is dated (Carson & Little, 2014; Chan, 2014; Real et al., 2014; Sanders, 2013; Tritt & Kendrick, 2014). Librarians and policy makers can use the findings to help librarians better serve the public, which is their mission (Goodlett & Kozier, 2016; Martzoukou & Elliott, 2016; Olene et al., 2015). Lastly, as a public service the library plays an important role in the pursuit of a lifelong education. Results from this study updated previous dated research (Bertot et al., 2015; Chan, 2014; Jibril, 2013; Tritt & Kendrick, 2014) and provides an opportunity to rebuild public libraries trusted as

information centers for the entire community (Goulding, 2016; Johnstone, Choi, & Leong, 2016; Mickiewicz, 2016).

Summary

The growing presence of technology in the public library has disrupted the way librarians work and connect with their community, and not all librarians are prepared to handle the changes. Despite the number of articles on new technology changes, there were few on the effect of technology on librarians and even fewer that revealed whether librarians were ready to meet the new challenges. The premise of this mixed-method research study was that all public librarians did not have the skills or intention needed to use changing technology that is an integral part of their work, and it was unclear what supports might aid their technology adoption. The assumption was that data gathered from the technology acceptance survey could, with semi-structured interviews focused on finding support for technology adoption, provide insight into how to prepare, engage, and remediate public librarians for future technology changes and adoption. Chapter 2 provides a thorough narrative of the literature strategy and literature review for this study as well as in-depth review of the applied theoretical foundations of the UTAUT model and the diffusion of innovations theory.

Chapter 2: Literature Review

Introduction

Public libraries have embraced new technologies and have transitioned into digitally-ready hubs for their community (Hildreth & Sullivan, 2015; Johnstone, Choi, & Leong, 2016; Tritt & Kendrick, 2014; Real, Carlo, Bertot, & Jaeger, 2014; Rosa & Storey, 2016; Ryan & Bruce, 2016). Most offer classes and training on how to use computers, the Internet, and emerging technologies (Chan, 2014; Hildreth & Sullivan, 2015; Johnstone, et al., 2016). This is in addition to makerspaces and the Science, Technology, Engineering, Arts, and Math (STEM)programs, personal device support for access to the library's digital materials, online database support, and various other literacy programs (Carson, 2014; Johnstone et al., 2016; Moorefield-Lang, 2015; Real et al., 2014; Torrisi-Steele, 2015). This list does not include the bank of public access computers that are always available and need ongoing technical service and support.

Public library technology and patron technology use and support are large, multifaceted tasks that have required public librarians to learn, practice, and understand multiple technologies across multiple platforms. The literature, though saturated with information about how new technology integrations have changed the physical landscape of public libraries, is limited regarding how services and staff support such activities. There has been little discussion about the skills public librarians needed to use and support existing or new technologies (Daland, 2016; Kendrick, Martzoukou, & Elliott, 2016; Schwartz, 2016; Tritt & Kendrick, 2014). Thus, this study focused on librarian's technology support needs, expectations, available resources, and skill sets. It concentrated

exclusively on State A and State B public libraries as a representative sample of public libraries of the southeast United States.

This chapter includes a description of the literature search strategy and a discussion of the theoretical foundations of the diffusion of innovation and the UTAUT model. I then examine current literature related to the adoption and use of technology as well as literature centered on public librarian skill sets, experience, and work environment. The chapter concludes with a summation of the reviewed literature and justification of the gap in literature.

Literature Search Strategy

The search for literature was focused on the concepts related to the study's focus on public librarians' adoption of technology, the supports and services needed to acquire technology abilities, and the preferences of librarians to acquire professional skills. The search of the literature involved resources from two libraries databases: Walden University Library and Charleston County Public Library. This literature review drew on multiple reference systems including Thoreau, which allows access to several education journals; SAGE journals online; and formative Walden University Library searches, which led to other professional organizations and publication databases. The search terms included, but were not limited to *librarian(s) and technology, public librarian(s) and technology, public library(ies) and technology, library(ies) and technology, academic library(ies), public librarian(s) professional development, librarian(s) professional development, public librarian(s) and training, librarian(s) and training, public librarian(s) continuing education, librarian(s) continuing education, librarianship,* and

public librarianship. Also included were searches for *UTAUT and public library(ies), UTAUT and library(ies), UTAUT and public librarian(s), UTAUT and librarian), diffusion of innovations and library(ies), and diffusion of innovations and public library(ies), diffusion of innovations and librarian(s),* and *diffusion of innovations and public librarian(s).* The literature review was primarily focused on research published between 2015 through 2019 to establish currency of the problem. Older research dates reflect the use of seminal literature for diffusion of innovation and UTAUT theories as well as studies that illustrate the ongoing changes to libraries.

Theoretical Foundation

To serve as the digital hub for a community, public librarians require ongoing training and public libraries need integration of technology advancements. Although there is literature about the new technologies in the public library (Hildreth & Sullivan, 2015; Johnstone, Choi, & Leong, 2016; Tritt & Kendrick, 2014; Real, Carlo, Bertot, & Jaeger, 2014; Rosa & Storey, 2016; Ryan & Bruce, 2016), less research has been conducted on the effect of technology on the role of a public librarian or their acceptance of technology required for their work. I used the constructs associated with the UTAUT to answer the quantitative phase of the mixed method study and the diffusion of innovation process for public librarians to answer questions for the qualitative phase.

Among studies available for technology adoption, I found no specific instruments for measuring the factors that influenced technology adoption in libraries. However, the studies did include a form of either innovation diffusion theory, TAM, or both.

Researchers have used the construct of technology acceptance and built various models based on their research. Some of the related models include:

- Theory of reasoned action by Fishbein and Ajzen in 1975
- Social cognitive theory by Bandura in 1986
- Technology acceptance model (TAM) by Davis, Bagozzi, and Warshaw in 1989
- Model of PC utilization by Thompson, Higgins, and Howell in 1991
- Theory of planned behavior (TPB) by Ajzen in 1991
- Motivational model produced by Davis et al. in 1992
- Combined TAM and TPB by Taylor and Todd in 1995
- Diffusion of innovation theory by Rogers in 2003

Separately each theory has merit and has been utilized extensively on its own and contribute to understanding about adoption; however, for this study I chose two frameworks: the UTAUT (Venkatesh et al., 2003) and the diffusion of innovations theory (Rogers, 2003).

The Unified Theory of Acceptance and Use of Technology

Venkatesh et al. (2003) unified eight theories of adoption into the UTAUT model. Their testing revealed which constructs of the theories listed in the previous section play a significant role in the individual acceptance of a technology. This allowed them to develop a theory that offers a comprehensive explanation of individual acceptance of technology.

Venkatesh et al. (2003) identified the four core constructs of performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy describes how well individuals believe that a given technology will fit their specific job requirements. Effort expectancy describes how individuals perceive the ease of use of the technology. Social influence describes how individuals perceive that people important to them support or use a technology. Facilitating conditions determine individual perception of support for a given technology. Table 1 connects the UTAUT core constructs with the original associated theory constructs. Venkatesh et al. validated the constructs and subsequently incorporated into the UTAUT instrument (see Figure 1).

Table 1

Core Constructs of UTAUT and Associated Theory

UTAUT Core Constructs	Associated Theory Constructs	Associated Theory
Performance Expectancy	Perceived usefulness	TAM & combined TAM and TPB
	Extrinsic motivation	motivational model
	Job-fit	model of PC utilization
	Relative advantage	diffusion of innovation
	Outcome expectation	social cognitive theory
Effort Expectancy	Perceived ease of use	TAM
	Complexity	model of PC utilization
	Ease of use	diffusion of innovation
Social Influence	Subjective norms	theory of reasoned action, TAM, combined TAM and TPB
	Social factors	model of PC utilization
	Image	theory of reasoned action, TAM, TPB, combined TAM and TPB
Facilitating Conditions	Perceived behavioral control	TPB, combined TAM and TPB
	Facilitating conditions	model of PC utilization
	Compatibility	diffusion of innovation

Moderating variables. In addition to the four core constructs, Venkatesh et al. (2003) identified four moderators of gender, age, experience, and voluntariness of use. Figure 1 illustrates their proposed research model.

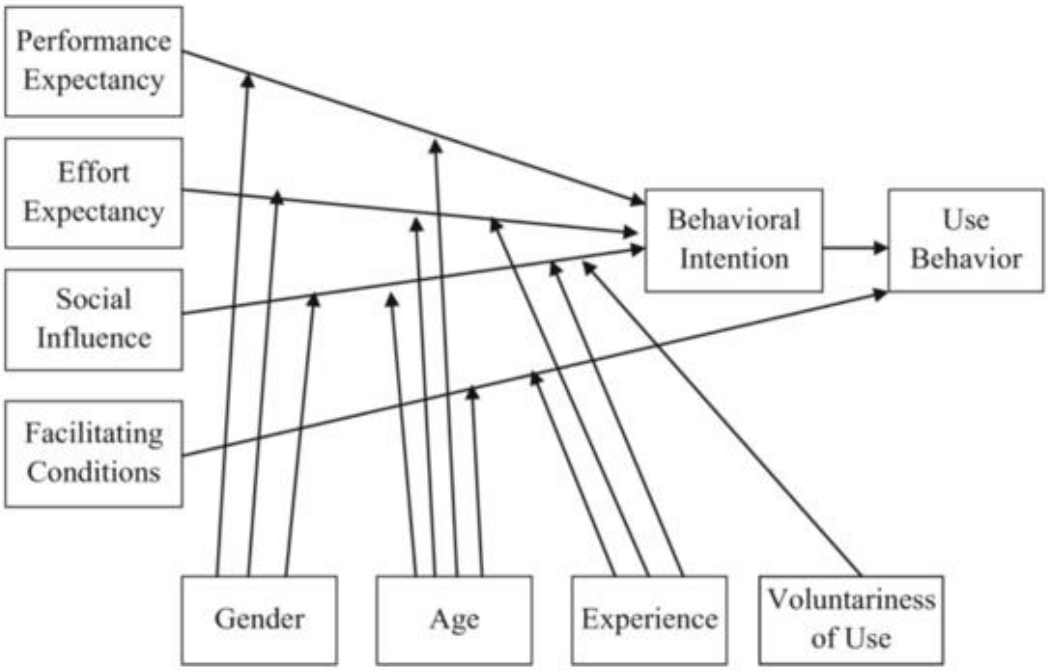

Figure 1. The UTAUT research model. Venkatesh et al. (2003).

The UTAUT model excludes constructs that Venkatesh et al. (2003) did not believe affected the intention to use technology. Venkatesh et al. theorized that self-efficacy, anxiety, and attitude toward the technology did not have an influence on behavioral intention. After empirical testing they did not include the constructs in the final instrument, but they did include the moderating effects of age, education, and experience.

Limitations of UTAUT. The use of UTAUT has been a best practice in measuring user acceptance, but researchers have cited some limitations. For instance, it

limits the mediating factors of technology acceptance to only four factors—age, gender, experience, and voluntariness of use—, which overlooks the aspect of attitude of individuals toward the innovation (Kiwanuka, 2015). The constructs that affect acceptance of technology are important, and the process through which they pass is equally important for the adoption process. Although Venkatesh et al. (2003) utilized Rogers's (2003) diffusion of innovation process, they did not consider the communication stages through which technology progresses through as a part of the adoption process (Kiwanuka, 2015). By combining the innovation-decision process of diffusion of innovation with UTAUT, the adoption process and the constructs that affect the adoption of any innovation can be better explained.

Research using UTAUT in public libraries. At the time of this study there was a lack of research utilizing UTAUT with librarians in academic or public contexts. However, some adoption research has a library setting, insightful to the library context in general. The studies reviewed in this section identify the use of UTAUT focused on library services and patron use of these services.

Studies utilizing the UTAUT instrument in libraries were few and often used an adapted model with a focus on library services rather than individuals. For example, Zainab, Kiran, Karim, and Sukmawati (2018) investigated librarians' acceptance of the Radio-frequency Identification based Library Management System utilizing an adapted UTAUT model, removing the construct facilitating conditions and replacing it with the attitude toward using technology and self-efficacy because they found these constructs were more reflective of users' behavior constructs. Results indicated that the constructs

had a strong positive influence on the acceptance of Radio-frequency Identification based Library Management System, though little research has been done on this type of library technology. Zainab et al. also examined UTAUT's use in other fields and found that it works as is or with justified adaptations and inclusions of external variables.

Other researchers have also modified the UTAUT to study technology acceptance. Vongjaturapat, Chaveesuk, Chotikakamthorn, and Tongkhambanchong (2015) modified UTAUT with the task-technology fit model in Thailand to study the acceptance of tablet use in library information services. The task-technology fit determines the degree to which technology assists an individual in performing their tasks, which means individuals only accept technology if the functions of the technology relate to the task completed. Combined with the core of either model, the performance expectancy in UTAUT and technology characteristics was important in understanding why individuals choose a technology for completing a task. They found performance expectancy and task-technology fit have a significant effect on actual use, both performance expectancy and task-technology fit had a significant effect on user adoption, technology characteristics influenced performance expectancy, screen design had a significant relationship between the design of a search system and effort expectancy, and interaction with a library search system had a significant relationship with effort expectancy and facilitating expectancy.

Further, Khan, Masrek, Mahmood, and Qutab (2017) modified the UTAUT to explore the factors affecting the adoption of digital reference services, particularly age, gender, and type of library in a Pakistan university. Digital reference services refers to a

system of assistance where patrons can submit questions to librarians synchronously via chat, instant messaging, voice over internet protocol (VOIP), video conferencing and/or asynchronously via email, web form, Chatterbox/FAQ. The modified UTAUT model included the three predictors of adoption: perceived usefulness, perceived ease of use, and information/communication technology (ICT) skill and reduced the total moderators to age, gender, and added library type. Results confirmed the stability of UTAUT and that usefulness, ease of use, and ICT skills were the significant indicators of the potential for adoption. They also found that age, gender, and type of library did not moderate the effects of predictors on the outcome variable. Khan et al. concluded that research should focus on the individual perspective instead of an organization context, highlighting the need for training and other professional development programs to allow these librarians to fully adopt digital reference services.

Also using a modified UTAUT survey, but with different participants, Rempel and Mellinger (2015) examined how researchers choose a bibliographic management tool and what made them continue using it. Participants completed three linked tasks in the 2-month study: screen capture recordings of their research, journaling with guiding questions, and an interview at the end. The researchers modified the constructs slightly because they were in an academic setting rather than a business one, so they replaced job performance verbiage with research performance terms. They modified the facilitating conditions to include workshops and training. They also modified performance expectations and effort expectations to performance expectations and experiences and effort expectations and experience because the participants were not predicting tool use

behaviors before actual uses, but they did discuss the active use of tools. They found that participants adopted the system because of an expectation of research productivity and persisted in using the tool because of ease-of-use experiences. Additionally, librarians reported that they had influenced tool adoption decisions but had less influence over the continued use of the tools. The adaptations of UTAUT illustrates the versatility of the tool by altering moderating variables and in some cases the actual theory constructs while not changing the effectiveness or the outcome, as modifications are generally grounded in the original eight theories that make up UTAUT.

Though the UTAUT has often been modified, research has also applied the original model's constructs to librarians' technology acceptance. Libraries offer much of their services through online portals, thus librarians have had to use and facilitate the use by patrons of such systems to perform their jobs. Chang, Lou, Cheng, and Lin (2015) investigated UTAUT and library website service quality in Taiwan public and private universities. They believed that librarians should strive to understand electronic usage conditions as well as the effects of website service quality and behavioral intention because the electronic materials in digital archives have increased in number and availability. Findings revealed website service quality had a significant positive influence on behavioral intention. They found that UTAUT constructs of performance expectancy and social influence were antecedents to behavioral intention and facilitating conditions positively affect user behavior. Additionally, the study tested the UTAUT model by using structural equation model technology, and the researchers found that it was a good fit, making it usable as a reference for future academic research and management practice.

Research that has focused on individuals tend to focus on the needs and requirements of the customer as related to a specific service. Awwad and Al-Majali (2014) investigated the electronic library services use versus traditional library services among college students in Jordanian university libraries. Their objective was to examine UTAUT in the context of electronic library services and to identify the effect of age, gender, experience, education level, and academic discipline as new moderating variables. Not only did findings validate the UTAUT in the frame of electronic library services, it also revealed that performance expectancy had a significant effect on younger students, effort expectancy was the strongest effect on older students, and social influence and facilitating conditions were significant moderators but gender and experience were not. This study, unlike Zainab et al. (2018), found the benefit of the theory's constructs. They did, however, apply different moderating variables found responsible for technology use in this location.

In previous studies researchers rarely used UTAUT in its original form for studying library services, but Wasitarini and Tritawirasta (2015) found it advantageous to use the original form. They reported on the use of UTAUT in investigating their public patrons' acceptance of a closed-access library service system through Online Public Access Catalogue and Integrated Library Information System applications at the Indonesian National Library. In closed-service systems users cannot take from the library collections; they must borrow directly from librarians. Integrated Library Information System is a combination of multiple modules, including Online Public Access Catalogue, circulation services, and statistical processing of library materials/collections. Online

Public Access Catalogue, part of Integrated Library Information System, is a computer-based information retrieval system used to browse the collections of a library. To improve these services, participants completed an assessment of both Online Public Access Catalogue and Integrated Library Information System via survey, interview, and observations. Analyzing the data with the UTAUT model researchers measured the constructs of performance expectancy, effort expectancy, social influence, facilitating conditions, and they included use behavior. Each construct identified a weakness in their system setting them up with a list for making corrections and changes to the system and their employees. Also, they used UTAUT differently and un-adapted.

Other research has examined how adoption occurs within library settings. Singh, Sharma, & Singh (2015) developed a digital library acceptance model by using UTAUT, the TAM, and two information system success models. Their target population was library professionals and users from academic institutions in India including faculty, graduate students, and undergraduate students. To develop the model, they administered a structured questionnaire with 63 statements relating to participants' acceptance and use of digital library technologies. They built a model, after validation, consisting of seventeen dimensions grouped under the four themes: perception of relevant social groups, informational aspects, user learning, and systemic aspects. They found that low awareness of the benefits, lack of training, and an indifferent attitude toward the potential positive effects on work efficiency were some of the factors the study found obstructing the growth of digital libraries. As UTAUT developed from other theories and models, the

researchers developed a digital library acceptance model that they validated to help identify issues in Indian libraries that are not seeing the growth of their digital libraries.

Few researchers have used UTAUT with librarians and tend to focus on employment strategies such as in the study by Yuvaraj (2016), which studied the adoption of social media technologies in the recruitment of librarians and faculty members in India. They employed the extended UTAUT model and extra constructs of the effect of the position of recruiters and level of education on data from 230 university recruiters. Yuvaraj asked respondents to rate nine UTAUT items on a seven-point Likert scale, from strongly agree to strongly disagree. Participants also answered questions about their use of social media in the recruitment process for eight functions: branding of the employer, job advertisement, sourcing of the passive candidates, receipt of job applications, examining the authenticity of the applicants' curriculum vitae, investigating the applicant's social media presence, and verifying the applicants' references. As for demographics, they utilized gender, date of birth, current position, and educational qualification. The results of the study showed that the behavioral intentions to adopt social media were dependent upon the perception of benefits, perceived ease of use, and their level of perceived importance. The behavioral intention and facilitating conditions were strong determinants for adoption.

All studies discussed in this section utilized UTAUT, but have adapted, modified, or combined it with other theories. Researchers made changes to the instrument to extend the use of the survey to their population. Researchers also selected, removed, or replaced UTAUT's constructs of performance expectancy, effort expectancy, and facilitating

conditions according to the importance within the study. Some of the studies reviewed in this section looked at the variables of age, gender, voluntariness, and experience, which were found to moderate the effect of performance expectancy, effort expectancy, social influence, and facilitating conditions constructs that influence the behavioral intention to use various technologies (Awwad & Al-Majali, 2014; Dečman, 2015; Farag, Park, & Kaupins, 2015; Isaias, Reis, Coutinho, & Lencastre, 2017; Jung & Lee, 2015; Khan, Masrek, Mahmood, & Qutab, 2017; Khechine, Lakhal, Pascot, & Bytha, 2014; Potnis, Demissie, & Deosthali, 2017; Yusof, Qazi, & Inayat, 2017; Yuvarj, 2016). Thus, illustrating the versatility of this tool as an identifier of behavioral intention to use these technologies.

The Diffusion of Innovation Theory

The diffusion of innovation theory (Rogers, 2003) helped to explain individual librarian participation in relation to their technology use, their attitudes toward technology, and their adoption of innovations. According to this framework, individuals, and even entire organizations adopt innovations at different rates and play different roles in the adoption process. Rogers (2003) identified roles in the adoption process which includes innovators, early adopters, laggards, change agents, and opinion leaders. The five steps of adoption illustrate variances among adopters, see Table 2.

Table 2

Rogers's Diffusion of Innovation Adopter Categorization

Adopter Categorization	Description
Innovators "Venturesome"	This includes those who want to be the first to try the innovation. They are interested in new ideas, willing to take risks, and are often the first to develop new ideas. Despite not being the most well respected, Innovators bring new ideas into system.
Early Adopters "Respect"	These people are a more integrated part of the local social system than are innovators. They hold leadership roles and embrace change or new ideas. Change agents seek out an early adopter as a local missionary for speeding the diffusion process.
Early Majority "Deliberate"	The early majority's unique location between the very early and the relatively late to adopt makes them an important link in the diffusion process. They provide interconnectedness in the interpersonal networks.
Late Majority "Skeptical"	Adoption may be both an economic necessity for the late majority and the result of increasing peer pressures. Innovations are approached with a skeptical and cautious air, and the late majority do not adopt until most others in their system have already done so.
Laggard "Traditional"	Laggards are the last in a social system to adopt an innovation. They possess almost no opinion leadership. They tend to be suspicious of innovations and of change agents. Their adoption decision is lengthy and lags far behind their peers because they must be certain the new idea will not fail before they use it.

Innovators and early adopters are quick to investigate and try innovative resources such as innovative technology. However, the majority accept an innovation much later in the process or resist adopting new technology altogether. Thus, a library may adopt a new technology but librarians may be slow to accept and adopt the technology into their practice.

Rogers (2003) demonstrated that the adopter distribution follows an s-curve over time with the five adopter categories: innovators, early adopters, early majority, late majority, and laggards. The normal frequency distribution has several characteristics used

to classify adopters: the mean of individuals in the system and the standard deviation, a measure of variation about the mean. The mean and standard deviation divide adopters into the five categories mentioned previously. Vertical lines mark off standard deviations on either side of the mean, so the normal curve is divided into categories with a standard percentage, see Figure 2.

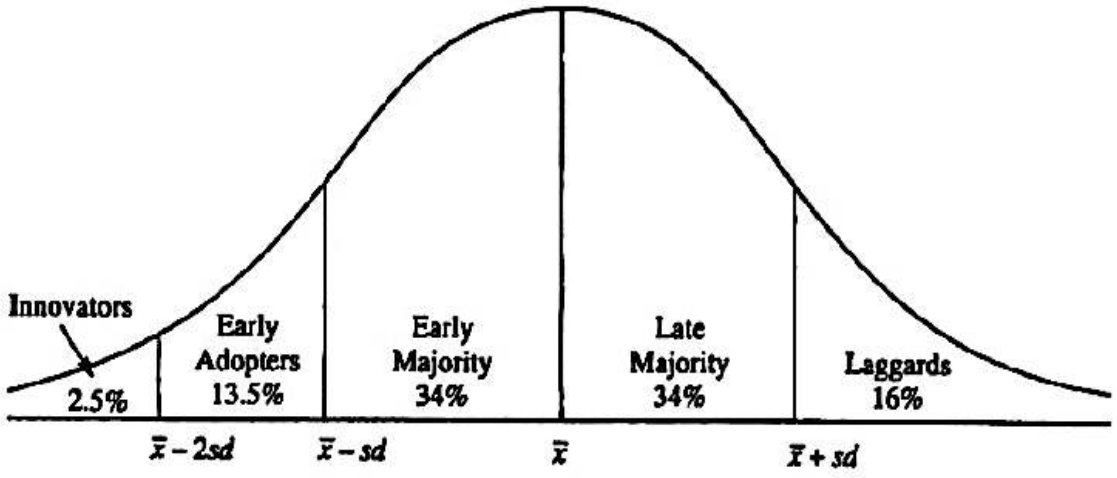

Figure 2. Adopter categorization based on innovativeness. From *Diffusion of innovations* (5th ed.), by E. M. Rogers, 2003, p. 280. Copyright by Simon & Schuster.

Attributes of adopters and rate of adoption. Rogers (2003) identified five attributes of innovation that decrease uncertainty about the innovation. He mentioned these in his theory of perceived attributes of innovations. Attributes of innovations includes five characteristics of innovation: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability. Rogers (2003) stated that the individuals' perceptions of these attributes predict the rate of adoption of innovations.

The rate of adoption is the speed of which members of a social group adopt an innovation (Rogers, 2003). For example, the rate of adoption of a new bibliographic

system is the number of public librarians who adopted it over a period. The significant predictors of the rate of adoption are the perceived attributes of an innovation. The five attributes also explain the 49-87% variance in the rate of adoption of innovations (Rogers, 2003). Additionally, these attributes, the innovation-decision type (collective, optional, or authority), communication channels (interpersonal channels or mass media), social system (norms or network connections), and change agents may increase the predictableness of the rate of adoption of innovations. For example, typically an individual adopts personal and optional innovations faster than the innovations involving an organizational or collective innovation-decision. Nonetheless, Rogers found that relative advantage is the strongest predictor of the rate of adoption of an innovation.

Relative advantage. The degree to which individuals perceive an innovation is better than a previous innovation is relative advantage (Rogers, 2003). Cost and social status motivations are part of relative advantage. As an illustration:

- Early adopters and majority are more status-motivated for adopting innovations and the late majority with the laggards see status as less significant.
- When academic librarians faced new demands of mobile technology (such as iPads) placed on them, they will adopt technology 89% of the time (Hamasu & Bramble, 2015).
- If educators see that technology has value in their instruction, then they will use it (Ashrafzadeh & Sayadian, 2015; Chitiyo & May, 2018; Pereira & Wahi, 2017; Shonhe, 2019).

Rogers (2003) presented two labels for innovations: preventive and incremental. The preventive innovation refers to a new idea that an individual adopts now to lessen the chance of some unwanted situation. Preventive innovations have a slower rate of adoption, so their relative advantage is highly uncertain. The incremental innovation or non-preventive innovation has beneficial outcomes in a shorter period.

Compatibility. Relative advantage and compatibility are similar, but they are theoretically different. Rogers (2003) defines compatibility as the degree to which individuals view an innovation as consistent with existing, past, and potential experiences of adopters. A lack of compatibility between the innovation and individual beliefs could negatively affect the adoption of the innovation. Thus, if an innovation is compatible with a librarian's needs, then uncertainty will decrease and the rate of adoption of the innovation will increase. For example, Moore and Benbasat (1991) stated that a technology should be compatible with aspects of users' work, that it should fit well with the way they work and fit their work style.

Complexity. Complexity is the degree to which an individual perceives an innovation as difficult to understand and use. Unlike the other attributes, complexity is negatively correlated with the rate of adoption (Rogers, 2003). Increased complexity of an innovation is an adoption hurdle, as illustrated in the following examples:

- A new technology could challenge faculty members to change their teaching methods (Ashrafzadeh & Sayadian, 2015), which would increase the level of complexity.

- If an application like Twitter were user-friendly, then a person might successfully adopt it (Alajmi, Alharbi, & Ghuloum, 2016).

Trialability. Rogers (2003) explains trialability as the degree to which an individual can experiment with the innovation for a limited time. Trialability, unlike complexity, is positively correlated with the rate of adoption. The more often someone tests an innovation, the quicker they will adopt it. Rogers stated that earlier adopters view trialability more important than later adopters. For example:

- If cities wanted to reduce traffic on the road, offering trial bus passes or bicycle rentals could increase the chance of individual using the alternative (Strömberg, Rexfelt, Karlsson, & Sochor, 2016).
- When offered the option to try eBook readers, students were more likely to adopt this technology (Waheed, Kaur, Ain, & Sanni, 2015).

Observability. Rogers (2003) defined observability as the degree to which the results of an innovation are visibly available. Like relative advantage, compatibility, and trialability, observability also is positively correlated with the rate of adoption of an innovation. The following examples illustrate observability:

- Role modeling could be a key factor in the diffusion of innovation (Rogers, 2003).
- Wearable technology is highly pervasive because the observation of its use has positively influenced the diffusion (Taib, De Coster, & Nyamu, 2016).

Rogers (2003) explained that a population will adopt an innovation faster when it has more relative advantage, compatibility, simplicity, trialability, and observability. He

cautioned that even with an innovation's obvious advantages, getting it adopted can be difficult. It is important to remember that the availability of all these attributes of innovations will improve the rate of the innovation-decision process. Thus librarians, whose work is public and collaborative, are more likely to observe the use of a new technology introduced in a new program or through coworker support.

Innovation-decision process. Rogers (2003) defines the innovation-decision process as the point in time when individuals move from first knowledge of an innovation to the decision to adopt or reject it as they move to integrating the innovation and confirming their decision. These communication stages are knowledge, persuasion, decision, integration, and confirmation, see Figure 3.

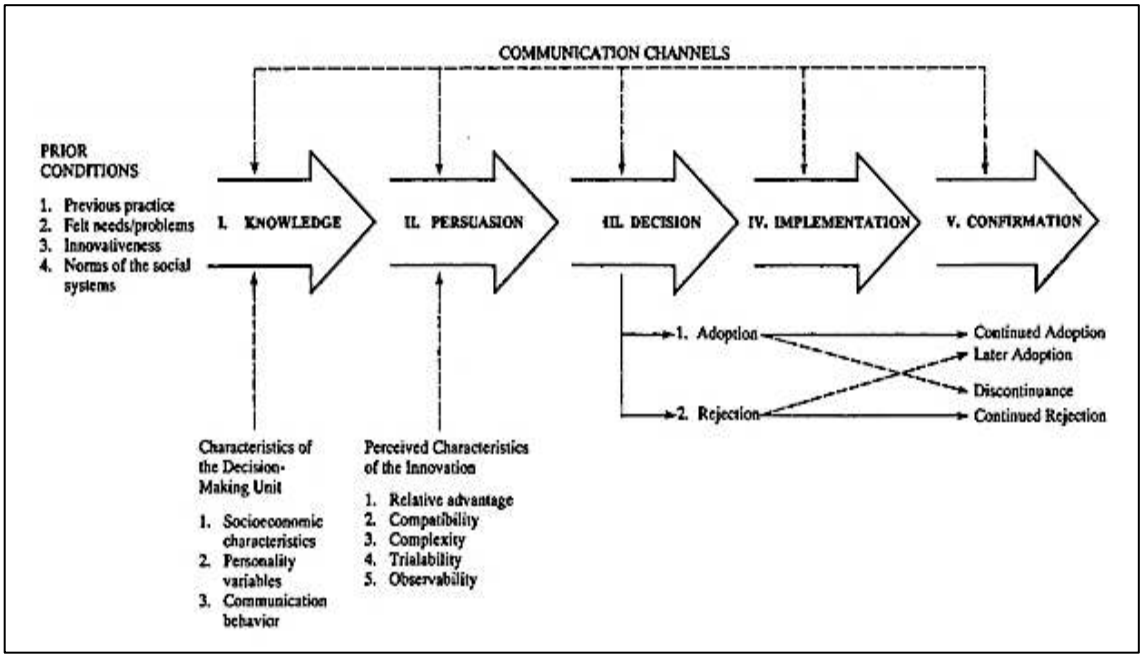

Figure 3. Rogers's (2003) model for the five stages of the innovation decision process.

The knowledge stage reveals an innovation and how it works through three phases. First there is gaining awareness-knowledge, where an individual is aware of an

innovations' existence (Rogers, 2003). Awareness-knowledge is not a passive activity, so a librarian could hear about an innovation through communication channels like library trade journals. This type of knowledge motivates the librarian to seek out the next type of knowledge. Second is how-to knowledge, a necessary step toward utilizing the innovation. This step consists of getting the information necessary to use the innovation properly, which could vary based on the complexity of the information). If the innovation were a new eBook service, for example, this could look like librarians getting a step-by-step guide of the service. The third and last knowledge stage is obtaining principle-knowledge that holds information on regulating the principles of how an innovation will work. For librarians, a new eBook service or a new makerspace device could fundamentally change how they work, as it could replace current services and effect the way they share books with patrons. In this stage change agents should generate awareness-knowledge and then really focus on how-to knowledge but not forget that principle knowledge is important for some. Consideration of an innovation does not move beyond the knowledge stage if the individual does not find the new knowledge applicable to them or there is insufficient knowledge acquired. If the user acquires knowledge, the next stage is persuasion.

The persuasion stage occurs at the time the individual forms an opinion of the innovation (Rogers, 2003). Rogers defined persuasion as the equivalent to attitude creation and change on the part of an individual, but not necessarily in the direction intended. Individuals are psychologically involved with the innovation and seek information, identifying information they regard as credible, and deciding to form a

favorable or unfavorable attitude toward the innovation. For example, librarians once had to develop an attitude toward having public computers in the library which involved much discussion about the perceived benefits and complications. The perceived attributes of an innovation, its relative advantage, compatibility, and complexity, are important in this stage. Individuals will also weigh the option against their future and have any uncertainties reinforced by social interactions based upon available information and channels before they decide.

The decision stage takes place when an individual engages in activities that lead to a decision to adopt (Rogers, 2003). Adoption is the decision to fully use an innovation and rejection is the decision not to adopt. Most individuals who try an innovation will adopt if it proves to have a degree of relative advantage. The ability to try the innovation, like free samples, will increase the rate of adoption. Change agents, wanting to increase the rate of adoption, can also attempt demonstrations. For example, librarians wanting to include an innovation into a current library program could provide a demonstration during a meeting where department leaders could witness and possibly try an innovation. Once an individual decides to adopt an innovation, implementation follows.

The implementation stage means the individual uses it. Until this moment, the innovation-decision process has been a mental process. This marks the behavioral change, but there is a certain degree of uncertainty that may still be present (Rogers, 2003). Active investigation, question-answering, takes place and it is up to change agents to provide support. For an organization, the implementation stage may be quite complex. Looking at individual library staff there are several branches of decision-makers that

could increase complexity such as county government, library board, library administration, library department heads, library managers, leads, and various individual positions.

In an organization, there are multiple people involved, and the implementers are often different from the decision makers (Roger, 2003). The organizational structure that gives stability and continuity to an organization could also trigger resistance to the innovation. This stage could continue for a long time, but eventually the new idea becomes established. At this point the innovation loses its innovation identity and signals the end of the implementation stage.

The final stage of the adoption process is confirmation. Here the individual decides if she or he will continue the use of the innovation and understands the benefit. Adopters recognize the benefits and integrate it into their routine. Approving individuals will promote the innovation by sharing it with others. Compare this to using an eReader device to download library books, an individual could then share that adoption with friends and evangelize the features.

Research using diffusion of innovations in public libraries. Like UTAUT, researchers have not used the diffusion of innovation theory in studies about librarians. Instead diffusion of innovation studies have focused on the adoption of specific library services and innovations, as well as their effect on librarians. This section reviews research focused on those library services and innovations.

Within the context of academic library assisting faculty with technology training, Stock-Kupperman (2015) explored a framework for collaboration in technology training

through the lens of faculty learning community and diffusion of innovation theory. This was a case study of one university library taking the lead on technology training after a multi-year, systematic collaboration with instructional design and information technology staff. In this study researchers applied faculty adoption rates with Rogers's (2003) bell-shaped adoption curve to faculty in this study and found that faculty members fell within the same categories and that the training needs were different with each group. Unlike diffusion of innovation concepts, many faculty members found rank unimportant in determining willingness to adopt technology, but younger faculty and those in technical disciplines were more likely to be early adopters. They also found that a combination of social support, communications, training resources, and designated time to learn or reflect best supported faculty adopters. This was where researchers then employed the faculty learning communities, which are small groups of cross-disciplinary faculty engaged in a time-based program focused solely on teaching and learning improvement. The faculty learning community relied on experiential learning theory where individuals created knowledge through transforming learning experiences into existing cognitive frameworks that changed their way of thinking. After understanding more about faculty use behavior and their intention to adopt under certain parameters, the researchers were able to establish several initiatives to adopt iPads, Moodle, an online student retention tool, online streaming tool, and Office365. Using diffusion of innovation in conjunction with faculty learning community helped the library better understand and provide meaningful services to faculty.

Other research has focused on higher education because of the impact of technology significant amount of literature has called for change in higher education primarily because of technology In a mixed methods study that that combined the punctuated equilibrium and diffusion of innovations theory, Katuli-Munyoro and Mutala (2018) investigated the lack of change that information and communication technologies have not had on library and information study programs in higher education. Their research questioned the level of awareness and attitudes of LIS faculty staff have toward the importance of technology. Using both diffusion of innovation and punctuated equilibrium theory allowed, according to researchers, both evolutionary change with diffusion of innovation theory and revolutionary change with the punctuated equilibrium theory. Punctuated equilibrium theory states that organizations go through long periods of stability or equilibrium, but at some point, revolutionary changes punctuate the equilibrium. The study integrated a case study design with interviews and a quantitative survey on a 5-point Likert scale for a sample of 47 LIS faculty staff and five deans from five universities. The study found that LIS faculty staff have high awareness levels of and optimism about the change in basic assumptions, but still resisted change. They attributed resistance to concerns of lack of competencies, confidence, time, resources, clearly formulated policy and regulatory frameworks, shared vision, and visionary leadership. Additionally, students' weak ICT competencies, fear of the unknown, fear of extra workloads, and lack of incentives together with the tyranny of customs compounded resistance to new technologies. The researchers provided significant information for decision makers at national and institutional levels. By using diffusion of innovation in an

organization context, they placed an emphasis on the innovation adoption process or lack of adoption as in this case.

From a different context, some researchers have used the diffusion of innovations theory in conjunction with several other theories. Aharony and Shonfeld (2015) conducted a study with students from educational technology and library and information science programs to explore what factors influenced students' ICT use and web technology competence. The study used diffusion of innovations, the big five model, and motivation theory. The big five is a personality model that includes five factors representing personality traits: neuroticism, extraversion, agreeableness, openness to experience, and conscientiousness. Motivation theory addresses any variable that may influence students' attitudes toward ICT. The hypotheses associated with diffusion of innovation included the intensity of ICT use that was positively associated with students' perception of relative advantage and the intensity of ICT use that would be negatively associated with students' perception of complexity. For the big five model they hypothesized that the openness will be positively associated with ICT use and neuroticism will be negatively associated with ICT use. Motivation theory hypothesis was the higher the motivation students have, the greater the ICT use. There were 110 responses to five different surveys built on demographics and the three theories. Results from the surveys found that both hypotheses from diffusion of innovation were accepted as: the more students use ICT, the higher their perceptions about its relative advantage and that the more students perceive ICT use as complex the less they use it. For the big five model the first hypothesis was accepted, but the neuroticism was not negatively

associated with ICT use. The motivation model hypothesis was accepted. The researchers not only contributed to understanding the variables that influence ICT use, but they demonstrated the advantage of using diffusion of innovation in the field of educational technology and library and information sciences.

Another study combining two frameworks is Liu & Hsu (2018) who used the diffusion of innovation theory alongside the TAM to conduct a study on the use of micro positioning beacons for locating and managing a patron's books in a library. Researchers wanted to develop a specific TAM for library micro-positioning services. The main purpose of the study was to explore user's behavior during the use of library micro-positioning services and to examine the key factors of the service success. They developed nine hypotheses and administered a survey that had 45 responses. Results on use attitude confirmed that if users perceived ease of use and spend less time and effort learning to use of this service, then the users' own use attitude will have a positive influence. The results also showed that the higher personal innovativeness of users means more positive attitude, the perceived entertainment of the users will have a positive influence in their use attitude, and a higher relative advantage and possibility of innovativeness will have a positive influence on acceptance rate. Results surrounding behavioral intention showed that perceived usefulness will not influence users to improve their behavioral intention to use the service and use attitude will have a positive influence on their own behavioral intention. While this study utilized TAM as a base model, they included significant diffusion of innovation theory characteristics of relative advantage and compatibility to help develop the proposed new model.

Other research has focused on the adoption of systems, such as open-source versions of software because costs associated were much lower and there was local support. To better understand the diffusion of open source integrated library systems (OS ILS) in Ugandan universities, Ponelis and Adoma (2017) conducted a study using diffusion of innovation supplemented by the fit-viability theory. An integrated library systems (ILS) was a commercially purchased software that is part of library automation of functions such as acquisition, circulation, cataloguing, reference service, and serials controls. Their goals were to determine the extent and pattern of diffusion of OS ILS as an innovation in libraries, identify any drivers and barriers of adoption, and determine whether there was a difference between public and private university adoption. They used a two-part survey of demographics and the current and future library automation situation. This survey included both open-ended and closed-ended questions. The sample included 63 librarians, of which 21 completed the survey. The researchers purposefully selected librarians for membership in the Consortium of Uganda University Libraries. The diffusion of OS ILS approached the S-curve expected based on diffusion of innovation. Researchers found that libraries adopted OS ILS for more flexibility because they thought it was an affordable cost, but not all were fully satisfied. They found that private universities were early adopters and innovators with public libraries following their lead. They also stated that the information and communication technology infrastructure, organizational procurement policies, national procurement legislation, human resource capacity, and limited finances were barriers to diffusion. This study showed that diffusion of OS ILS was taking place in Ugandan libraries and could, with

consideration of drivers and barriers, lead to improved performance due to better fit and viability of the OS LIS in libraries. This study successfully employed diffusion of innovation to understand adoption rates and define levels of influence that would guide further research.

Researchers have used the diffusion of innovations theory in conjunction with several other theories to explain the adoption of specific systems, define levels of influence, and illustrate the acceptance of technology in an organization. The additional theories expanded the studies to also understand behavioral intention, personality traits, motivation. In the context of libraries and library science, my review indicates that studies were either qualitative or mixed methods in nature and the use of diffusion of innovation is valid in a variety of settings.

Limitations of the diffusion of innovations. Diffusion of innovations theory is not without its critics. It is not known why certain attitudes lead to adoption or rejection and diffusion of innovation fails to link between innovation properties and expected attitude (Nan, Zmud, & Yetgin, 2014; Tarhini, et al., 2015). In response to these criticisms, Venkatesh, et al (2003) created the UTAUT model to reduce the workload on researchers who are combining constructs from various TAMs. Explained in the previous section, UTAUT integrates the characteristics of innovation as perceived advantage in performance expectancy, trialability in performance expectancy, observability in performance expectancy, complexity in effort expectancy, and compatibility in social influence from the diffusion of innovation theory (Venkatesh, et al, 2003; Williams, Rana, Dwivedi, & Lal, 2015).

The constructs that affect acceptance of technology are important, but the process through which they pass is equally important. Initially, Venkatesh noted that diffusion of innovation was part of eight theories used to build UTAUT but he did not include the innovation-decision process of communicating stages. Different communication channels play a different role at each stage of the innovation-decision process and in a system, this is more complicated than on an individual level (Rogers, 2003). UTAUT is more applicable to users in the system, allowing for human factors to contribute to the adoption decision. Diffusion of innovation theory is more suited to organizations. For this study, I will use these two frameworks to examine how the individual librarian reports their adoption process within the larger institutional context, through relative advantage, compatibility, complexity, observability, and trialability.

Literature Review Related to Key Variables and Concepts

This literature review covers the following major topics: Technology adoption from related populations, how librarians learn, and how librarians learn technology. Although my research focuses on public libraries, I expanded the literature to include topics from higher education. The need to expand the literature review into higher education identified a gap in the existing knowledge of public libraries and will contribute to future studies.

Technology Adoption from Related Populations

Building on studies summarized about public libraries and UTAUT, this section examines research that have used different populations, but which are like the proposed study. The UTAUT model, which applies constructs to identify factors that affect

technology adoption, has been applied in a wide-range of educational contexts including as learning management systems (Bervell & Umar, 2017; Radovan & Kristl, 2017), online/virtual classrooms (Dečman, 2015; Isaias, Reis, Coutinho, & Lencastre, 2017; Kidd, Davis, & Larke, 2016), eBooks (Lawson-Body, Willoughby, Lawson-Body, & Tamandja, 2018), web-based resources (Alshare, El-Masri, & Lane, 2015; Altanopoulou & Tselios, 2017; Jung & Lee, 2015; Lakhal & Khechine, 2016; Xu, 2015), and student monitoring/communication devices (Farag, Park, & Kaupins, 2015; Yusof, Qazi, & Inayat, 2017). Higher education was also an important inclusion since public librarians must obtain MLS/MLIS degrees for their employment and academic libraries often work closely with educators in higher education. UTAUT use in this section will include modified, integrated, and extended uses of the model.

Educators. Higher education has seen significant changes at the institutional level due to technological advances. Radovan and Kristl (2017) stated that higher education institutions have incorporated information and communication technologies into their teaching process to transform traditional pedagogy and improve teaching strategies. They examined the acceptance and use of learning management systems among higher-education faculty members. They hypothesized that the acceptance of blended teaching and the acceptance/usability of the university's learning management system influences the formation of a teaching presence. Employing the UTAUT model and a complementing community of inquiry framework, they administered a web-based quantitative survey to 326 teachers from 26 universities in Slovenia. Community of inquiry states that online learning is not just a consequence of cognitive factors and the

teacher, but also the existence of a community. Combined with UTAUT and community of inquiry the researchers assumed that perceived usefulness, effort expectancy, and social influence should have a significant influence on the willingness to use. This willingness, according to Radovan and Kristl, should have affected use frequency, upon which teaching presence in a learning management system depends. The results indicated that performance expectancy or usefulness of the learning management system was the main predictor of acceptance of the learning management system, and effort expectancy was not a determinant of behavioral intention or intention to use e-learning environment. Social influence proved to have a greater than expected role in adopting the learning management system but no direct influence on actual use. According to the UTAUT model, facilitating conditions do not have direct influence in behavioral intention, but in this study they did. This is more in line with the UTAUT 2 model from Venkatesh et al. (2012) where facilitating conditions directly influence behavioral intention.

Another study of learning management system acceptance (Bervell & Umar, 2017) focused on tutors as an extension of faculty. The target population was 400 tutors working in distance education, but only 267 responded to the Likert scale-based survey. Researchers developed the survey using demographic data and the four direct determinants of UTAUT. Results of the relationships indicated that the main determinants of behavioral intentions by tutors in distance education were effort expectancy and facilitating expectancy. The effect of performance expectancy was not relevant, and the effect of social influence was insignificant to behavioral intention. This study illustrated that a non-linear relationship can exist between and among UTAUT

exogeneous constructs. The findings showed that the tutors' intention to accept learning management system was a product of effort expectancy and facilitating expectancy. This result, in this case, allowed researchers to develop a UTAUT model with all initial moderators that has a combination of linear and non-linear relationships.

In a similar study of technology acceptance, Kidd, Davis, and Larke (2016) explored the experiences of public health faculty who were teaching online to inform educational practices and workforce development initiatives. Adoption and experience were two concepts emerged from this study. Researchers used UTAUT to measure how attitudes towards technology, self-efficacy, and computer anxiety played a role in the use and experience of an innovation which was in this case online teaching. In addition to UTAUT, they included Dewey's (1963) theory of experience because Kidd et al. found UTAUT only provided a discussion of how experience influences the use of technology, thus limiting insights into experience. They stated that Dewey's theory of experience was based on the principles of continuity and interaction, which means that an individual's prior experience may influence current learning experiences, as well by the physical and social settings of the previous and current experience. This study was a phenomenological study with a total of five faculty who participated in intensive multiple one-hour interviews, an analysis of their online course, and their course documents. They identified three common themes from the experiences: rhetoric of fear, transformation, and negotiation of institutional support. The researchers found that UTAUT explained the rhetoric of fear as anxiety and this influenced attitudes toward technology, which was the degree to which an individual believed they should use a technology. This study also

showed that the influence of past experiences of online teaching directly influences self-efficacy, which UTAUT defines as the degree to which individuals judge their ability to complete a task. Lastly, the experience of faculty showed a struggle with institutional support, which is what UTAUT defines as facilitating conditions that are necessary for adoption. The study findings identified that an individual's failure to learn a technology may induce a negative cycle of non-use and emotions.

Identifying factors that motivate or impede faculty use of online learning components was also a theme for Xu (2015). This mixed methods study focused on the use of learning object repositories by faculty of colleges and universities that had access to the Orange Grove and Wisconsin Online Resource Center learning object repositories. UTAUT was the main theoretical framework for the study and used in two phases. The first phase was a set of thirteen semi-structured qualitative interviews that identified twenty-two factors that motivated faculty and twenty-one barriers to use. The second and last phase utilized a web-based survey with a five-point Likert scale that measured the 38 respondents' opinions about factors that influenced the use of the learning object repositories. The researchers aligned the 22 motivating and 21 barrier factors with UTAUT direct determinants and compiled into 10 specific constructs that informed designers of learning object repositories about what positively or negatively influences faculty use of learning object repositories.

other research has focused on adoption of specific technologies. Farag, Park, and Kaupins (2015) examined faculty perception of the adoption and use of clickers in a business classroom. Clickers are wireless handheld devices that often contain a keypad

permitting students to respond to an instructor who has a receiver that collects responses on a computer using specific clicker software. They used UTAUT to examine the perception of adoption because of its use in similar studies to develop a comprehensive framework for predicting the conditions under which clicker technology adoption is likely to emerge. Farag et al. designed a UTAUT web-based survey and sent it to 912 of the undergraduate and graduate faculty members within the program. The 106 faculty members who responded to the twenty-six-question survey reflected both user and non-user responses. There was a significant association between clicker experience and perceptions of teaching quality. The biggest differences between users and nonusers related to the amount of time expected to learn how to use the clickers and the apprehension regarding learning how to use them. They also explained that clicker users tend to be less intimidated and did not feel that clickers took longer to learn. Gender, academic rank, total enrollment in the institution, and recent perceptions of performance appraisal ratings were not to be associated with the UTAUT variables.

Extending the use of UTAUT with an additional variable, the Šumak & Šorgo (2016) study investigated the differences in the UTAUT determinants between pre- and post-adopters of interactive whiteboards (IWB). This quantitative study employed a thirty-seven-item online survey from 898 responses from teachers, principals, and higher education faculty in Slovenia. The results compared post-adopters and pre-adopters, finding that for pre-adopters the social influence had a big effect on behavioral intentions, performance expectancy strongly affected attitudes toward using IWBs, and there was a significant difference in attitudes towards using IWB on users' potential use of IWBs.

Then for post-adopters they found that the facilitating conditions had a big effect on the use of IWBs and behavioral intention was a strong predictor of the use of IWBs when compared to pre-adopters. Even though the researchers admitted limitations of both their use of the snowball sample and omission of technology abandonment as an issue, they did demonstrate an effective strategy for modifying UTAUT to fit the situation.

Technological changes in education are abundant and often affect the teacher-student relationship. In understanding the teacher-student relationship, Yusof, Qazi, and Inayat (2017) examined the use of a student real-time visualization system. The student real-time visualization system enables teachers to monitor students inside the classroom, analyze student grades, manage student data, assign time slots, and assist with student attendance. Their study sample came from two different universities in Malaysia and was comprised of 119 participants that were teachers or university administration. The UTAUT-based survey provided to participants was in two parts: seventeen questions to measure the constructs in the research model from teachers and questions about the participants' demographics. In examining results, they included a dependent variable of usability expectancy which represented a users' intention to use student real-time visualization system in the future and their satisfaction with it. They hypothesized and found that performance expectancy, effort expectancy, and facilitating conditions did have a significant effect on usability expectancy. Usability expectancy did have a significant effect on user satisfaction. The results for the variables of gender showed that the effect of performance expectancy on usability expectancy and the effect of usability expectancy on satisfaction was greater for male participants. The effect of effort

expectancy and facilitating conditions on usability expectancy was more for female participants. The variable of category, which was teacher or administration, revealed that non-teachers did not consider performance expectancy as an important factor in deciding to use and the teachers placed substantial importance to the performance expectancy and effort expectancy when making their decision. The facilitating condition that resources and supports were available was of importance to both teachers and administration. The usability expectancy of student real-time visualization system included its ease of use or both categories in determining their satisfaction level.

Like the previous study that explored the teacher-student relationship, Jung and Lee (2015) examined factors influencing YouTube acceptance by university faculty and students in Japan and the United States. They surveyed 90 students from the USA, 479 students from Japan, 27 educators from the United States, and 29 educators from Japan. Surveys were based on the Venkatesh et al. (2003) study and contained 19 items using a 5-point Likert scale. The results of the study show that performance expectancy, social influence, and facilitating conditions influenced YouTube acceptance for educators and students in the two countries. The influence of each predictor on YouTube acceptance varied according to the cultural environment and the roles of the educators and learners. Effort expectancy was not an important predictor of YouTube acceptance for all participants, but culture did have a significant effect on effort expectancy. The researchers hypothesized that facilitating conditions were stronger in Japan than in the United States, but that was only true for students. The effect of social influence on behavioral intention was stronger for students than educators. They also found that a

strong effect of performance expectancy has on behavioral intention for educators than for students, but performance expectancy was also a factor for predicting students' acceptance of YouTube. This study demonstrated that educators show a stronger intention to use, but Japanese respondents showed weaker intention to use YouTube than those in the United States. They did not explore a possible effect of demographics of gender and age in the study, so the researchers could focus on the cultural and role differences.

Investigating another learning tool, East, Havard, & Hastings's (2016) research had two objectives. The first was to identify factors influencing counselor educators' decisions to include or not include instruction regarding the use of mental health mobile applications by investigating perceptions of mental health mobile applications before and after interaction with one evidence-based mental health mobile applications, Prolonged Exposure Coach app. The second objective was to determine how counselor education programs are contributing to future counselors' technological competence. To organize the sequential explanatory mixed methods study, researchers used a nonexperimental comparative design in the quantitative phase to investigate the current state of counselor education regarding mental health technologies. This study included behavioral intention to use an innovation and defined it as counselor educators' behavioral intention to teach students about mental health mobile applications. Researchers stated that educators' courses may be incompatible with integrating mental health mobile applications so they investigated total values of mental health mobile applications by combining scores from three UTAUT-based scales: performance expectancy/relevance, effort expectancy, and

attitude. The researchers use a phenomenological qualitative approach in the second phase of research. One-hundred and thirty-two participants completed a 38-question survey and then 10 educators from different institutions completed qualitative semi-structured interviews. Results from the qualitative interviews produced themes of relevance, benefits, ease of use, ethical concerns, and the need for efficacy evidence also supported the influence of the independent variables on behavioral intention. The independent variables identified by the UTAUT along with the variables anxiety/apprehension and ethical concerns influenced counselor educators' behavioral intention. This study is a good example of mixed methods approach to using the UTAUT model.

Researchers have also used UTA to explore potential barriers or levels of acceptance when institutions planned to integrate new technologies.With an e-learning initiative on the horizon, Evans & le Roux (2015) questioned whether academic staff and students accepted existing e-learning resources at the University of Zululand, although they did not specifically define e-learning. Four-hundred and five students and 73 academic staff completed a quantitative survey based on UTAUT that had a five-point Likert scale. The results of the study demonstrated the acceptance of e-learning resources by both students and academic staff. Acceptance required a positive relationship that will influence both behavioral intentions to use and usage behavior. Empirical findings showed respondents perceived e-learning resources improved student performance and were easy to use. With the academic staff, researchers found a significant relationship between the use of resources and improved academic performance. Empirical results

demonstrated moderate predictive accuracies for student and academic staff's behavioral intentions. Also, UTAUT had a low predictive accuracy for student usage behaviors but was twice as accurate in predicting academic staff's usage behavior towards e-learning resources. Although results could not be generalized to other institutions, the findings contributed to UTAUT's theoretical validity and empirical applicability to the organization of e-learning initiatives.

Students. To explain the variance in usage intention, Khechine, Lakhal, Pascot, and Bytha (2014) used UTAUT to determine factors that explained the acceptance of an online seminar system called Elluminate. Online seminar systems like Elluminate are web-based conferencing systems that this university used to support blended learning, but the course for this study was online only. Four-hundred and seventy students in an undergraduate information systems management course in the business administration program of a Canadian University received a 27-item survey based on a 7-point Likert scale. Only 114 participated in the survey. Results indicated performance expectancy, effort expectancy, and facilitating conditions directly influenced the intention to use Elluminate. Performance expectancy was the strongest predictor of the intention, effort expectancy was not a predictor of the intention, social influence was a significant predictor of intention, and facilitating conditions made students more willing to use Elluminate. Age, instead of gender, was the only variable that moderated the relationship between performance expectancy and facilitating conditions and the dependent variable of the intention to use Elluminate. Younger students were worried more with their own

performance, and older students were more anxious about facilitating conditions. This quantitative study aligned with the original UTAUT model, despite the academic setting.

With the proliferation of electronic books, researchers have also examined acceptance by students for a new format of a required resource. Lawson-Body, Willoughby, Lawson-Body, and Tamandja (2018) collected data from accounting students to test the UTAUT acceptance model. One-hundred and fourteen students across five different accounting classes completed the survey. Researchers built the 28-item survey with a 5-point Likert scale like the Venkatesh et al. (2003) UTAUT survey and only modified text to include information about eBooks. Researchers categorized their hypotheses into four areas: perceived ease of use/perceived usefulness, innovativeness, attitude toward books, and perceived risk. The results were consistent with most of their hypotheses, but they were surprised to learn that perceived ease of use did not have a positive effect on any factor. According to Lawson-Body et al. (2018), perceived ease of use has negative effects on perceived usefulness and attitude toward eBooks. This suggested that accounting students found eBooks impractical. Their research extends the applicability of the UTAUT model in education.

Understanding how technology acceptance can improve participation is another focus for research in higher education. Isaias, Reis, Coutinho, & Lencastre (2017) established a modified version of UTAUT model to examine the acceptance of empathic and affective principles in an educational forum. They believed these principles were useful and effective ways to increase students' participation and motivation. In their version of the UTAUT they used the variable attitude toward technology and then used

gender, age, and experience as moderators. They gathered data in an online survey of 69 Portuguese students from two different universities. The results confirmed three of the nine hypotheses: performance expectancy and effort expectancy had a positive influence on the students' attitudes when the effect of social influence and facilitating conditions were considered insignificant; social influence had a positive influence on the students' behavioral intention to use when attitude toward technology, performance expectancy, facilitating conditions and effort expectancy were not relevant. Despite the small sample size, this study established grounds for future research on attitude and its use in the UTAUT model.

Researchers have also explored how UTAUT could provide insights into technology use when such use was mandated and not elective. Dečman's (2015) study assessed and evaluated the appropriateness of UTAUT within a mandatory e-learning environment of 228 first year undergraduates from the administration science department. The study uses the UTAUT model but modified it to fit their learning environment. They kept the influence of gender and included students' previous education on acceptance and use. They excluded age because all students were of age 18 or 19. Since a blended form of learning was mandatory researchers excluded the factor voluntariness of use. They also excluded the facilitating conditions construct because they did not include the use behavior construct. The survey was a web survey with 19 questions and measured with ordinal scales using a 7-point Likert scale. Researchers assumed five hypotheses: performance expectancy will have a significant positive influence on students' attitude toward behavioral intention, effort expectancy will have a positive significant influence

on students' attitude toward behavioral intention, social influence will have a significant positive influence on students' attitude toward the behavioral intention, gender will have a significant influence on the relationships, and student previous experience will have a significant influence on the relationships. Results demonstrated the applicability of the UTAUT model in e-learning settings and showed that social influence and performance expectancy significantly influenced the intention to use e-learning technology. The results indicated no significant influence of students' previous education or gender on the model fit. Researchers also assumed that students 18-19 years of age thought that they handled modern technology well and were ready to use it only if there was an increase in performance. This study supported the use of UTAUT in mandatory e-learning environments but limited because they could not identify the relation between behavior intention and use behavior since the researchers did not include it.

Following Dečman's (2015) study and using a modified UTAUT, Alshare, El-Masri, & Lane (2015) researched the factors that influence students' effort at learning enterprise resource planning software by assessing the effect of students' cultures. They proposed a model that integrates Hofstede's cultural dimensions framework to the UTAUT model. The model from this study included effort expectancy, performance expectancy, and social influence, but the researchers did not include FI since the support needed for the use of enterprise resource planning system was available for students. They included self-efficacy because it measures students' perception of their capability of using enterprise resource planning software. Excluded from the study were the original demographic moderators from the UTAUT model; this was due to the inclusion of the

cultural dimensions as moderators. From Hofstede's model they defined culture by five dimensions: power distance, uncertainty avoidance, individualism–collectivism, masculinity–femininity, and time orientation. External variables considered were course structure, self-efficacy, career relevance, and subjective norms. The study used a two-part survey that first asked for a few demographic variables related to their program and second asked students to evaluate 13 variables mentioned earlier. Study participants were students from three different but similar enterprise resource planning courses at two Midwestern US universities. All 102 students completed the survey. Results showed that students' perceptions of effort expectancy and performance expectancy of enterprise resource planning software predicted students' attitudes which in turn affected the level of student's effort at learning enterprise resource planning software. This study demonstrated that the UTAUT model can be a good theoretical lens to examine the use of enterprise resource planning software in education and to examine student effort to learn enterprise resource planning software.

Predicting student acceptance and perceived value of technology has revealed insights into potential barriers for student adoption. Lakhal and Khechine (2016) collected data on the predictive value of some factors on acceptance and use of desktop web-conferencing by 376 undergraduate business students in a higher education blended information system course using an online survey. The survey was comprised of 38 items with a 7-point Likert-type scale and tailored to a specific desktop web-conferencing system called Elluminate (Flook, 2010). Also included with UTAUT constructs performance expectancy, effort expectancy, social influence, and facilitating conditions

was autonomy and their hypotheses were as follows: performance expectancy, effort expectancy, social influence, and facilitating conditions positively affects behavioral intention to use, autonomy positively affected behavioral intention to use, and autonomy positively affected performance expectancy and effort expectancy. Additionally, in this study, a moderating variable was the course delivery mode because students had the choice of taking the course face-to-face, online synchronous, online asynchronous, and blended. Results showed that performance expectancy, autonomy mediated by performance expectancy, and social influence were the main influences of the behavioral intention to use desktop web-conferencing. Since researchers used course delivery mode with the modified UTAUT model, results also suggested that course delivery mode played a moderating role. A limit of the study was the sample size and no open-ended responses.

Potnis, Demissie, and Deosthali (2017) investigated the factors influencing the intention of 405 undergraduate students to voluntarily adopt a personal safety wearable device at a four-year college in the Northeast portion of the United States. They proposed a theoretical model of six independent variables: performance expectancy, effort expectancy, social influence, facilitating conditions, and trust. Behavioral intention remained as a dependent variable. Surveys were part demographic-based and partly based on the variables. Researchers found no statistical significance between gender, age, and academic status of respondents in the model, so they did not control for these variables. Results from the measurement model stated that performance expectancy did not positively influence behavioral intention, but effort expectancy, social influence,

facilitating conditions, and trust did positively influence behavioral intention. In addition to quantitative results the survey allowed for qualitative responses to why students did not use their personal safety wearable device and researchers found that it confirmed their quantitative data. Despite that these results do not apply to all American universities; this study introduced and validated an additional construct to the UTAUT model.

There is evidence that acceptance may change with exposure, use, and possibly student maturity. For example, McKeown & Anderson (2016) designed a comparative investigation of the online use of one undergraduate and two postgraduate cohorts taking similar introductory management courses on the same online learning platform, Moodle. The researchers used the UTAUT model to develop a survey administered via hardcopy (paper) to students. Three-hundred and thirty students comprised the sample; 227 were undergraduates and 103 were post-graduates. Researchers use paper surveys as not to confuse students who might think it was an online university-driven survey. They found that technology use and students' acceptance increased as the researchers moved from undergraduate to post-graduate with little to no work experience and were highest for post-graduate students with 2 years or more work experience. Researchers stated this suggested that delivery of materials via online learning platforms requires more effort than a one-size fits all approach. This study has a verified use of the UTAUT model but limited otherwise to this very specific example.

Researchers have used UTAUT model in quantitative and mixed method studies, as evidenced in research reviewed for librarians, library services, and higher education educators and students. Additionally, researchers have used UTAUT in combination with

supportive theories to develop a full view of use behavior and/or behavioral intention. Some of the studies looked at the variables of age, gender, voluntariness, and experience, as related to technology adoption. The variables were found to moderate the effect of performance expectancy, effort expectancy, social influence, and facilitating conditions that influence the behavioral intention to use various technologies (Awwad & Al-Majali, 2014; Dečman, 2015; Farag, Park, & Kaupins, 2015; Isaias, Reis, Coutinho, & Lencastre, 2017; Jung & Lee, 2015; Khan, Masrek, Mahmood, & Qutab, 2017; Khechine, Lakhal, Pascot, & Bytha, 2014; Potnis, Demissie, & Deosthali, 2017; Yusof, Qazi, & Inayat, 2017; Yuvarj, 2016).

How Librarians Learn

Little is known about how public librarians learn in general much less about technology learning. However, some librarian learning research has focused on higher education academic librarians. Specifically, the studies reviewed in this section incorporate professional development as a core strategy, effective practices for professional development, and the role of administrators and library systems.

Professional development as a core strategy. Professional development is a core strategy for library staff to acquire and update skills once they have acquired formal certification. Alawadhi (2015), in a mixed methods study, investigated information professionals' and academic librarians' perceptions about the value of different continuing professional development activities. The distributed survey included items regarding communication/management, cataloging, user-service, and IT skills. Results revealed that information professionals, in academic libraries, believed they possess the

personal and professional skills that would enable them to serve library users, yet they placed a priority on development activities. Using a hermeneutic, phenomenological approach, Attebury (2017) corroborated Alawadhi's (2015) findings in an examination of ten academic librarian's perceptions of meaningful or transformational professional development activities. Through a survey and individual interviews, researchers found that librarians preferred longer and interactive development even when they created discomfort. While librarians preferred the cost effectiveness of on the job training, the truly transformational activities came from professional development activities that required something extra and beyond the normal day-to-day. Librarians had mixed feelings about reflective activities and found it important to face self-awareness. Thus, there is evidence that librarians learn well when they participate in applied training.

Research has documented the effect of continuing education in a variety of settings with implications beyond the local library. For example, Hamid and Soroya (2017) conducted a study to determine the outcome of continuing education programs and whether they were having positive or negative effect on the personal and professional lives of the participants. Researchers surveyed 120 library professionals that were from three different online discussion groups, each with a high rate of library professional memberships. Results demonstrated that continuing education programs had positive effects on work performance as a team member, knowledge of library automation or digital software, and managerial skills. They found that continuing education programs were a good way to improve library professionals' communication skills, personal interaction, leadership, research skills, and usage of advanced technical tools in their

personal lives. Fitzgibbons, Kloda, and Miller-Nesbitt (2017) examined journal club participation as cost-effective means for promoting ongoing development with participation of 20 librarians from four countries. A journal club is a group of people who focus on critically appraising articles using pre-existing guidelines or tools. Results indicated that librarian's viewpoints varied on perceived effects of their participation in clubs as noted by individual effects, group effects, and effects on library users. Yet, the sustained participation reported by the participants suggests that they experienced benefits that contributed to their daily practice. Fitzgibbons, Kloda, and Miller-Nesbitt (2017) and Hamid and Soroya (2017) findings suggest that professional development can improve learning and practice even if participants do not accomplish the intended objectives.

While there is evidence that continuing education is a valuable contributor to librarians' learning, librarians may struggle to identify and participate in training that will benefit gaps in their knowledge. Harhai and Krueger (2016) explored ongoing self-assessment of core competencies in a multi-subject learning survey developed as part of an assessment plan for MLS/MLIS graduate student with the goal of determining perceived knowledge level specific to program competencies. It included accreditation standards, competencies from professional associations, and a review by subject experts. The researchers collected data from 127 librarians. Findings identified different areas for professional development for both academic and public librarian career paths thus confirming that competency-based professional development was viable to improve professional development that targets competency-based needs.

Effective practices for library professional development. Some research has focused on specific professional development instructional strategies that support learning. For example, Swanson and Rinehart (2016) utilized a set of real-world case studies to define how data, a key skill set with increased data management responsibilities, affected academic librarians. Researchers designed training around one event and then gave a set of five real world case studies to existing engaged librarian forums. The engaged librarian forum was an online forum created to discuss, disseminate, and provide professional development to librarians in the competency areas of the university. Results revealed that solutions to case studies were correlated to librarian competencies, and participants sought additional expertise via online resources or colleagues and discussed legal complexities of data rights. All groups suggested that the library develop educational material on best practices and develop service models to support data management services.

Along with case studies, professional development that promotes self-reflection has proven effective. Greenall and Sen (2014) conducted a study exploring the use of reflection by library and information staff to support practice and continuing development. Researchers used a survey with 464 library staff. About 92% identified themselves as reflective practitioners and 52% engaged in reflective writing. Researchers found that the main benefits on individual and organizational levels were learning from significant incidents, continuing professional development, and identification of gaps in skills and knowledge. However, they found the following barriers: lack of time, lack of motivation, not supported by organizational culture, working alone, ineffective training,

and overly prescriptive requirements for reflective writing. Thus, professional development should offer real-world training, in a supportive environment with individualized options for optimum success.

Research has identified several strategies for designing programs that can support librarian learning. In an analysis of personal research networks Kennedy, Kennedy, & Brancolini (2017) used an exploratory method to gather data from 25 novice librarian researchers who participated in a hands-on, 9-day institute for research design in librarianship workshop. Researchers surveyed participants at the beginning of the workshop, immediately after it, 6 months after it, and 1 year after the workshop. academic and research librarians from research institutions, community college, college, or university libraries. Results from the study found that institute for research design in librarianship had significantly positive effect on growing librarians' personal research networks, but there were structural changes in the networks of some librarians that may have had an effect. Another study of a training program by Bakkalbasi, Jaggars, and Rockenbach (2014), examined an assessment design for a developing a librarian training program, specifically for updating digital humanities skills. They used three instruments: explicit self-reflections to assess what participants learned in each training unit; the Utrecht work engagement scale to measure how participants felt about their work before and after the program; and the skill set, knowledge and attitude assessment administered at completion to measure the effectiveness of the training program. At the time of the study, the program was ongoing, yet researchers were able to identify skills gaps at the individual and organizational level. Results indicated that professional development

leveraged assessment and evaluation to identify skills gaps and generate actionable data for improving staff learning. These two studies suggested that competency-aligned training that is in-depth and sustained improves learning outcomes.

Given the digital nature of library services, online communities of practice are an effective strategy for learning. Bilodeau and Carson (2015) conducted a qualitative case study in which they interviewed 12 academic librarians, who had graduated from the same university, to explore the experiences of learning in library school and later as they advanced through their careers and the role of communities of practice in lifelong learning. Findings indicated that the library school was lacking the practical aspects necessary to give students a good understanding of work done by librarians. They also noted that part-time work experience in libraries during school provided more practical experience. After school librarians found that they needed substantial training to be current in their first job, but learning was very informal and on-the-job as orientation activities were not enough. All participants, regardless of their career stage, reported listservs and documentation created by former employees supported their learning, but their best supports were their coworkers. Thus, learning from peers and focused self-study reinforced the idea of communities of practice as an effective professional support for learning.

Role of administrators and library systems. It is unclear who or what is responsible for determining the individual needs for professional development and who should sponsor it. For example, in a phenomenological study, Attebury (2018) surveyed, and then interviewed, academic librarians about the role administrators should play in

supporting professional development. Attebury identified themes detailing identification of appropriate professional development activities, freedom to choose activities, requirements for sharing with colleagues, and barriers to participation, such as high costs and time constraints brought about by competing duties. Participants in this study all expressed understanding the need for and benefit of professional development. They also described participation in professional development as beneficial to their practice, careers, and their patrons. An administrator's role is a delicate balance between mandates for professional development and recommendations because librarians prided themselves on their ability to self-assess needs for their unique positions. They also stated that the barriers to participation in professional development were a reality and occasionally outside the control of administration.

Other research has investigated where the responsibility for professional development resides. Rafiq, Jabeen, and Arif (2017) conducted a sequential mixed methods study that explored the opinions of 144 library Pakistani professionals to make an assessment about continuing education needs and the role library schools need to have that would address those needs. In this context, library associations did not offer training and left professional development up to library schools and professional organizations. Researchers administered a quantitative survey followed with a focus group of 13 mid-career library professionals. Results identified core areas of continuing education offerings that would be helpful for library schools and professional organizations to consider. Respondents perceived an active role of library schools in their continuing education and reported that their preferred formats of learning were workshops, post-

master's degree certificate, and post-graduate diplomas as preferred formats of continuing education programs. Returning to a library school for continuing education is, in comparison, a new method of learning, but this study demonstrated that programs offered by library associations, organizations, or library schools are not meeting the requirements of library professionals.

System-wide training can help to unify and standardize those institutions that may not have infrastructure, funding, or support to offer professional development. Schnuer, Ford, and Barber's (2015) study focused on a leadership and innovator training program in two countries sponsored by the Bill & Melinda Gates Foundation's Global Libraries (GL) grant program. They chose Latvia and Romania. While the foundation expected the program to last 2 years and work through five stages, they found that the program's effect was a strategy for the development of knowledge and skills of participants. Researchers documented positive results from the 2-year program finding that each country's library system had acquired new funding, provided new services, improved the library's reputation in the community and formed new partnerships. While continued funding is a challenge for a program such as this, Schnuer, Ford, and Barber's successful professional development program demonstrated how strategic training resulted in further adoption of innovation.

In-house development of training can customize local needs with targeted outcomes. Like Bilodeau and Carson (2015), Shamchuk (2015) investigated an in-house professional development university library staff using an information literacy community of practice. The 2-year program created the communities of practice in the

first year and offered workshops and peer observation and teaching triangles. The second year continued these strategies along with additional professional development opportunities. Although the participants did not complete formal evaluations, findings indicated that low to no-cost professional development by academic librarians resulted in site- and community-based on the job training.

Research in this section viewed librarians learning through the lens of various frameworks and explored it through quantitative, qualitative, and mixed methods research. Even though each study contributed their own view of librarians learning, the common theme was for more and newer professional development that offers choices, hands-on, real-world activities, and alignment with local and national standards. There is evidence that training offered based on librarian needs is more effective. Following that trend the next section will review articles on the need for technology-specific professional development.

How Librarians Learn Technology

This section focuses on how librarians learn to use technology. The dearth of literature specific to public librarians required an expansive search into academic librarianship, a related population, and more international studies. Since the term technology is broad, articles in this section will cover multiple technologies, learning groups, learning models, professional development opportunities, and explorations studies of how librarians are using technology.

Beliefs about technology and role. Some librarians have mixed feelings about their ability to assist patrons with new technologies and have questioned their

technological roles. Cushing (2016) conducted a study of all public libraries in one state utilizing personal information management research, which is the practice and study of the activities a person performs to create, store, organize, maintain, retrieve, use, and distribute information needed to complete a task. Researchers administered a 37-item survey about the types of personal technology assistance requests common response to such requests with follow up interviews. Results of the 130 responses found that public librarians were willing to help but felt unprepared or lacking specific continuing education in the area to support patrons. They also reported that many public librarians categorized technology assistance as reference work, but the Reference and User Services Association guidelines did not consider this within the scope of reference librarians.

In a study that reflected mixed feelings over the role librarians have with technology, Kaviev and Mamontova (2016), using the method of modeling, presented and described a theoretical and methodological model of information competence for a Russian librarian. The researchers identified factors of information competence as internal factors like motivation, intellectual development, capacity for reflection, and the desire for self-development and external factors like information, library professional environment, advanced training system, and self-education. Information competence included dualism, relativity, structuredness, accumulation, selectivity, dynamism, integration, and multifunctionality. The model of information competence consisted of cognitive, activity and creativity, value, and motivation components. Each component included 35 related competencies. Researchers empirically tested their model with a survey of five different libraries and found that 62% of study participants believed that

information competence was an important part of professional development. However, 38% denied the importance of the development of informational competence. Additionally, results indicated that while the competencies reflected technology use in the library, librarians had low theoretical knowledge, and their mastery of technology was related positively to their daily use of technology. Moreover, about a third of librarians expressed psychological barriers such as anxiety about information technology. The practical result of this study was a training program and continuing education course.

Adoption may be more complex than job skill or expertise. In a study working with academic and public librarians, Nelson and Irwin (2014) explored how interactions as they learned a new technology shaped professional identity. They conducted a qualitative longitudinal case study of the intersection of internet searches and librarianship from published research over a 30-year period. Researchers illustrated how occupational identity served as an interpretive lens for new technologies and how interpretations shape adoption decisions with technology. They also introduced the concept of paradox of expertise in which the ways in which task mastery may lead to dismiss innovation opportunities related to that task. Researchers also demonstrated how an innovation can influence changes in professional identity, suggesting that professional learning about technology may be varied across experience.

Available supports and services. Exposure to new technology may motivate or trigger learning in librarians, despite any lack of skills. Ahenkorah-Marfo and Akussah (2016) conducted a study in Ghana on the use of social media in reference and user services departments of academic libraries. This quantitative study provided a survey

soliciting the views of 99 academic librarians and paraprofessionals from six public and private universities. Results of the study found most librarians had knowledge of social media but limited because of the application of platforms; they favored Facebook and Twitter. Additionally, less than half were able to use personal profile features like online messaging or picture sharing through social media. Despite the lack of skill, librarians were still positive about the integration of social media into both their professional and personal lives revealing that positive intent to use an innovation unfortunately highlighted librarians lack of social media skills.

Some librarians engage with knowledge bases to stay current. In a mixed method study that used shared online accounts as training tools, Robinson, Casey, & Citro (2017) explored the idea of creating a librarian knowledge base with 138 librarians. Findings indicated that a quarter of participants had formal training with these services, but most learned through self-study. They also identified the types of knowledge bases they currently used, but only 25% reported a requirement to learn them, while 60% found them useful. Most participants were concerned about the time constraints, general lack of use among librarians, the limited functionality of current knowledge bases, and the lack of training on how to use knowledge bases.

A librarian's intent to learn does not always match with available resources. In an international survey of librarians, Ahmed and Rehman (2016) explored the perception and level of ICT competencies. To achieve this the researchers used a descriptive survey with a population of 100 library professionals from fourteen public universities. Ninety-eight librarian participants had MLS/MLIS degrees and two had a Bachelors in Library

and Information Science (BLIS). The study revealed that the status of librarians' ICT competency was unsatisfactory, self-study was the main method of acquiring ICT skills, and insufficient staff made it more difficult. Major issues included a lack of professional development policies, limited opportunities for professional development, and negative attitudes toward outsourcing professional development opportunities. Researchers were able to identify the technologies that librarians wanted training on and the learning methods they most preferred. This study provides insight into the level of ICT proficiency and a framework for discovering which competencies librarians need to learn.

In some cases, it may be difficult for librarians to find professional development opportunities as it takes more buy-in from administration and policy makers to create the opportunities. Looking to identify professional development opportunities, Dzanda and Akussah (2018) designed a cross-section survey of 61 staff and conducted interviews with 20 heads of libraries from 24 private universities in Ghana. Professional librarians were those holding a postgraduate degree in library studies, but they included para-professionals who could have held a certificate, diploma, or first degree in library studies. Results found that administrators did not allow all library staff to attend professional development programs and no institution had a professional development policy. They also noted that only three universities budgeted for any kind of professional development and most did not have in-house programs to support staff. The lack of professional development suggests that other institutions may be doing the same but there is little research that documents policies about professional development.

It is important to pair the right learning tool with the right subject. In a study to explore the use of social media for professional development by female librarians in Pakistan, Khan and Du (2017) collected data from a self-administered structured survey. The survey, completed by 102 librarians, addressed the usage frequency, perception of social media, choice of librarianship as a profession, and perceived benefits of social media. Twenty librarians also took part in online interviews via Facebook chat. Researchers noted that female librarians claimed that they had infrequent opportunities for professional development, attributed to limited resources, reduced mobility, and finances. The study results revealed that most female librarians were aware of social media and used it often. Librarians often used social media for professional development and perceived it as a useful tool in this capacity. Despite this, librarians saw social media as less helpful in acquiring technical skills and researchers found privacy, parent's years of schooling, marital status, and family support as factors affecting the use of social media for professional development. Thus, despite being receptive to social media use, librarians had barriers that prevented deeper applications.

Working in a social forum. Interacting with peers could support new skills and knowledge in a social strategy. In a netnographic mixed methods case study, Moreillon (2015) examined the motivation and benefits to stakeholders and 232 school librarians in creating and/or participating in regionally based Twitter chat groups. Communities of practice formed around an interest group in which members built relationships, interacted regularly, and learned together. Vygotsky's activity theory explores how people engage with others socially and focused on how people use cultural tools to contribute to theirs

and others understanding. Topics covered were technology, school library management, literature, marketing, notable librarians, collaboration, lesson plans, professional development, and leadership. In the online survey, 25 librarians and librarian supervisors found that the Twitter chats helped them expand professional networks, keep informed of trends, find mentorship, and get real-time support as evidence of how a technology-based tool increased knowledge and improved librarian skills.

Networking within a professional community may be an effective strategy for librarians to learn from peers. In a study of public librarians in Hawaii, Irvin and Reile (2018) examined an inquiry-based professional development model called The Librarians' Inquiry Forum. The model was employed with public librarians at a state public library via the cloud-based collaborative workspace application called Slack uses to support a community of practice for learning and development in an isolated community in discussions. Fifteen librarians from fifteen different libraries across the state participated in included on-site and online interviews. Results found librarians independently sustained the use of Slack revealed common concerns of homelessness, programming, and various reference services. Participants populated the communities of practice with favorite resources, wish lists, and personal topics. The expansion of this model was strongly positive; however, librarians caused some attrition claims of being busy or not savvy. Thus, public librarians were able to learn about technology from a community of practice focused on their needs and interests.

Applied learning. Utilizing hands on professional development and learning in context librarians can increase collaboration and skills. For a skills development project,

Brown, Crocamo, Bielskas, Ransom, Vanti, and Wilfong (2017) aimed at increasing technology competencies by adopting a maker learning model with academic librarians from a university's science and engineering library. The project, labeled the Librarian Re-skilling project, was a response to a remodeled space in the library that functioned as a multipurpose space for workshops and maker activities. As a maker space it would include many new technologies. The re-skilling project was a semester long learning process that required participants to collaboratively choose technology projects as one large group, break into pairs to learn smaller components of the larger project, and then come together to present the learning outcomes. The project assessment involved measures of success that included managing expectations, getting participant buy-in, structure with specific scheduling, engagement with technology, and flexibility. The challenges reported were varied learning styles and a lack of reliable source material. After the Librarian Reskilling project, the researchers expanded the activities to include library clinics, which presented strategies to engage students on topics of interest and provided introductory hands-on technology workshops for collaborative learning. As the project grew it helped define a branded identity of innovation for the new remodeled space. Librarians were able to support the innovations and even lead more workshops. Because many of the original librarians had no experience with the technologies they used, the project provided the researchers with a new insight into first-time technology learners. According to researchers the biggest value was staff developing collaboratively. They interpreted this as a retooling project that was important to include because it

demonstrated another successful community of practice approach to technology integration and an expansion of current librarian skillsets.

Internal professional development opportunities can be both meaningful and informational. Hess and Greer (2016) explored how a group of public librarians added to their knowledge of instructional design and instructional technology in a qualitative case study. They examined a four-week learning community of practice was adapted to an ongoing professional development system at one university. Results indicated that individuals had a positive experience with learning communities, found effective instructional approaches, believed that the community facilitated new learning experiences with technology, and that it made them feel more likely to use technology to support instruction. However, results also revealed that librarians did not feel equipped or comfortable in assessing either student learning or the effect of instruction efforts. For many academic librarians, professional development programs often occurred externally at conferences or seminars, but this type of on-the-job development created a practical and accessible opportunity for academic librarians to learn in a meaningful way.

Establishing a community of practice may identify gaps in learning and instill the importance of continued learning. Martzoukou and Elliott (2016) investigated the extent to which public librarians were successfully prepared to engage the community in digital literacy and inclusion. To do so, they developed a qualitative multiple case study that used an analysis of policy documents and existing training programs offered by the library together with semi-structured interviews of public librarians and library management staff. Findings revealed that librarians perceived that information

technology skills were important, but they identified gaps in what they learned in library school and their working environment, and they reported interest in professional development. They also identified gaps in MLS/MLIS programs concerning eBooks, computer troubleshooting, social media, and some communication skills. Thus, what librarians do not know is not necessarily visible in their practice or to administrators.

Collaborative learning is another strategy used to support librarian learning. Focusing on the first implementation of an emerging technologies seminar for Australian academic librarians, O'Neil and Pegrum (2018) examined the benefits of professional development offered as a seminar. The seminar covered the history of new technologies linked to new pedagogies, an examination of relevant educational theories and frameworks, a broad overview of current and emerging literacies focusing on information literacy, and the consideration of issues and challenges that could arise. Within the seminar, participants worked individually and in groups on organizationally framed projects involving digital technologies. To assess the seminar researchers used Kirkpatrick's model applied to determine the extent the seminar influenced participants' use of new technologies, new pedagogical approaches in their library instruction, their interactions with colleagues, and the effect of the seminar over time. Results showed that respondents positively perceived organizational benefits, realized learning gains, and embraced collaboration However, researchers identified limitations of university support and time for participation.

For librarians, the process of decision-making and learning technology by making resources can improve skills, but it often takes more time to become proficient.

Describing the use of podcasts, online radio broadcasts, YouTube channels, and other technology mediums in delivering professional development information, Moorefield-Lang (2017) explored five case studies of all types of librarians and library professionals who have created them. Each librarian participated in an in-depth interview reflecting on their self-created online programming (i.e., podcasts, radio YouTube, etc.), delivery of information, professional development, and the successes and challenges that accompanied it. The researchers used the information dissemination theory to analyze cases finding that despite the positive reception and variety of information, there were still challenges including time available, type of technology topics, cost, and content. This demonstrated, according to Moorefield-Lang (2017) and Wenger (1999), a need for a community of learning and for additional learning opportunities.

I focused my review of research in this section on how librarians have learned technologies. There were very few articles that specifically focused on public librarians, but I included academic librarians because the credentials are the same; each need only an MLS/MLIS degree to be employed as a librarian. This section like the previous had common themes of continued learning, learning with and through peers, perceived abilities, and learning identities.

Summary and Conclusions

In this literature review I explored the variables and concepts associated with the use of the UTAUT research model and the diffusion of innovations framework in a library setting. I also investigated how librarians learn essential skills and technology.

Across all four topics I found a dearth of literature focusing on public librarians, thus I expanded the scope of inquiry into higher education and international librarians.

The UTAUT research model in a library setting was most often employed in academic libraries. Research focused on the acceptance of specific library services for the librarian and their patrons. The studies, though reporting successful strategies for adoption, were few, which led to exploring a parallel population of higher education educators and students. Higher education had more research utilizing the UTAUT model and documenting technology adoption. Researchers have used UTAUT to study post-secondary librarian's acceptance of online learning, information and communication technologies, learning management systems, and professional development. Other researchers have used the model to assess the acceptance of technologies and online learning environment. It is important to note that most studies used UTAUT model in conjunction with other theories.

I found that limited use of the diffusion of innovations in libraries, like the UTAUT model, thus some of the reviewed research focused on academic libraries, a parallel group because both professions require an MLS/MLIS for employment. Research focused on the adoption of library technologies for faculty and librarians, student use of information and communication technologies, and specific patron technology adoption. Other researchers use the diffusion of innovations in studies alongside other theories.

Research focusing on how librarians learn professional skills in general explored professional development activities, training, and specific skill development tactics. The common theme, despite some studies that reported successful learning supports, was the

lack of professional development prospects and the need to create more training opportunities.

Research about how librarians learn technology specifically offered little insight into how public librarians learned, suggesting all librarians learn in similar ways. The reviewed literature focused on readiness for digital inclusion, support of patron technology, use of specific technology, and occupational identity. For academic librarians, specific themes included occupational identity, certain online technologies, instructional design and technology, knowledge base creation, maker learning, and workshops/seminars. The small amount of research specifically addressing public librarians learning technology expressed a great interest in professional development and a need for more learning opportunities. I found little research that examined specific individual factors that effected technology adoption of technology, thus suggesting a reed for more research in this area and thus the UTAUT is a good fit.

Moving forward with evidence from the literature review, in Chapter 3 I provide details about the research design, rationale, and methodology for study. I also discuss the role of the researcher, data collection and analysis, threats to validity, and issues of trustworthiness.

Chapter 3: Research Method

Introduction

The goal of this study was to gain data to describe librarian's existing technology needs, expectations, available resources, and skill sets. Using the UTAUT framework, I decided to investigate the technological (performance expectancy and effort expectancy), organizational (social influence and facilitating conditions), and demographic (gender, age, experience, and voluntariness) variables that can help predict the adoption of technology. A better understanding of how librarian demographics relate to their intention to adopt technology, along with what supports they identify as useful (like further education, professional development, or self-directed learning), will add information currently missing from librarian and educational technology research.

In this chapter, I describe and justify the setting, research design, role of the researcher, the methodology, the participants, and the instrumentation. Then, I outline the data collection procedure and explain how I collected and analyzed the data. Lastly, I discuss how I addressed issues concerning threats to validity, reliability, and ethics.

Setting

The environment for this study was public libraries of State A and State B, and the participants were public librarians with an MLS/MLIS or ALA accredited equivalent degree. I selected these states because I reside in State B and am adjacent to State A, which assisted with data collection. State B is also the location where I have had experiences working with public librarians and technology. Additionally, State B and State A also service a comparably average-to-large community of 4,652,360 and

10,155,942 people in a nationwide comparison (Institute of Museum and Library Services, 2019). State B has 194 public libraries in 46 counties whose populations range from 10,000 to 460,000 (Institute of Museum and Library Services, 2019). State A has 389 public libraries in 81 counties with populations ranging from 4,600 to 1,053,545 (Institute of Museum and Library Services, 2019). As of 2017, there was a total of 1,951.91 public library staff members in State B and 3,059.03 in State A (Institute of Museum and Library Services, 2019). Of that number, State B had 478 public librarians with an MLS/MLIS and State A had 768 (Institute of Museum and Library Services, 2019). Altogether, State A and State B were good choices for a comparison because they represented, with their size and population, all sizes of public libraries.

A representative from the state library of State B stated that they did not have administrative oversight for public libraries, and I was required to contact each county independently as I did for State A. I connected with libraries by e-mail for both written permission and then application of a quantitative survey. I provided the quantitative UTAUT survey to each cluster of county libraries who then shared with librarians. Within the clusters, I selected participants for interviews.

Research Design and Rationale

I chose a mixed methods approach because of its strength of utilizing both qualitative and quantitative research and decreasing the limitations of both approaches. I used qualitative analysis to develop a deep understanding of public librarians' perceptions about supports for technology adoption. For this study, technology adoption involved any resource or professional development activity that contributed to the

knowledgeable use of a technology such as professional development or professional learning networks (Deissler, Ding, Neumann, & Kopcha, 2015; Kvenild, Tumbleson, Burke, & Calkins, 2016; Moorefield-Land, 2017). Additionally, quantitative data from the survey provided evidence of the intention to use or not use new technology from many librarians. A large population helped with generalizability, but there was no clear standard for public librarians' technology needs nor between libraries. I used baseline data to establish a deeper study of relationships between librarians and different variables in the future. However, at the time of this study, it was important to avoid constructing relationships that were not relevant or might not have existed. The additional qualitative interview data, although few and time-intensive, allowed for deeper and richer exploration of librarian choices. For example, quantitative evidence of a significant relationship between performance expectancy and behavioral intention permitted me to ask more specific questions about which aspects of performance expectancy influenced public librarians' behavior intention when adopting technology. In this way, the qualitative data shed light on the quantitative results and provided deeper understanding of public librarians' technology use. Thus, this was a sequential, explanatory, mixed method research study of State A and State B public librarians.

I collected data in two phases. First, I collected quantitative data, analyzed the results, and then used findings to plan the second, qualitative phase. The quantitative results informed the types of participants I purposefully selected and the types of questions I asked (see Creswell, 2018a). The goal was to have the qualitative data help

explain the quantitative results. After I completed the survey data analysis, I followed up with qualitative interviews to help explain the results and mediate any confusion.

The research questions assisted me in achieving the purpose of the study, which was to determine the predictive relationships between technology supports and behavioral intention to adopt new technology and analyze how age, gender, voluntariness, and experience of librarians moderates behavioral intention:

Quantitative:

Research Question 1: How does the self-reported level of performance expectancy, effort expectancy, social influence, and facilitating conditions predict public librarians' behavioral intention to use new technology?

Research Question1a: For public librarians, how does the self-reported level of performance expectancy predict their behavioral intention to use new technology?

H_0: There is no significant predictive relationship between performance expectancy and behavioral intention to use new technology.

H_a: There is a significant predictive relationship between performance expectancy and behavioral intention to use new technology.

Research Question 1b: For public librarians, how does the self-reported level of effort expectancy predict their behavioral intention to use new technology?

H_0: There is no significant predictive relationship between effort expectancy and behavioral intention to use new technology.

H_a: There is a significant predictive relationship between effort expectancy and behavioral intention to use new technology.

Research Question 1c: For public librarians, how does the self-reported level of social influence predict their behavioral intention to use new technology?

H_0: There is no significant predictive relationship between social influence and behavioral intention to use new technology.

H_a: There is a significant predictive relationship between social influence and behavioral intention to use new technology.

Research Question 1d: For public librarians, how does the self-reported level of facilitating conditions predict their behavioral intention to use new technology?

H_0: There is no significant predictive relationship between facilitating conditions and behavioral intention to use new technology.

H_a: There is a significant predictive relationship between facilitating conditions and behavioral intention to use new technology.

Research Question 2: How do the predictive relationships vary by age, gender, voluntariness, and experience?

H_0: The predictive relationships do not vary significantly by age, gender, voluntariness, and experience?

H_a: The predictive relationships does vary significantly by age, gender, voluntariness, and experience?

Research Question 2a: How does the predictive relationship between performance expectancy and public librarians' behavioral intention to use new technology vary by age, gender, voluntariness, and experience?

H_0: The predictive relationship between performance expectancy and public librarians' behavioral intention to use new technology does not vary significantly by age, gender, voluntariness, and experience?

H_a: The predictive relationship between performance expectancy and public librarians' behavioral intention to use new technology does vary significantly by age, gender, voluntariness, and experience?

Research Question 2b: How does the predictive relationship between effort expectancy and public librarians' behavioral intention to use new technology vary by age, gender, voluntariness, and experience?

H_0: The predictive relationship between effort expectancy and public librarians' behavioral intention to use new technology does not vary significantly by age, gender, voluntariness, and experience?

H_a: The predictive relationship between effort expectancy and public librarians' behavioral intention to use new technology does vary significantly by age, gender, voluntariness, and experience?

Research Question 2c: How does the predictive relationship between social influence and public librarians' behavioral intention to use new technology vary by age, gender, voluntariness, and experience?

H_0: The predictive relationship between social influence and public librarians' behavioral intention to use new technology does not vary significantly by age, gender, voluntariness, and experience?

H_a: The predictive relationship between social influence and public librarians' behavioral intention to use new technology does vary significantly by age, gender, voluntariness, and experience?

Research Question 2d: How does the predictive relationship between facilitating conditions and public librarians' behavioral intention to use new technology vary by age, gender, voluntariness, and experience?

H_0: The predictive relationship between facilitating conditions and public librarians' behavioral intention to use new technology does not vary significantly by age, gender, voluntariness, and experience?

H_a: The predictive relationship between facilitating conditions and public librarians' behavioral intention to use new technology does vary significantly by age, gender, voluntariness, and experience?

Qualitative:

Research Question 3: What are public librarians' perceptions regarding technology adoption supports?

Research Question 4: What are public librarians' perceptions regarding how these technology adoption supports may connect to their behavioral intentions?

Role of the Researcher

The role of the researcher is to be the data collection instrument, preparing and finding data from surveys, interviews, and interview transcription (Merriam & Tisdell, 2016). Thus, it is important to document personal values, assumptions, and biases at the beginning of a study. My personal experiences have shaped my perception of public

libraries. From November of 2014 to March of 2016, I served as technology team assistant manager and technology course instructor in a county public library in State B. The role was more focused on course instruction and creation, county-wide support of technologies and less focus on managerial responsibilities. As assistant manager I reported to the technology team manager and was involved with the technology team, librarians and staff who took classes, and the patrons who attended regular courses. I excluded any person with whom I have a personal relationship from this study.

I believe that my experiences in my previous role enhanced my knowledge of the challenges, decisions, and issues encountered when using new technologies. Due to previous experiences working closely with new technology support, I brought biases to this study. Although I noted every effort and checked data to safeguard objectivity, these biases may have formed the way I view and understand the data I collected and the way I interpreted my experience. To avoid this, data were deidentified.

Methodology

Using a mixed methods research design was a good fit for this research problem, because it provided rigorous and refined conclusions by using the results of the quantitative survey to inform the qualitative interviews (Plano Clark & Ivankova, 2016). A survey design alone increases generalizability, but including the meaningful qualitative data and ability to triangulate benefited this study. In this section I further discuss the participant selection logic and the instrumentation for both qualitative and quantitative components.

Participant Selection Logic

With the scope of participation limited to State A and State B, the population for this study was both states' 1,246 public librarians who possessed an MLS/MLIS. Although this number of potential participants allowed for a more complex analysis of factors related to technology skills and demographic information, there was no means to predict how many librarians might participate because it was unclear how important technology was to librarians. If librarians had a requirement to acquire and maintain currency of technology skills, they might have been more likely to participate in research about technology skills. The total population of survey participants was 1,246. A power analysis using g power was conducted and showed that a sample size of 160 was required for the planned analysis (Faul et al., 2019). Librarians' only identification was by the employer as they worked alongside various staff in each department. Thus, it was important to identify participants for interviews from the survey where they had the option to choose to be available for interview.

From the 12 librarians who were selected to participate in interviews, I chose three from four different sizes of public libraries (rural, town, suburban, city). The Institute of Museum and Library Services's 2019 public library survey utilizes the National Center for Education Statistics locale coding system, which classifies areas into four major types: city, suburban, town, and rural. Thus, I chose three from each of the major types. I chose 12 interview participants because other studies like this have kept their interview numbers low so that they can focus on the participants' different roles (Katuli-Munyoro & Mutala, 2018; Kidd et al., 2016). In this study the participants' roles

varied with size of the library. Only I knew the name of interviewees for communication purposes, which will not be published. I assigned names according to the size of the library and a number:

- Rural Libraries: R1, R2, R3
- Town Libraries: T1, T2, T3
- Suburban Libraries: S1, S2, S3
- City Libraries: C1, C2, C3

Instrumentation

For this study I used Venkatesh et al.'s (2003) UTAUT instrument to examine the behavioral intention to use new technology for all working State A and State B public librarians with an MLS/MLIS. I collected data from the survey (Appendix C) using SurveyMonkey from which I downloaded an Excel spreadsheet for analysis. However, survey results did not identify how much technology librarians had access to, what technology they needed to use, or how they learned to use such technologies. Thus, I conducted semistructured interviews guided by my research questions developed using Rogers's (2003) diffusion of innovation theory. I recorded all data from interviews. Then I transcribed and reviewed for member checking (Merriam & Tisdell, 2016). In the following section, I examine the quantitative and qualitative components of each.

Quantitative components. Venkatesh et al. developed the UTAUT survey in 2003. Their work advanced individual acceptance research by unifying the theoretical perspectives common in the literature and included four moderators to account for dynamic influences including organizational context, user experience, and demographic

characteristics (Venkatesh et al., 2003). UTAUT explains as much as 70% of the variance in intention (Venkatesh et al., 2003). Because there is no instrument specifically for librarians, I determined that the UTAUT was a good fit. I obtained permission to use the UTAUT survey from the developers (Appendix A) and the journal that holds its copyright (Appendix B).

I made a few changes to the instrument. The original UTAUT survey included performance expectancy, effort expectancy, attitude toward using technology, social influence, facilitating conditions, anxiety, self-efficacy, and behavioral intention to use a system. However, Venkatesh et al. (2003) later omitted attitude toward using technology, anxiety, and self-efficacy noting they did not have any direct effect on intention. Thus, I have not included these in my survey (Appendix C). Additionally, Venkatesh, et al. (2003), used three- and seven-point scales for survey responses. I opted to use a seven-point Likert scale to get range of responses from participants and to use a method currently used in other UTAUT research (Bervell & Umar, 2017; Dečman's, 2015; Khechine, Lakhal, Pascot, & Bytha,2014; Lakhal & Khechine, 2016; Yuvaraj, 2016). I also replaced the term "system" used in the original UTAUT survey with the word "technology" because it is used more frequently in research on UTAUT and library/librarian use of technology (Awwad & Al-Majali, 2014; Dečman, 2015; Farag, Park, & Kaupins, 2015; Isaias, Reis, Coutinho, & Lencastre, 2017; Jung & Lee, 2015; Khan, Masrek, Mahmood, & Qutab, 2017; Khechine, Lakhal, Pascot, & Bytha, 2014; Potnis, Demissie, & Deosthali, 2017; Yusof, Qazi, & Inayat, 2017; Yuvarj, 2016).

Researchers have used UTAUT across sectors and disciplines to better understand technology acceptance confirming acceptance in the research community that it is a valid and reliable instrument. In Chapter 2, I reviewed nine studies that used UTAUT in public and academic library settings, in which researchers used the instrument for understanding the use a new technology item or a new system that librarians had or were about to adopt. There were many more applications of UTAUT in higher education. The success of UTAUT in public libraries, academic libraries, and in higher education validates the use of the instrument in cases of technology adoption. Content validity stems from the unification of eight adoption theories: theory of reasoned action by Fishbein and Ajzen (1975), social cognitive theory by Bandura (1986), TAM by Davis, et al. (1989), model of PC utilization by Thompson, et al. (1991), TPB by Ajzen1991), motivational model produced by Davis, et al.(1992), combined TAM and TPB by Taylor and Todd (1994), and diffusion of innovation by Rogers (2003). These adoption theories offer a comprehensive explanation of individual acceptance of technology and provided the foundation for UTAUT. UTAUT's flexibility allows adaptations for any organization, technology, or mode of delivery. Based on split-half reliability test, the results showed value of reliability coefficient of 0.8868 (Aditya & Permadi, 2017) and Cronbach alpha of greater than 0.7 for all constructs (Awwad & Al-Majali, 2015; Bervell & Umar, 2017; Venkatesh et al., 2003). UTAUT incorporates a strong internal reliability and has proven to be a valid instrument.

Qualitative components. Interviews are useful when the researcher cannot observe participants directly due to distance or time constraints and the researcher wants

more control over the line of questioning (see Creswell, 2018b; Merriam & Tisdell, 2016). Due to the lack of standardized technology training for librarians, it is difficult to determine how librarians acquire technology knowledge. Because there is no foundation for exploring this area, a qualitative approach helped to uncover those supports librarians use. Participants in the qualitative portion of this study resided across the states of State A and State B. To ensure data saturation and to provide ease of access for the study participants, I selected an interview protocol as the method of gathering additional data. I focused my questions on what supports public librarians perceived as useful when learning to use a new technology. Because this was the second part of a sequentially designed mixed methods study, participants chose interview participation in the quantitative survey.

I conducted the semi-structured interviews using questions based on the research question and anticipate adding probing questions to explore the participant responses (Burkholder, Cox, & Crawford, 2016). The interviews began with asking what supported participants most as they learned new technology. This was a conversational question based on my first research question for this study: How do librarians explain their responses to the survey results? I then asked 12 additional questions developed using Rogers's (2003) diffusion of innovation and its five attributes that influence adoption of an innovation. I asked additional questions as needed for clarification.

Procedures for Recruitment, Participation, and Data Collection

Recruitment and Participation

This research study required an ongoing relationship with all public libraries in State A and State B and access to the librarians within it. To gain access to public librarians across the states of state A and state B, I sought out permission from the state library of State A and State B to do research. A response from the State B Director of Library Development stated that I must contact the director of each county library system because they do not have administrative oversight for libraries. The Director of Library Development in State B suggested it was best to reach out to Directors. Thus, the beginning of the research incorporated email and phone correspondence, depending upon their preference, with all directors from State A and State B libraries.

With IRB approval, the recruitment phase began with an email/phone conversation about the purpose of the research study and to address any concerns for all forty-six county directors. The email/phone conversation included the requirements of librarians involved, the survey dissemination procedure, follow-up interview process, and a request for permission to move forward with the study. Upon permission, I provided directors a prepared statement, consent form, and link to the survey for them to disseminate to their librarians. The prepared statement included a brief introduction to the study, the purpose, a word of appreciation, and encouragement to complete the study. Encouragement was a reminder of the incentive for completing the survey, which were a list of supports and ideas that come from the qualitative interviews. I integrated the consent form into the survey form.

Data Collection

I provided each of the 127 counties a link to the UTAUT-based survey using SurveyMonkey. Library directors, who agreed to participate, distributed the link to their librarians. The total population was 1,246, but a g power analysis requires a sample size of 160 (Faul et al., 2019). Additionally, I made library directors aware of the participation requirements since they disseminated the surveys to their librarians. Library directors know the credentials of staff members, as it is a statistic they report nationally (Institute of Museum and Library Services, 2018). As a contingency plan, I included librarians from another state, state A, in study. All quantitative data came from this survey.

In the demographic identification section of the survey, participants answered an item about participation in an interview connected to the study. Selection included three librarians from four different sizes of public libraries (rural, town, suburban, and city) for a total of twelve interviews. If they selected to participate in the study, they provided an email or phone number for direct contact. I gave interviewees the option to conduct recorded interviews via telephone or an online chat/video service such as Skype or FaceTime. This, like the quantitative data, remained confidential by assigning a pseudonym to each person interviewed.

There was only one survey and one set of interviews. However, there was a possibility of a follow-up interview should new data have required clarification (Merriam & Tisdell, 2016). The survey was available for two weeks and interviews followed as soon I knew who volunteered for an interview. I collected data from the quantitative survey using SurveyMonkey and then exported for analysis. I recorded all interviews.

Then I transcribed and summarized for member checking (Merriam & Tisdell, 2016). I asked interview participants if they were willing to be a part of follow-up interviews should it be necessary.

Data Analysis Plan

Quantitative Components

Guided by the UTAUT instrument I developed quantitative research questions related to how self-reported levels of performance expectancy, effort expectancy, social influence, and facilitating conditions predict public librarians' behavioral intent to use new technology. I collected quantitative data using the UTAUT survey (Appendix C). Each of the participating state A and state B counties had a link to the survey through the SurveyMonkey web tool.

Analyzing the data from the survey started with exporting the results to Excel for analysis. I used Faul et al (2019) G*Power 3.1.9.4. software with the developers' recommended effect size of .015 for a medium sample size, .05 probability error, .95 power, and 8 predictors (4 dependent, 4 mediating), resulting to this study's total required sample size of 160. As a contingency plan, I included librarians from another state, state A, in study. I analyzed questionnaire data by exporting the results to Excel and importing to SPSS for multiple linear regression.

Data coding. Coding data consisted of assigning a numerical code to all variables. See Table 3 for coding of Venkatesh et al. (2003) moderating variables. The creation of a code book served as a guide to identify variables in the study, as well as, the minimum and maximums for those variables. I entered all the UTAUT moderators and

variables into SPSS. Then, I imported the Excel files from SurveyMonkey into SPSS. Because there were 127 participating library counties, I consolidated 127 Excel workbooks into one sheet before the last import into SPSS.

In Table 3, codes for age are on an interval scale in a range of 10 years. Age was a key moderating variable for all constructs of the UTAUT instrument by Venkatesh et al. (2003). Additionally, the table specifies codes for gender as male, female, and non-binary. Gender was a key moderating variable for performance expectancy, effort expectancy, and social influence construct of the UTAUT instrument by Venkatesh et al. (2003). The table also specifies codes on a quasi-interval scale from completely mandatory to completely voluntary with a neutral position included (Creswell, 2018a). Voluntariness was a key moderating variable for social influence construct of the UTAUT instrument by Venkatesh et al. (2003). Finally, the table identifies codes for experience on an interval scale in a range of 5 years. Experience was a key moderating variable for effort expectancy, social influence, and facilitating condition constructs of the UTAUT instrument by Venkatesh et al. (2003).

Table 3

Codes for Moderating Variables

Code	Code Number
Age	
< 21	01
21 – 30	02
31 – 40	03
41 – 50	04
51 – 60	05
61 – 70	06
71 – 80	07
>80	08
Missing Data	99
Gender	
Male	1
Female	2
Non-binary	3
Missing Data	99
Level of voluntariness	
Completely Mandatory	1
Mostly Mandatory	2
Somewhat Mandatory	3
Neutral	4
Somewhat Voluntary	5
Mostly Voluntary	6
Completely Voluntary	7
Missing Data	99
Experience	
< 1	1
2 – 5	2
6 – 10	3
11 – 15	4
16 – 20	5
21 – 25	6
26 – 30	7
31 – 35	8
36 – 40	9
41 – 45	10
46 – 50	11
≥ 50	12
Missing Data	99

I entered the UTAUT constructs and moderating variables into SPSS as well as Excel files from SurveyMonkey. A total of 127 counties were involved, therefore there were 127 Excel workbooks, but I consolidated these into one Excel sheet before entering them into SPSS. Using an Excel worksheet was important for compatibility with SPSS and the identification of missing data or errors in the data. Creswell (2018a) states that errors occur when participants provide scores outside the range for variables or the researcher inputs the wrong numbers. I avoided by visually inspecting the data, which included sorting the data by ascending order and finding the outliers. Missing data can occur when instrument data is lost, participants skip questions, or participants refuse to complete a question (Creswell, 2018a). I eliminated questionnaires with missing data from the study.

I then conducted a multiple linear regression analysis under the assumptions that there must be a linear relationship between the outcome variable and the independent variables, residuals are normally distributed, the variance of error terms are similar across the values of the independent variables, and that multicollinearity does not exist between the independent variables (Frankfort-Nachmias et al., 2015). I conducted the multiple linear regression analyses to evaluate the relationship between direct determinants (performance expectancy, effort expectancy, social influence, and facilitating conditions), moderating variables (gender, age, experience, voluntariness of use), behavioral intention to use new technology, and use behavior. Tables 4 and 5 outline the independent variables, questions, analysis protocol, and dependent variables.

Table 4

UTAUT Constructs

Independent Variable	Definition	Questions	Analysis	Dependent Variable
Performance Expectance	Degree to which an individual believes using a new technology will help their job performance	• I would find new technology useful in my job. • Using new technology enables me to accomplish tasks more quickly. • Using new technology increases my productivity. • If I use new technology, I will increase my chances of getting a raise.	Multiple Linear Regression	Behavioral Intention
Effort Expectancy	Degree of ease associated with using a new technology	• My interaction with new technology would be clear and understandable. • It would be easy for me to become skillful at using new technology. • I would find new technology easy to use. • Learning to operate new technology is easy for me.	Multiple Linear Regression	Behavioral Intention
Social Influence	Degree to which an individual perceived that it is important to others that they use new technology	• People who influence my behavior think that I should use new technology. • People who are important to me think that I should use new technology. • The senior management of this business has been helpful in the use of new technology. • In general, the organization has supported the use of new technology.	Multiple Linear Regression	Behavioral Intention
Facilitating Conditions	Degree to which an individual believes that the organizational and technical infrastructure exists to support the use of new technology	• I have the resources necessary to use new technology. • I have the knowledge necessary to use new technology. • New technology is not compatible with other technologies I use. • A specific person (or group) is available for assistance with new technology difficulties.	Multiple Linear Regression	Use Behavior
Behavioral Intention	Predictor of Usage	• I intend to use new technology in the near future. • I predict I would use new technology in the near future. • I plan to use new technology in the near future.	Multiple Linear Regression	Use Behavior

Table 5

UTAUT Moderating Variables

Moderating Variable	Definition	Measure	Analysis	Independent Variable
Gender	As reported by participants	Male Female Non-binary	Multiple Linear Regression	Performance expectancy Effort expectancy Social influence
Age	Range of age as reported by participants	< 21 21 – 30 31 – 40 41 – 50 51 – 60 61 – 70 ≥ 80	Multiple Linear Regression	Performance expectancy Effort expectancy Social influence Facilitating conditions
Experience	Years with MLIS degree as reported by participants	< 1 2 – 5 6 – 10 11 – 15 16 – 20 21 – 25 26 – 30 31 – 35 36 – 40 41 – 45 46 – 50 ≥ 50	Multiple Linear Regression	Effort expectancy Social influence Facilitating conditions
Voluntariness	Degree to which the use of new technology is voluntary	Completely Voluntary Mostly Mandatory Somewhat Mandatory Neutral Somewhat Voluntary Mostly Voluntary Completely Voluntary	Multiple Linear Regression	Social influence

Qualitative Components

The qualitative component of this mixed method study provided a deeper look into the results and elaborated on the possible reasons for the results, particularly as related to the characteristics of workplace technology innovations. The guiding qualitative research questions asked what public librarians' perceptions are regarding technology adoption supports and what public librarians' are perceptions regarding how these technology adoption supports may connect to their behavioral intentions through open ended questions that probed their experiences about work-based technology adoption (see Table 6). The objective of data collection was to create a comprehensive record of participants' words and actions to ensure as little loss as possible (Merriam & Tisdell, 2016). I conducted semi-structured interviews, which I recorded, and then I transcribed verbatim into text documents. I then analyzed for hand coding. I used Rogers's (2003) five attributes that influence adoption of an innovation (relative advantage, compatibility, complexity, trialability, and observability), and UTAUT's four constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) to inform the interview questions, the a priori codes, and open coding. Table 6 details the a priori codes. All coding, accounting for surprising and unusual coding will be as precise as possible and I used hand coding. All coding allowed the identification of themes and patterns from the data. I reviewed this information to identify key determinants, conditions, and intentions behind the use of new technology.

Table 6

Research Questions Related to Theories and A Priori Codes

Research Question Research Question 3: What are public librarians' perceptions regarding technology adoption supports?			
Interview Guiding Questions	Connections to diffusion of innovation theory	Connections to the UTAUT	A Priori Codes
What supported you most as you have learned a new technology?	Compatibility, Trialability, Complexity, Observability, Trialability	Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions	technology supports, good work fit, time to learn, easy to use, social use, time to learn, peer influence
How were these supports helpful and why?	Relative Advantage, Complexity	Effort Expectancy	easy to use, benefits, easy to use
How much support did the library provide for this?	Relative Advantage, Compatibility, Trialability	Facilitating Conditions	technology supports, benefits, time to learn
How did you access the support?	Relative Advantage, Complexity	Effort Expectancy	benefits, easy to use
What was the easiest part of learning this tech?	Complexity	Effort Expectancy	easy to use
What was the hardest part of learning this tech?	Complexity	Effort Expectancy	easy to use
In what ways did you practice your new tech skills?	Trialability	Effort Expectancy	time to learn
As you were learning this tech, how did the training (support) relate to your particular work?	Compatibility	Performance Expectancy	good work fit
How did learning this tech compare to learning other tech you need to learn for your job?	Relative Advantage	Performance Expectancy	benefits, good work fit
What might have been a better way to learn this tech?	Relative Advantage, Complexity	Effort Expectancy, Facilitating Conditions	benefits, easy to use, technology supports

(table continues)

Research Question Research Question 4: What are public librarians' perceptions regarding how these technology adoption supports may connect to their behavioral intentions?			
What made you want to learn this new technology?		Social Influence, Facilitating Conditions	peer influence, technology supports, easy to use, good work fit, social use, benefits, time to learn
If using the technology will help you attain gains in job performance, how does this influence your decision to use the new technology?	Relative Advantage, Compatibility	Performance Expectancy	benefits, good work fit
How does the degree of ease associated with using a technology effect your decision to use a new technology?	Complexity	Effort Expectancy	easy to use
If the use of technology is seen as important to coworkers, how does that influence your decision to use a new technology?	Observability	Social Influence	social use, peer influence
If the use of technology is seen as important to administration, how does that influence your decision to use a new technology?	Observability	Social Influence	social use, peer influence
How would you use a new technology if you knew adequate resources were not available?	Trialability	Facilitating Conditions	technology supports, time to learn

Quantitative and Qualitative Components

It is unclear if all libraries have the same technologies, thus it is not valid to identify relationships. With the unknown relationships between adoption factors and little research on this topic, there would not be enough data for a quantitative inferential study. The predictive statistics from the survey informed the qualitative interviews for this study. This study provided data for future inferential studies and develop a starting point for understanding public librarians use of technology.

Threats to Validity

Quantitative and Qualitative Validity

Validity does not carry the same connotations in qualitative research that it does in quantitative research (Creswell, 2018b). Qualitative validity means that the researcher checks for accuracy of the findings by employing certain procedure or strategies. To establish qualitative validity, I used triangulation for establishing data themes, member checking, rich description of findings, clear bias clarification, and discussion of discrepant information. For quantitative validity, the following section discusses the threats to both internal and external validity.

Internal Validity Threats

Internal threats to validity are experimental procedures, treatments, or experiences of the participants that threaten the ability to draw correct inferences from the data about the population (Creswell, 2018b). This study did not employ experimentation. Therefore, threats of concern are those involving participants; this section includes only history, maturation, selection, and mortality threats.

Time passes during a study, events can occur that unduly influence the outcome, and participants may change in a way that influences the study (Creswell, 2018b). With history and maturation, time passes, and events can occur, but the design for this study is cross-sectional not longitudinal. I designed the study so that participants completed the quantitative survey within a 10-day period so I could schedule interviews within a month of survey completion. Neither the quantitative nor the qualitative data required similar timeframes for data collection. It is possible that the consistent change of new technologies in libraries may have beneficially brought thoughts of technology to the forefront of a participant's mind.

Selection of participants can pose a threat because the researcher might only select those who have ideal characteristics for the study rather than a representative sample (Creswell, 2018b). To prevent that, I only selected participants from state A and state B public libraries and only those librarians who completed their MLS/MLIS degree, which, according to the Institute of Museum and Library Services (2019), was about 1,246 public librarians of the reported 136,851 librarians in the United States. I kept identities of the participants confidential to ensure a random distribution of participant characteristics of those I interviewed.

Participants could have refused the survey or changed their mind about interview participation in the time it took for me to schedule an interview. Participants drop out during a study for many reasons and researchers need to choose a large sample to reduce this threat (Creswell, 2018b). The survey required sample size of 160 participants, found with a confidence level of 95% and a 5% margin of error, from a population of 1,246

librarians. As for the 12 interviews, I invited all 1,246 librarians to participate. The large population helped account for participant dropouts. As a contingency plan, I included librarians from another state, State A, in study.

External Validity Threats

External threats to validity happen when researchers draw incorrect inferences from the sample data to other persons, other settings, and past or future situations (Creswell, 2018b). Threats arise because of the characteristics of participants selected for the sample, the uniqueness of the setting, and the timing of the research. This section discussed the following: the interaction of selection, setting, and history.

The narrow characteristics of participants does not allow researchers to generalize their information beyond individuals who do not possess the characteristics of the original participants (Creswell, 2018b). For this study it was possible to generalize findings to other states. However, such generalization only applies to public libraries and librarians who were ALA approved and MLS/MLIS credentialed.

The results of a study are time-bound and a researcher cannot generalize the results to past or future situations (Creswell, 2018b). Other researchers would need to replicate this study at another time to eliminate this threat. The goal then is to have a precise enough study to easily repeat should it be necessary or requested.

Construct and Statistical Conclusion Validity Threats

Threats to statistical conclusion validity occur when researchers draw inaccurate inference from the data because of inadequate statistical power or the violation of statistical assumptions (Creswell, 2018b). Threats to construct validity occur when

researchers use inadequate definitions and measures of variables (Creswell, 2018b). To establish construct validity researchers must relate a measuring instrument to the general theoretical framework, to determine whether the instrument is logically or empirically tied to the concepts and theoretical assumptions being employed (Frankfort-Nachmias, Nachmias, & DeWaard, 2015).

Issue of Trustworthiness

Trustworthiness is an umbrella term for quality in research. To establish trustworthiness, a researcher needs to consider credibility, transferability, dependability, and confirmability of the data (Frey, 2018). This section includes a definition of these constructs and the response to threats on trustworthiness.

Credibility, an internal validation, is the extent to which a research study is truthful and conveys the study participants' experiences (Plano Clark & Ivankova, 2016; Frey, 2018). To establish credibility, this researcher strived and hoped for data saturation while continuing to collect and analyze data on an ongoing basis so there is continual checking for ideas, constructs, and themes from both quantitative and qualitative data. I also focused upon member checking, verbatim statements, and nonjudgmental descriptions to provide a level of credibility. Additionally, for credibility and confirmability, seeking participant validation engaged the study participants with the data from surveys to determine if it correctly reflected their lived experiences (Frey, 2018). I also used member checking to gather new data for fuller understanding of the context.

Transferability is the extent to which findings are applicable to other contexts and studies (Plano Clark & Ivankova, 2016; Frey, 2018). Thus, it is equivalent to

generalizability and external validity. The quantitative data results should be transferable to public librarians across the United States because the only exclusion was the requirement of an MLS/MLIS degree which is the standard for most states. Qualitative data is transferable because I provided thick descriptions that details a full account of the context, participants, and research design (Plano Clark & Ivankova, 2016; Frey, 2018). Additionally, I was committed to purposeful sampling that represented the research design, limitations, and delimitations of the study.

Confirmability is the preference of objectivity (Frey, 2018). Thus, I identified any predispositions toward the research. Confirmability is also the degree to which other researchers can corroborate the results of an inquiry (Frey, 2018). I additionally established an audit trail of the process in a journal as the research progresses.

Dependability refers to the consistency of qualitative research study findings and parallels reliability in quantitative research studies (Frey, 2018). Peer debriefing, in this study, provided participants the opportunity to review and approve interview transcripts before use. My use of peer debriefing ensures that interview data was as dependable and reliable as the quantitative data. It also supported the confirmability of the study's findings, which is comparable to quantitative objectivity (Frey, 2018).

Because I was previously employed as a technology trainer and manager for one of the state B's 194 public libraries, I experienced the need for technology-related skills within a public library setting. The connection is why I chose to pursue this study. It is important to identify personal biases early in the research process to remain neutral. To ensure credibility of the findings and interpretations I utilized member checking with

participants (Salkind, 2010). Thus, I employed only facts and the beliefs of public librarians who volunteered to be a part of the study.

Ethical Procedures

Ethical issues can occur during a research study, particularly when collecting data. Creswell (2018a) recommended that researchers must take the necessary steps to protect the interest of participants and the integrity of the study. These steps should include the respect for the intellectual property, privacy, and welfare of all participants involved in the study.

In agreement with Walden IRB policy, I acquired the necessary approvals from Walden University (approval number # 07-16-19-0406379) and the local authorities. Concerning autonomy, I assured the participants of their right to withdraw from the study at any time. I provided them with the option to continue to the survey or opt out.

The benefits of the study include a list of resources for learning new technology. While the strain of sitting and reading from a digital screen for up to 30 minutes might produce discomfort for some individuals, it was not a concern for librarians who use a computer for extended time as a part of their normal work conditions. I informed librarians of the exclusion of personal data and the use of codes, aggregate data, password, and a firewall to protect their responses.

In terms of justice, I treated all participants with respect and offered them the same information and benefits. For example, I did not exclude any working librarian with an MLS/MLIS for any reason. Also, I hoped to use work e-mail addresses for all the librarians so that they have equal access to the invitation, proof of employment, and could

complete the survey at their own convenience. After survey results were in, I coded respondents with their email hidden. Therefore, I included all the necessary IRB endorsements and prefaced the survey with a note clarifying the purpose and voluntary nature of the study. I also provided contact details for myself and the appropriate Walden authorities so that the participant could resolve any ethical concerns.

At the end of the study, I removed all data from the survey site and deleted the survey. Also, I saved the data on a password-protected MacBook Pro with the firewall enabled, and a password-protected internet connection. Additionally, I stored a copy of the data on an encrypted USB flash drive. Based on Walden University stipulation, I will keep the data for at least 5 years, and then delete them.

Summary

A mixed methods approach began with quantitative survey data that resulted in predictive statistics detailing evidence of the intention to use or not use new technology from many librarians. Qualitative interview data, although few and time-intensive, allowed for deeper and richer exploration of their choices and provided insight into the supports that have facilitated technology adoption. Thus, this was an explanatory sequential (quantitative – qualitative) mixed method research study of State A and State B public librarians. I used a two-phase data collection process in which I first collected quantitative survey data, I then analyzed results, and then used results to plan and implement the second, qualitative phase. In Chapter 4 I detail the research process and discuss the results.

Chapter 4: Results

Introduction

The results of the data analyses that address the research questions are presented in this chapter. I analyzed the qualitative and quantitative data separately, as the two types of data answered two different research questions. The purpose of this predictive, sequential, explanatory, mixed method study was to examine public librarians' attitudes toward learning new technology and their behavioral intention to adopt it. I wanted to understand the predictive relationships between the UTAUT constructs of performance expectancy, effort expectancy, social influence, and facilitating conditions, and public librarians' behavioral intention to adopt technology as well as understand public librarians' perceptions about needed supports for technology adoption. The research questions to address the purpose were related to prediction of technology use based on these UTAUT constructs; how predictive relationships vary by age, gender, voluntariness, and experience; public librarians' perceptions regarding technology adoption supports; and public librarians' perceptions regarding how technology adoption supports connect to their behavioral intent. This chapter includes sections describing the setting, demographics, data collection, data analysis, trustworthiness, the results, and a summary of answers to the research questions.

Setting

The setting for this study was public libraries of State A and State B and the participants are public librarians with an MLS/MLIS or ALA accredited equivalent degree. These states were close to my location and I had previous experience working in

State B, making data collection easier. Additionally, State B and State A also serviced an average-to-large community of 4,652,360 and 10,155,942 people in a nationwide comparison (Institute of Museum and Library Services, 2019). State B had 194 public libraries in 46 counties whose populations range from 10,000 to 460,000 (Institute of Museum and Library Services, 2019). State A had 389 public libraries in 81 counties with populations ranging from 4,600 to 1,053,545 (Institute of Museum and Library Services, 2019). As of 2017, there was a total of 1,951.91 public library staff members in State B (478 with an MLS/MLIS) and 3,059.03 in State A (768 with an MLS/MLIS; Institute of Museum and Library Services, 2019). These states were a good choice for comparison because, based on their sizes and populations, they represent all sizes of public libraries.

Demographics

The participants in this study were public librarians with MLS/MLIS degrees from ALA accredited programs. For the quantitative part of this study, I emailed a link with description of my quantitative survey to all county library directors in first State B (46) and then State A (81). State A was included because of the low response rate from State B. Then 127 library directors disseminated the survey to 1,246 public librarians with MLIS degrees in both states.

The survey had a voluntary question that asked if potential participants were interested in interviewing and allowed them to type their name, e-mail, and phone number. I purposely sorted those interested into groups depending on if they were from rural, suburban, town, or city. I chose three participants from each group and interviewed. I conducted Interviews via phone and recorded with Google Voice. Recordings, notes,

and the names of interviewees were kept in a secure file. The names of the participants and libraries were assigned pseudonyms to prevent identification. Tables 7 and 8 show the demographics of participants.

Table 7

Demographics of Surveyed Public Librarians

Demographic	*N* = 202	Percentage
Gender		
Male	44	21.8
Female	157	77.7
Non-binary	1	.5
Age		
21 – 30	24	11.9
31 – 40	58	28.7
41 – 50	57	28.2
51 – 60	44	21.8
61 – 70	19	9.4
Years with MLIS		
<1	16	7.9
2-5	40	19.8
6-10	49	24.3
11-15	33	16.3
16-20	20	9.9
21-25	24	11.9
26-30	8	4.0
31-35	8	4.0
41-45	4	2.0

Table 8

Demographics of Interviewed Public Librarians

	Age Range	Gender	Years with MLIS
C1	31 – 40	Female	6 – 10
C2	31 – 40	Female	11 – 15
C3	31 – 40	Female	11 – 15
S1	51 – 60	Male	21 – 25
S2	21 – 30	Female	< 1
S3	61 – 70	Female	11 – 15
T1	51 – 60	Female	31 – 35
T2	31 – 40	Female	2 – 5
T3	31 – 40	Female	11 – 15
R1	61 – 70	Male	21 – 25
R2	41 – 50	Female	11 – 15
R3	21 – 30	Female	< 1

Data Collection

Quantitative Data Collection Procedures

After receiving Walden IRB approval in July 2019, I sent e-mails with links to the survey to 46 State B library directors. Directors were asked to disseminate the survey, accessible through SurveyMonkey website, to the 478 public librarians with an MLIS degree. Originally, I had planned to deploy the survey for 2 weeks. However, at the end of the 2-week period the response rate was low (only about 120 participants), and I extended it 2 more weeks with the addition of another e-mail to library directors. I had expected much more participation because of the population size. After 1 month the numbers remained low, so I included State A in the study. Due to the change in population, I sought a Walden IRB revision in mid-August 2019, and upon receiving it I sent an e-mail and survey link to 81 State A library directors. They disseminated the

survey to 768 public librarians with an MLIS degree. Altogether the intended survey population was 1,246 public librarians. After a month, the survey reached 202 participants, which was more than my g power analysis goal of 160.

Qualitative Data Collection Procedures

The last question on the survey asked if the participant would also like to participate in an interview for the qualitative portion of this study. Those who identified as interested provided an e-mail address and contact number. I purposefully selected 12 librarians as outlined in Chapter 3. The twelve participants, 10 females and two males, participate in the qualitative part of the study. Interviewing occurred over 2 months. The interviews were all conducted via phone and recorded with Google Voice. Google Voice allowed me to record and download the conversation as an MP3, which I then played back on VLC Media Player for transcription. VLC allowed me to slow down the audio for better transcription.

All data were collected following the format of the surveys, interviews, and subsequent data collection events as described in Chapter 3 and approved by IRB. No adverse or unusual circumstances occurred during the data collection. Many of the participants indicated interest in subsequently learning the results.

Data Analysis

Quantitative Data Analysis

I used Faul et al. (2019) G*Power 3.1.9.4. software with the developers' recommended effect size of .015 for a medium sample size, .05 probability error, .95 power, and eight predictors (four dependent, four mediating), resulting in this study's

total required sample size of 160. As a contingency plan, I had to include librarians from another state, State A. The total number of librarians surveyed was 202.

I collected quantitative data using the UTAUT survey (Appendix C). Each of the participating State A and State B counties had a link to the survey through the SurveyMonkey web tool. I exported data from SurveyMonkey to an Excel sheet. Using an Excel worksheet was important for compatibility with SPSS and the identification of missing data or errors in the data. Errors occur when participants provide scores outside the range for variables or the researcher inputs the wrong numbers (Creswell, 2018a). I avoided this by visually inspecting the data, which included sorting the data by ascending order and finding the outliers. Missing data can also occur when instrument data is lost, participants skip questions, or participants refuse to complete a question (Creswell, 2018a). I eliminated surveys with missing data from the study.

Because both states had their own identical survey statistical data, I combined it into one sheet and then imported it into SPSS. All surveys were complete, so no one was excluded from further analysis. I then conducted a multiple linear regression analysis under the assumptions that there must be a linear relationship between the outcome variable and the independent variables, residuals are normally distributed, the variance of error terms are similar across the values of the independent variables, and that multicollinearity does not exist between the independent variables (Frankfort-Nachmias et al., 2015). I conducted the multiple linear regression analyses to evaluate the relationship between direct determinants (performance expectancy, effort expectancy, social influence, and facilitating conditions), moderating variables (gender, age,

experience, voluntariness of use), behavioral intention to use new technology, and use behavior. Tables 4 and 5 outline the independent variables, questions, analysis protocol, and dependent variables.

Qualitative Data Analysis

The qualitative component of this mixed method study provides a deeper look into the results and the possible reasons for the results related to the characteristics of workplace technology innovations. The qualitative research questions addressed public librarians' perceptions regarding technology adoption supports and how these supports may connect to their behavioral intentions, which I answered by asking open-ended questions that probed their experiences about work-based technology adoption (see Table 6). The objective of data collection was to create a comprehensive record of participants' words and actions to ensure as little loss as possible (Merriam & Tisdell, 2016).

I conducted semi-structured interviews, which I recorded and then transcribed verbatim into text documents. I use Rogers's (2003) five attributes that influence adoption of an innovation (relative advantage, compatibility, complexity, trialability, and observability) and UTAUT's four constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) to inform the interview questions, the a priori codes, and open coding. Table 6 details the a priori codes. All coding, accounting for surprising and unusual coding, was as precise as possible. All coding allowed the identification of themes and patterns from the data. I reviewed this information to identify key determinants, conditions, and intentions behind the use of new technology.

I began qualitative data analysis as I received it. As participants completed an interview I transcribed in Word, coding interesting and potentially relevant information. I was open to anything using open coding (Merriam & Tisdell, 2016). The first open coding of interview transcripts produced the following codes: technology supports, perceived administrative expectations, time to learn, ease of use, learning needs, peer influence, adopter categories, public service focus, good work fit, self-support, benefits, budget, social use, and age. At this point, I began a second review of interview transcripts where I pulled quotes that matched the coding into an Excel spreadsheet. Each code had its associated quotes from participants.

I started seeing patterns after extracting all the quotes. Thus, I started axial coding, combining the codes from the open coding into fewer, more comprehensive categories (Merriam & Tisdell, 2016). I recoded each interview and developed the following codes: hands on, one-on-one, formal class, coworker support, self-directed learning, time to learn, access to technology, coworker complacency, administrative decisions, public service, positive view of technology, and administrative support. Thus, I began to analyze for themes and categories. The categories and themes constructed during data analysis should be responsive to the purpose of the research, exhaustive, mutually exclusive, sensitizing, and conceptually congruent (Merriam & Tisdell, 2016). There were four themes that stood out: learning needs, learning strategies, barriers to adopt technology, motivation to adopt technology. Themes 1 and 2 answered my first research question, and Themes 3 and 4 answered my second research question.

Results

Quantitative Components

Descriptive statistics. There were 202 participants who completed the quantitative survey for this study. The actual sample size was higher than the required sample size of 160 from the power analysis. The surveys were completely answered; therefore, all participants were included in the study. Of the 202 completed surveys, 21.8% (n = 44) were male, 77.7% were female, and 0.5% were non-binary (see Table 9).

Table 9

Gender Frequencies and Percentages

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	44	21.8	21.8	21.8
	Female	157	77.7	77.7	99.5
	Non-binary	1	.5	.5	100.0
	Total	202	100.0	100.0	

There were 24 (11.9%) participants in the 21–30 age range, 58 (28.7%) participants in the 31–40 age range, 57 (28.2%) participants in the 41–50 age range, 44 (21.8%) participants in the 51–60 age range, and 19 (9.4%) participants in the 61–70 age range. Table 10 shows the age group distribution for this data set.

Table 10

Age Range Frequencies and Percentages

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21 – 30	24	11.9	11.9	11.9
	31 – 40	58	28.7	28.7	40.6
	41 – 50	57	28.2	28.2	68.8
	51 – 60	44	21.8	21.8	90.6
	61 – 70	19	9.4	9.4	100.0
	Total	202	100.0	100.0	

The participants also reported how many years they held their MLIS degrees. Sixteen (7.9%) of participants indicated that they have less than 1 year with the MLIS degree, 40 (19.8%) indicated 2-5 years, 49 (24.3%) indicated 6-10 years, 33 (16.3%) indicated 11-15, 20 (9.9%) indicated 16-20 years, 24 (11.9%) indicated 21-25 years, eight (4%) indicated 26-30, 8 (4%) indicated 31-35 years, and four (2%) indicated 41-45 years. Table 11 shows the distribution of participants number of years with MLIS degrees.

Table 11

Number of Years with MLIS Degree Frequencies and Percentages

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<1	16	7.9	7.9	7.9
	2-5	40	19.8	19.8	27.7
	6-10	49	24.3	24.3	52.0
	11-15	33	16.3	16.3	68.3
	16-20	20	9.9	9.9	78.2
	21-25	24	11.9	11.9	90.1
	26-30	8	4.0	4.0	94.1
	31-35	8	4.0	4.0	98.0
	41-45	4	2.0	2.0	100.0
	Total	202	100.0	100.0	

When asked how voluntary the use of new technology is in their library, 21 (10.4%) indicated that the use of technology is completely mandatory, 67 (33.2%) indicated mostly mandatory, and 62 (30.7%) indicated somewhat mandatory. Fourteen (6.9%) participant indicated neutral, 23 (11.4%) indicated somewhat voluntary, 15 (7.4%) indicated mostly voluntary, and no participants indicted completely voluntary. Table 12 shows the distribution of the voluntariness of use of new technology in the public librarians' library.

Table 12

Voluntariness of Use Frequencies and Percentages

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	CM	21	10.4	10.4	10.4
	MM	67	33.2	33.2	43.6
	SM	62	30.7	30.7	74.3
	Neutral	14	6.9	6.9	81.2
	SV	23	11.4	11.4	92.6
	MV	15	7.4	7.4	100.0
Total		202	100.0	100.0	

Note. CM = completely mandatory, MM = mostly mandatory, SM = somewhat mandatory, SV = somewhat voluntary, and MV = mostly voluntary

Assumptions. As seen in Table 13 the tests to see if the data met the assumption of collinearity indicated that multicollinearity was not a concern. All independent variables had VIF value less than 10 and a tolerance less than 0.1. To check see if residual terms are uncorrelated, the Durbin-Watson values can be anywhere between 0 and 4. The data met the assumption of independent errors (Durbin-Watson value = 2.17; see Table 14).

Table 13

Coefficients with Collinearity Statistics

		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-1.662	.759		-2.191	.030		
	PE	.247	.066	.274	3.739	.000	.602	1.661
	EE	.161	.056	.205	2.880	.004	.635	1.574
	SI	.135	.053	.175	2.524	.012	.668	1.497
	FC	.132	.067	.134	1.967	.051	.691	1.448

Note. Dependent Variable BI. PE = performance expectancy, FC = facilitating conditions, SI = social influence, EE = effort expectancy

Table 14

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.603[a]	.364	.351	2.23694	2.176

Note. Predictors are (Constant), facilitating conditions, performance expectancy, social influence, effort expectancy and the dependent variable is BI.

The histogram of standardized residuals (Figure 4) indicated that the data contained approximately normally distributed errors, as did the normal P-P plot of standardized (Figure 5), which showed points that were not completely on the line, but close. The scatterplot of standardized residuals showed that the data met the assumptions of homogeneity of variance and linearity. The data also met the assumption of non-zero variances (performance expectancy, Variance = 9.463; effort expectancy, Variance = 12.559; social influence, Variance =13.113; facilitating conditions, Variance = 7.958; and BI, Variance = 7.708; see Table 15).

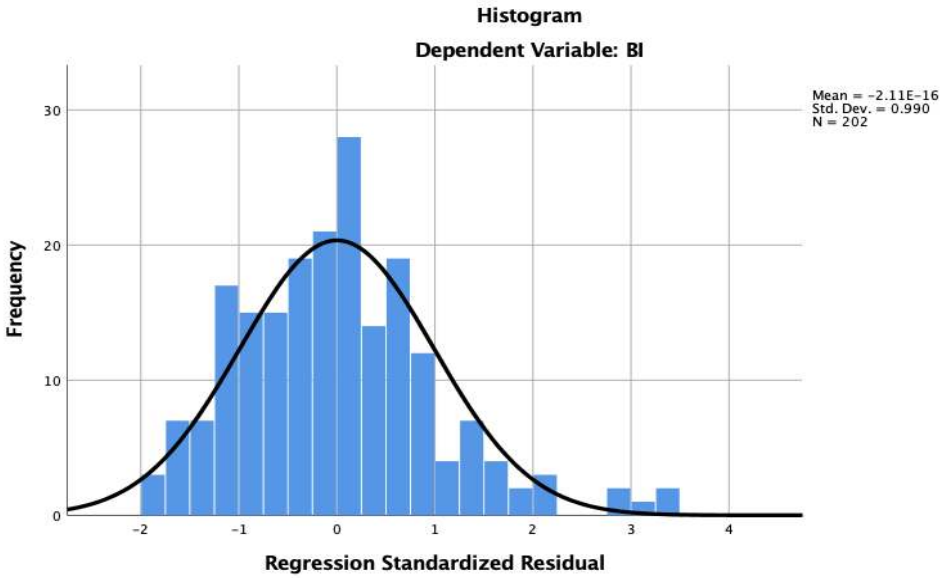

Figure 4. Histogram.

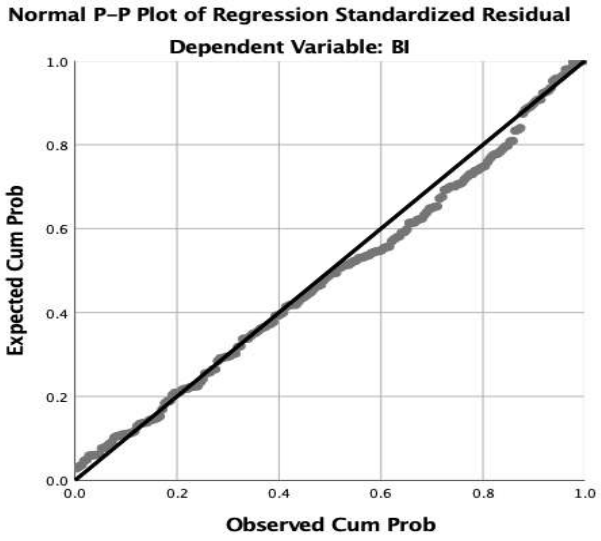

Figure 5. Normal p-p plot of regression standardized residual.

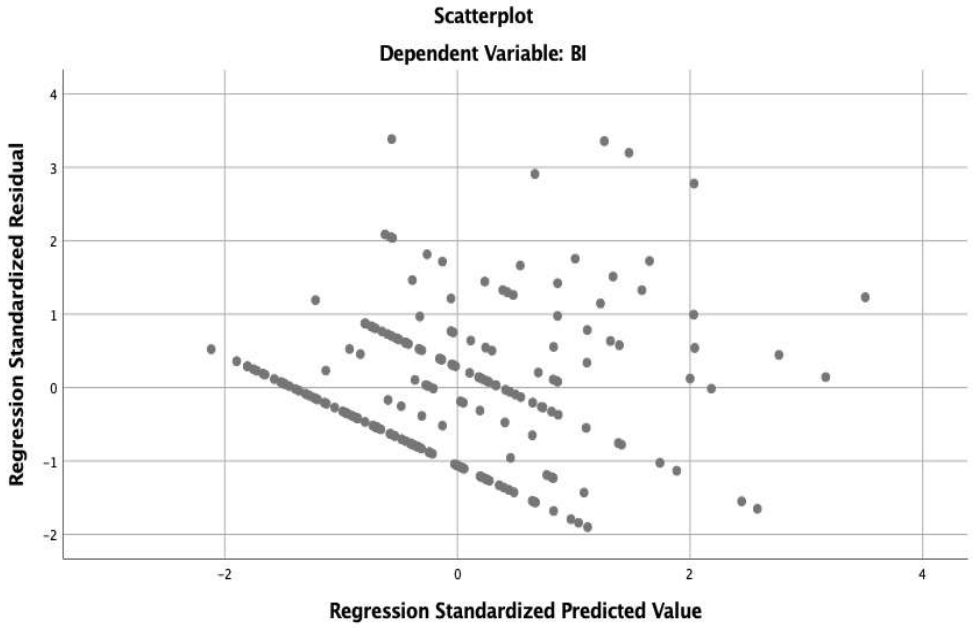

Figure 6. Scatterplot.

Table 15

Descriptive Statistics with Variances

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
PE	202	4.00	21.00	10.3515	3.07618	9.463
EE	202	4.00	25.00	9.1683	3.54381	12.559
SI	202	4.00	19.00	10.7079	3.62122	13.113
FC	202	4.00	22.00	11.8218	2.82102	7.958
BI	202	3.00	15.00	5.3762	2.77642	7.708
Valid *N* (listwise)	202					

Note. PE = performance expectancy, FC = facilitating conditions, SI = social influence, EE = effort expectancy

Statistical analysis. The results of Table 16 confirm that all 202 participants provided a valid response for each item. That is, there were no missing data. The results also reveal that behavioral intentions grew from performance expectancy (M = 10.3515, SD = 3.07618), effort expectancy (M = 9.1683, SD = 3.07618), social influence (M = 10.7079, SD = 3.62122), to facilitating conditions (M = 11.8218, SD = 2.82102).

Table 16

Descriptive Statistics for Factors Influencing Behavioral Intention

	Mean	Std. Deviation	N
BI	5.3762	2.77642	202
PE	10.3515	3.07618	202
EE	9.1683	3.54381	202
SI	10.7079	3.62122	202
FC	11.8218	2.82102	202

Note. PE = performance expectancy, FC = facilitating conditions, SI = social influence, EE = effort expectancy

A multiple regression was run to predict behavioral intention from performance expectancy, effort expectancy, social influence, and facilitating conditions. Some of these variables statistically significantly predicted behavioral intention, $F (4, 197) = 28.160$, $p < .0005$, $R_2 = 0.364$. All four variables added statistically significantly to the prediction, $p < .05$.

A value of 0.603 indicates a good level of prediction (Laerd Statistics, 2019). The R Square column in Table 17 represents the R_2 value, which is the proportion of variance in the dependent variable that can be explained by the independent variables. With an R Square value of 0.364 the independent variables explain 36.4% of the variability of the dependent variable. Table 18 shows that the independent variables statistically significantly predict the dependent variable, $F (4, 197) = 28.160$, $p < .0005$. The general form of the equation to predict behavioral intention from performance expectancy, effort expectancy, social influence and facilitating conditions is predicted BI = -1.662 – (.247 x performance expectancy) – (.161 x effort expectancy) – (.135 x social influence) – (.132 x facilitating conditions). See Table 19 for these results.

Table 17

Model 1 Summary

					Change statistics				
Model	*R*	R_2	Adjusted R_2	*SE* of the Estimate	R_2 Change	F Change	Sig. F Change	df1	df2
1	.603	.364	.351	2.23694	.364	28.160	.000	4	197

Table 18

ANOVA for Model 1

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	563.641	4	140.910	28.160	.000
	Residual	985.765	197	5.004		
	Total	1549.406	201			

Table 19

Coefficients for Model 1

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	-1.662	.759		-2.191	.030
	PE	.247	.066	.274	3.739	.000
	EE	.161	.056	.205	2.880	.004
	SI	.135	.053	.175	2.524	.012
	FC	.132	.067	.134	1.967	.051

Note. PE = performance expectancy, FC = facilitating conditions, SI = social influence

If $p < .05$, it can be concluded that the coefficients are statistically significantly different to 0 (zero). The p-value is located in the Sig. columns. There is a significant predictive relationship between performance expectancy, effort expectancy, social influence, facilitating conditions and behavioral intention to use new technology. As performance expectancy goes up the behavioral intention to use technology increases. When effort expectancy goes up the behavioral intention to use technology increases. As

social influence goes up the behavioral intention to use technology increases. When facilitating conditions goes up the behavioral intention to use technology increases.

A multiple regression was run to predict behavioral intention from performance expectancy, effort expectancy, social influence, and facilitating conditions. Some of these variables statistically significantly predicted behavioral intention, $F(8, 193) = 14.195$, $p < .0005$, $R_2 = 0.370$. Three of four variables added are not statistically significantly to the prediction, $p < .05$.

A value of 0.370 indicates a good level of prediction (Laerd Statistics, 2019). The R Square column in Table 20 represents the R_2 value, which is the proportion of variance in the dependent variable that can be explained by the independent variables. With an R Square value of 0.370 the independent variables explain 37.0% of the variability of the dependent variable. Table 21 shows that the (independent variables), performance expectancy, effort expectancy, social influence, and facilitating conditions statistically significantly predict the dependent variable, $F(8, 193) = 14.195$, $p < .0005$. There is a significant predictive relationship between performance expectancy, effort expectancy, social influence, facilitating conditions and behavioral intention to use new technology. The general form of the equation to predict behavioral intention from performance expectancy, effort expectancy, social influence and facilitating conditions is predicted BI = -1.582 – (.254 x performance expectancy) – (.161 x effort expectancy) – (.120 x social influence) – (.149 x facilitating conditions) – (-.091 x FDV) – (.142 x Age) – (-.154 x MLIS) – (-.028 x Voluntariness). See Table 22 for these results.

Table 20

Model 2 Summary

					Change statistics					
Model	*R*	R_2	Adjusted R_2	*SE* of the Estimate	R_2 of change	F Change	Sig. F Change	df1	df2	Durbin-Watson
2	.609	.370	.344	2.24816	.007	.509	.729	4	193	2.174

Table 21

ANOVA for Model 2

Model		Sum of Squares	df	Mean Square	F	Sig.
2	Regression	573.939	8	71.742	14.195	.000
	Residual	975.467	193	5.054		
	Total	1549.406	201			

Table 22

Coefficient for Model 2

		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	*t*	Sig.	Tolerance	VIF
2	(Constant)	-1.582	1.113		-1.421	.157		
	PE	.254	.067	.281	3.770	.000	.585	1.709
	EE	.161	.059	.206	2.738	.007	.576	1.737
	SI	.120	.056	.157	2.162	.032	.621	1.609
	FC	.149	.070	.151	2.131	.034	.647	1.547
	Female Dummy Variable	-.091	.385	-.014	-.236	.814	.975	1.026
	What is your age?	.142	.188	.059	.755	.451	.527	1.897
	How many years have you had your MLIS degree?	-.154	.109	-.111	-1.411	.160	.524	1.909
	How voluntary is the use of new technology in your library?	-.028	.120	-.014	-.236	.814	.891	1.123

Note. PE = performance expectancy, FC = facilitating conditions, SI = social influence,

EE = effort expectancy

If $p < .05$, it can be concluded that the coefficients are statistically significantly different to performance expectancy, effort expectancy, social influence, and facilitating conditions were significant, while gender, age, years with MLIS, and voluntariness were not. There is a significant predictive relationship between performance expectancy, effort expectancy, social influence, facilitating conditions and behavioral intention to use new technology. The predictive relationship between performance expectancy, effort expectancy, social influence, and facilitating conditions and public librarians' behavioral intention to use new technology does not vary significantly by age, gender, voluntariness, and experience.

Qualitative Components

Results were analyzed through a priori codes which were derived from the synthesis of the Roger's (2003) diffusion of innovation and Venkatesh's (2003) UTAUT. The a priori codes of technology supports, good work fit, time to learn, easy to use, social use, benefits, and peer influence did not all appear in the data. Thus, I used a more general inductive approach (Merriam & Tisdell, 2016).

Research questions. This section provides an overview of answers to the two qualitative questions followed by a detailed description of the themes. The themes are learning needs, learning strategies, barriers to technology adoption, and motivation to adopt technology.

Research Question 3: What are public librarians' perceptions regarding technology adoption supports? This research question was answered by public librarians in the following qualitative themes: learning needs and learning strategies. Public

librarians perceived that learning needs such as lack of supports in areas like hands-on time with technology, one-on-one training, and formal classroom opportunities are preventing them from fully adopting technology. To address this lack of technology adoption supports, public librarians have turned to learning strategies like coworker support or self-directed learning.

Themes: Learning needs and strategies. In response to the first qualitative research question, some public librarians interviewed have been employing their own learning strategies to adopt new technologies. However, they have found they still have several learning needs. The strategies that public librarians have been using are coworker support and self-directed learning. The learning needs public librarians specified a need for are hands-on learning, one-on-one learning, and formal classes. These are defined in Table 23 and explored next.

Table 23

First List of Themes with Definitions

Theme	Subtheme	Definition
Learning Needs	Hands On	Four public librarians wanted more time hands on with new technology. They state it allows for real time experience which is important to them.
	One on One	Three public librarians wanted someone to show them one on one how to use a new technology. This is due to a lack of time to learn and the need for learning repetition.
	Formal Class	Four public librarians would like to learn in a formal classroom setting. They want real world examples, experienced trainers, and opportunities to practice what they have learned.
Learning Strategies	Coworker Support	Ten public librarians were learning from their coworkers. They approach the most tech savvy for support and return the favor by sharing their expertise.
	Self-Directed Learning	Six public librarians were learning on their own. They do this by locating instructions, searching Google, and watching YouTube videos. Some of the learning must take place at home due to time constraints.

Learning needs are defined learning preferences described by public librarians. For hands-on learning, participants C1 and S3 stated, “Well here I would like to have more time to acclimate to the new technology and get chance to get hands on with it, before it gets rolled out with the public or announced to the public,” and “I think we needed more opportunities to actually train on it, having a training module and training on it. Which was available but not as much as it should have been.” Public librarians in need of the one-on-one style of learning have stated (R2) “I think for me sometimes I’m so busy I just want someone to show me how to do it, so I can jump in,” and (T3) “I’m pretty sure one-on-one and hands-on...It lets you see it and do it in real time.” A formal classroom style of learning was also described by most public librarians and participants said, (R1) “I could have taken a formal class and learned it that way, but if I had more time that might have been a better way,” and (C2) “ One is going in person to a classroom and doing tradition learning. For certain things I prefer that way.” Public librarians’ perception regarding technology adoption supports is that to adopt technology they need more hands-on training, more one-on-one time with technology, and formal classroom experiences.

Coworker support meant a libraian asked for help or was taught by coworkers how to use a new technology. Participant R2 stated that “what helped me the most was sitting down with another staff person who had already been working on it,” and participant C3:

> Mostly I would say coworkers. You know if like we have a new something or technology in the branch there is usually training, sometimes depending upon

> what it is that it is training for everybody or might be training for a few people and those people come back to the branch and kind of train everyone else. Usually I would say, coworkers if you're stuck or something isn't working right.

These quotes and ten others support the defined learning strategy.

Self-directed learning is learning to do something on their own without the support of coworkers or the library. Participant R1 stated:

> In my particular case, sitting down by myself or asking the occasional question, going to the manuals, going to the instructions, or looking up online when needed. I learned to do excel spreadsheets more, not because I took a class, but because I needed it to do something. So I needed to do research to see how this one thing was done.

Participant R3 stated, "If I ever needed help with something I've always been welcomed to talk to someone else who knows more, but for the most part it has been more self-directed." These were from two librarians of six that supported this learning strategy. Many public librarians were learning on their own. Public librarians' perception regarding technology adoption supports was learning on their own through self-directed learning or from coworkers during working hours.

Research Question 4: What are public librarians' perceptions regarding how these technology adoption supports may connect to their behavioral intentions? This research question was answered by public librarians in the following qualitative themes: barriers to technology adoption and motivation to adopt technology. Public librarians perceived that when there were barriers to technology adoption in place like the lack of

time to learn, access to technology, coworker complacency, and administrative decisions it prevented them from fully adopting technology. Despite the barriers in place, public librarians are focused on public service, have a positive view of technology, and believe some administrative decisions are supportive of their technology adoption.

*Themes: Barriers and motivation***.** In response to the second qualitative research question, 75% of the interviewed librarians perceive that there are barriers to adoption of technology and motivations to pursue the adoption of technology. The barriers to technology adoption are the time to learn, access to technology, and administrative decisions. The motivations to learn new technology are for public service, positive view of technology, and administrative support. These are defined in Table 24 and explored next.

Table 24

Second List of Themes with Definitions

Theme	Subtheme	Definition
Barriers to Technology Adoption	Time to Learn	Nine lacked time to learn technology, slowing down adoption. They believed the nature of the work, role in the library, adoption decisions, and staffing levels were factors causing limited time.
	Access to Technology	Five believed they needed more access to technology to better support patrons. They noted a lack of budget and prioritization of technology.
	Coworker Complacency	Seven stated coworker complacency stood in the way of adoption, citing age near retirement, satisfaction with status quo, and fear of technology.
	Administrative Decisions	Eight experienced barriers created by administration. They felt unsupported and had to sell ideas to administration. Some distrust or were suspicious of administration. There was a lack of planning for implementation and a lack of promotions for being proactive with technology in their jobs.
Motivation to Adopt Technology	Public Service	Seven PLs wanted to be knowledgeable, helpful, and current with technology to provide good public service.
	Positive View of Technology	Six had a positive attitude toward technology but they believed libraries cannot move forward without technology, basic technology standards should be a priority, it makes them more efficient, and being relevant is important.
	Administrative Support	Seven believed administrative support was instrumental technology adoption. PLs demonstrated this by sharing the positive experiences with administration citing both pro-technology and pro-training attitudes.

A barrier is anything that might prevent technology adoptions. The sub themes of barriers to technology adoption are the time to learn, access to technology, and administrative decisions.

The time to learn is having enough time to learn a topic and most of the librarians interviewed believed there were many things taking time away from learning technology. Participant R2 stated,

> Being the assistant director and also head of adult's services, because librarians have been wearing a lot more hats these days. Sometimes I end up having to do these things at home or stay late possibly to be able to fit in what I need to learn.

Participant R3 mirrored that statement by stating:

> I need time to figure things out. A lot of times I'm able to do things on the spot, part of my job, but not everything you can do on the spot. Some things take time. So, access and time are the big things.

Nine of the 12 librarians supported these quotes.

Access to technology is the ability to opportunity to use technology. This, according to some public librarians, was a big limitation. Participant R1 said that, "I'd just say that my experience is that it can be hard for libraries to keep up with all that patrons would like for us to keep up with for technology. We don't have the resources." Participant R3 concurred by stating:

> I need access to it. If someone comes in a needs help with their device, which is fairly regular, I might never have seen the device before. Because of that I might

> not be able to help them. So, I need to be able to experience some of the technologies before I can do anything to help people with them. That is my job.

Half of the public librarians believed the access to technology has prevented the adoption of technology.

Coworker complacency is the inability of going above or beyond one's current position or role. Public librarians cited age near retirement, satisfaction with status quo, and a fear of technology. Participant R1 stated:

> There are people around me who would rather I not use new technology. I think it is that, for them, it is something they don't want to bother with, or they've gone as far as they want to go. They're not in a frame of mind or place in their career where they want to do whatever the next new thing is, but they are still very important to me.

Another participant S3 said:

> Definitely got some people who are reluctant. I would say about half and half. I think that you've got some people that you mention it and they'll do it and other people that you have to push them into taking that time to learn.

Seven out of twelve public librarians believed this to be a cause that prevents technology adoption.

Administrative decisions are, in this study, any decision made by the administrative team that affects public librarians. Many public librarians experienced barriers to technology created by administration. They did not feel supported and have been stalled by having to sell ideas to administration. Some distrust and were suspicious

of administration. They also noted the lack of planning for technology implementation and the inability to get a raise for doing more with technology in their jobs. Participant C2 stated, "Generally admin and IT are not very supportive of this and we have to advocate and make our case to get anything done." Additionally, participant S2 reported:

> So, our admin we don't actually trust their views of tech for the most part. So, we tend to be more skeptical if they are the one telling us that something is great and wonderful. That is just because, being in a large system, the admin is further removed from things. And we are in a unique situation, but hopefully things will change. If admin is hyping something too much we get suspicious.

Eight of the twelve public librarians noted similar opinions. Public librarians' perceptions regarding how technology adoption supports may connect to their behavioral intentions were that barriers like the time to learn, access to technology, coworker complacency, and some administrative decisions prevented technology adoption.

In addition to the barriers to technology public librarians noted that they did have the motivation to learn and adopt new technology. The motivation to adopt technology was described in three sub themes: public service, positive view of technology, and administration which are described as follows.

The sub theme motivation of public service is any action that could support and help the patrons of the public library. Most public librarians wanted to be knowledgeable, helpful, and current with technology to provide good public service. They wanted to make it easier for the patrons. Participant C2 stated:

> I guess I never think of it in terms of job performance and gains. I always think of it from a customer service standpoint where it makes it much easier for me to give the customer what they want, and I get satisfaction out them getting what they need.

Participant T3 concurred, stating:

> Well, I would say that most of our decision that relate to tech are more about patron satisfaction and patron experience, which therefore helps in the performance of job duties which helps the customer service side of our job duties is improved. Improved experience for the patron.

Seven of the twelve public librarians mirrored this in their responses.

The sub theme of positive view of technology is favorable statements about the intention to adopt new technology. The public librarians interviewed believed libraries cannot move forward without technology, that it is a goal to maintain basic technology standards, it makes them more efficient, and there is a value in remaining relevant. Participant R2 stated:

> I think technology really helps work. In a lot of ways, it helps us work more efficiently and effectively. So, I think it contributes to staff being able to do their jobs better...I think technology is really positive and I think in our profession we are going to see more and more need for technology skills.

Participant C1 corroborated this opinion.

> To remain relevant, we have to be on the edge of technology. Even though it is hard to adapt to change and keep up with tech, sometimes it is something that is

> very important. It impresses people. It is something that will keep the profession relevant. It is something we have to keep on top of.

Most participants expressed a positive attitude toward technology as a valued skillset.

The sub theme of administration as motivation means that public librarians noted times when administration was a positive force in the adoption of technology. Many public librarians believed that administrative support was instrumental in the adoptions of technology, sharing the positive experiences with administration citing both pro-technology and pro-training attitudes. Participant R2 stated:

> Our director is a huge proponent of learning. So, she is always having us go to trainings and encouraging us to go to trainings and to get our staff to do trainings... During our management team meetings and programming meetings we watch videos to better understand our patrons or technology.

Participant C1 said, "Very supportive, training is prioritized... I'm accommodating my staff training request any time they ask to go to any tech training or time off to watch a webinar or anything like that. That is going to take priority." Seven out of twelve librarians noted that this was a motivation for them to adopt technology.

The time to learn, access to technology, coworker complacency, and administrative decisions were reported barriers to public librarians learning technology. More than half of interviewed librarians pointed out and illustrated the issues. Despite the issues, most public librarians were still motivated to learn and had a positive view of technology adoption. Public librarians' perceptions regarding how technology adoption

supports may connect to their behavioral intentions were split between the motivations to adopt to technology and the barriers that prevented technology adoption.

Evidence of Trustworthiness

Trustworthiness is an umbrella term for quality in research. To establish trustworthiness, a researcher needs to consider credibility, transferability, dependability, and confirmability of the data (Frey, 2018). In this study I used multiple sources of evidence to establish a chain of evidence and supported the trustworthiness of this mixed method study. Each section reflects the accuracy of the findings and quality of the analysis.

Credibility

Credibility, an internal validation, is the extent to which a research study is truthful and conveys the study participants' experiences (Plano Clark & Ivankova, 2016; Frey, 2018). To establish credibility, I pushed for data saturation while continuing to collect and analyze data on an ongoing basis so there was continual checking for ideas, constructs, and themes from both quantitative and qualitative data. I employed member checking with a summary of the interviews, transcribed verbatim statements, and used nonjudgmental descriptions to provide a level of credibility. Additionally, for credibility and confirmability, I sought participant validation to engage study participants with the data from surveys to determine if it correctly reflected their lived experiences (Frey, 2018). Finally, I used member checking to gather new data for fuller understanding of the context.

Transferability

Transferability is the extent to which findings are applicable to other contexts and studies (Plano Clark & Ivankova, 2016; Frey, 2018). Thus, it is equivalent to generalizability and external validity. Mixed methods allow for credible, trustworthy, dependable, and transferable findings (Merriam & Tisdell, 2016; Plano Clark & Ivankova, 2016). A strength of a mixed methods study is that the qualitative data often explains the quantitative results. The quantitative data results in this study should be transferable to public librarians across the United States because the only exclusion was the requirement of an MLS/MLIS degree which is the standard for most states. Qualitative data should be transferable because I provided thick descriptions that illustrated a full account of the context, participants, and research design (Plano Clark & Ivankova, 2016; Frey, 2018). Additionally, I committed to purposeful sampling that represented the research design, limitations, and delimitations of the study.

Dependability

Dependability refers to the consistency of qualitative research study findings and parallels reliability in quantitative research studies (Frey, 2018). Peer debriefing, in this study, provided participants the opportunity to review and confirm accuracy of interview transcripts before use. My use of peer debriefing ensured that interview data was as dependable and reliable as the quantitative data. It also supported the confirmability of the study's findings, which is comparable to quantitative objectivity (Frey, 2018).

Confirmability

Confirmability is the preference of objectivity (Frey, 2018). Thus, in Chapter 3 I identified any predispositions toward the research. Data were collected by electronic means. The survey results were store on a secure external hard drive. The interviews, recorded online and transcribed by me, were stored on an external hard drive. In my role as researcher I followed strategies to reduce bias. Confirmability is also the degree to which other researchers can corroborate the results of an inquiry (Frey, 2018). While I cannot predict if other researchers will replicate this study, I have attempted to document the research process as thoroughly as possible.

Summary

My research sought to find the answer to four research questions. Research question one addressed how does the self-reported level of performance expectancy, effort expectancy, social influence, and facilitating conditions predict public librarians' behavioral intention to use new technology. Quantitative results from this study showed that the self-reported level of performance expectancy, effort expectancy, social influence, and facilitating conditions significantly predicted public librarians' behavioral intention to use new technology. Research question two addressed how predictive relationships varied by age, gender, voluntariness, and experience. Quantitative results from this study showed that these predictive relationships did not significantly vary by age, gender, voluntariness, and experience.

Research question three addressed public librarians' perceptions regarding technology adoptions supports. Qualitative results from this study showed the learning

needs public librarians specified a need for are hands-on learning, one-on-one learning, and formal classes. It also showed the learning strategies that public librarians currently have in place: coworker support and self-directed learning. Research question four addressed public librarians' perceptions regarding how these technology adoption supports may connect to their behavioral intentions. Results from this study showed that the barriers to adoption are time to learn, access to technology, coworker complacency, and administrative decisions. It also showed that public librarians were motivated to adopt new technology through public service, positive view of technology, and administration. Chapter 5 includes a discussion interpreting my findings, provides recommendations for future research, describes the limitations of the study, and details the study's implications related to social change.

Chapter 5: Discussion, Conclusions, and Recommendations Introduction

Introduction

The purpose of this predictive, sequential, explanatory mixed method study was to examine public librarians' attitudes toward learning new technology and their behavioral intention to adopt it. Public librarians are information professionals (Raju, 2017). As such, it is their duty to connect communities to technology. Understanding how librarians perceive technology and evaluate their ability to use it is essential to their profession. I used a mixed method design with surveys and interviews to explore this complex social experience. The findings of this study can be used by stakeholders in the educational and library communities to make informed decisions about the adoption and use of new technology and provide insights that can help librarians successfully use already adopted technology.

This chapter provides a discussion and interpretation of the study findings in relation to the conceptual and theoretical frameworks and literature in Chapter 2. I then discuss the study's limitations as well as its methodological, theoretical, and social implications. The chapter concludes with recommendations for future research and practice.

Interpretation of the Findings

This section provides an interpretation of the findings as they relate to prior research and the conceptual frameworks, UTAUT (Venkatesh et al., 2003) and diffusion of innovations (Rogers, 2003). Technology is core to a public library's mission, and patrons expect support and direction about technology use, so public librarians must

learn, practice, and understand multiple technologies across multiple platforms. However, though the literature has covered how new technology integrations have altered the physical landscape of libraries such as makerspaces (Carson, 2014; Johnstone, et.al., 2016; Moorefield-Lang, 2015; Real, et.al., 2014; Torrisi-Steele, 2015) and technology education classrooms (Chan, 2014; Hildreth & Sullivan, 2015; Johnstone, et al., 2016), there is a gap in the research about how services and staff support such activities. There has been little discussion about the skills public librarians need to use and support existing or new technologies (Daland, 2016; Kendrick, Martzoukou, & Elliott, 2016; Schwartz, 2016; Tritt & Kendrick, 2014). This study focused on librarians' technology support needs, expectations, available resources, and skill set, starting with a measure of acceptance and intention to use technology by using the UTAUT model.

Interpretations of Librarian Acceptance and Intention to use Technology

As a measure of technology acceptance and intention to use technology, UTAUT in adapted forms has been used in the adoption of library services rather than individual librarian adoption (Zainab et al., 2018). This study involved an unmodified version of UTAUT to capture public librarians' measures. Venkatesh et al. (2003) identified a positive relationship between the four core constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions and behavioral intention. However, although results from this study showed that public librarians' self-reported level of these constructs positively predicted their behavioral intention to use new technology, variables of age, gender, experience, and voluntariness did not moderate the intention to use technology.

Although not generalizable to all public librarians, the findings suggest that public librarians see new technology integration in their libraries fitting into their job requirements in a form of performance expectancy (Ventakesh et al., 2003). Librarians may be more likely to experience an ease of use for new technologies when provided with supports prior to or during implementation (effort expectancy). Public librarians may be influenced by people important to them, including coworkers, supervisors, and administration, who are supportive of new technology (social influence). They also may be influenced to learn technology when support is available for technology (facilitating conditions) adoption. Despite this, findings also revealed that these predictive relationships did not vary by age, gender, voluntariness, or experience. Unlike UTAUT postulates that predicted these relationships, librarians accepted technology despite their demographics. There may be several reasons for this.

From this study there is evidence that public librarians are likely to see technology, an innovation in the workplace, as inevitable, adding value to the workplace, expected as part of the job description, and anticipated to be challenging. Technology acceptance as inevitable and adding value to the workplace aligns with the findings of other research about other professional or adoption studies (Ashrafzadeh & Sayadian, 2015; Chitiyo & May, 2018; Pereira & Wahi, 2017). Findings also suggest that librarians may see new technologies as a relative advantage (Rogers, 2003) to their work, so they would be more likely to spend the time and effort to learn new technology skills. Innovation, according to public librarians, is part of the job description, therefor they expect it to be challenging (see Cushing, 2016). These findings reflect effort expectancy

(Venkatesh et al., 2003) and Rogers's (2003) compatibility, affirming the findings of other studies (see Liu & Hsu, 2018; Vongjaturapat et al., 2015).

According to my findings, public librarians also believe that people around them, particularly coworkers, supervisors, and administration communicate that technology is important for them to use, thus they learn and use it. This phenomenon is explained by Venkatesh et al.'s (2003) social influence variable and is reflected in the findings of similar studies (Jung & Lee, 2015; Khechine et al., 2014; Radovan & Kristl, 2017; Šumak & Šorgo, 2016). Finally, the use of modifiers like age, gender, voluntariness, and experience had no effect on performance expectancy, effort expectancy, social influence, or facilitating conditions, suggesting that these moderating variables do not affect the perceptions or intention of public librarians when it comes to adopting technology. This, though unexpected, has occurred in other studies (Khan et al., 2017; Potniss et al., 2017). Thus, it may be that training and support offered for new and existing technologies needs to be available to ensure adoption of technology and that immediate supervisors and administration need to on board with the process.

Interpretations of How Librarians Learn Technology

Little focus has been placed on how public librarians learn in general (Alawadhi, 2015; Attebury, 2017; Hamid & Soroya, 2017; Fitzgibbons et al., 2017; Harhai & Krueger, 2016), and much less about technology learning (Cushing, 2016; Kaviev & Mamontova, 2016; Nelson & Irwin, 2014). However, this study uncovered that public librarians have created learning strategies but still have learning needs. In this case, most public librarians reported learning from their coworkers or on their own. Fitting with

Rogers's (2003) communication channels, they approached the most technology savvy person for support and returned the favor by sharing their acquired expertise. If they did not have a savvy coworker, public librarians located instructions, searched Google, or watched YouTube videos (see also Ahmed & Rehman, 2016; Robinson et al., 2017). Some learning took place at home, unpaid, due to time constraints at work.

Additionally, because findings revealed that librarians preferred hands-on activities, one-on-one learning, and formal classes with real world examples and practice, it may be that librarians need training based on local needs and priorities so that librarians can best acquire skills and knowledge directly transferable to their practice. It also may be that they prefer training led by more experienced peers use collaborative learning approaches, as evidenced in previous research (Alawadhi, 2015; Attebury, 2017; Brown et al., 2017). It also reflects a lack of time and working alone (Greenall & Sen, 2014). Because there is a lack of literature about the technology learning needs of public librarians, these findings contribute to the literature.

Interpretations of Learning Supports for Technology

Most of the literature, despite the focus on professional development, does not address barriers to learning technology and motivation that public librarians have toward adopting technology (Ahmed & Rehman, 2016; Alawadhi, 2015; Attebury, 2017; Attebury, 2018; Dzandza & Akussah, 2018; Khan & Du, 2017). My findings indicated that a primary barrier to technology adoption and learning is the lack of time to learn, as found in prior research (Greenall & Sen, 2014; Robinson et al., 2017). Most public librarians believe the nature of the work, their role in the library, administrative adoption

decisions, and staffing levels are all factors limiting time for learning anything, much less technology. It may be that public librarians need more professional development opportunities in their day-to-day activities. Librarians also reported access to technology prevented them from learning new technologies. They noted a lack of budget and prioritization. It may be that libraries need to outsource access to technologies for their librarians, either through the state library, pursuit of technology grants, or other community resources.

Librarians also recognized coworker complacency as a problem, which could prevent the adoption of technology. Because public librarians cited barriers for adoption as age near retirement, satisfaction with status quo, and fear of technology, it may be that librarians' attitudes toward technology needs to be assessed further. For example, Kaviev and Mamontova (2016) found anxiety as a barrier that is readily observed or evaluated. The fourth barrier identified is administrative decisions. Public librarians stated they have not felt supported and have been stalled by having to sell ideas to administration. Dzanda and Akussah (2018) similarly found that administrators did not allow all library staff to attend professional development programs. They also noted the lack of planning when it comes to technology implementation and the inability to get a raise for doing more with technology in their jobs. It may be that public librarians need administration to support their decisions for professional development and that their system may need to refocus on professional development.

Despite the barriers, public librarians were motivated to learn new technology. They accepted that technology is part of their job description, but not only that, they

wanted to be knowledgeable, helpful, and current with technology to help patrons as found by Cushing (2016). They want to make it easier for patrons to use and learn technology. It may be that most public librarians have a have a positive attitude toward technology but believe libraries cannot move forward without technology, that it is a goal to maintain basic technology standards, that it makes them more efficient, and that there is a value in remaining relevant. While the role of administrative support is unclear in all public libraries, it may be instrumental in the adoptions of technology, as reported by study participants who expressed positive experiences with administration citing both pro-technology and pro-training attitudes. It was surprising to find so little literature on the perception of public librarians, but it may have been due to the focus on the rapid introduction of technology in public libraries where time to reflect, observe, and analyze the adoption context is not possible.

Limitations of the Study

There are two limitations of my study. The first limitation for the study was the timeline for surveying and interviewing the participants which was originally 2 weeks for the quantitative survey and 1 month for qualitative interviews, as a longer period for the data collection would allow those with limited time to participate. The timeframe stretched to a month on the surveys due to the lack of participation and inclusion of participants from State A.

The second limitation was that possible participants of the survey may not have been a representative of the entire public librarian population. I opened the survey up to all public librarians employed in a public library and who had an MLIS degree. The

director of each public library was to disseminate the survey to all who fit that demographic. However, the survey did not discern if a librarian was also part of administration or had a supervisory role. Thus, generalist librarians may not have been fully represented by the survey and interview findings.

Recommendations

The results of the study suggest several areas for further study. As technologies continue to evolve, library stakeholders need to understand the relationships between public librarian supports for technology adoption and their behavioral intention to adopt new technology. This study provided an understanding of the relationship between public librarians' technology use and their behavioral intention to adopt it. I have three recommendations for future research.

First, further research should could continue to focus on public librarians, not just academic or school librarians, as they are underrepresented in the literature. Interview data analysis revealed that several of the participants were also managers or part of administration. Thus, research should examine different career levels and positions which might reveal an undocumented view of technology adoption.

Second, research should be repeated as a case study to examine particular library systems or unique libraries. This would allow public libraries to adjust to and assess the needs of their librarians on a prioritized level. It would also allow researchers to focus on a specific type of public library like rural, urban, city, or suburban. I would encourage future researchers to use mixed methods to deliver the most informative and balanced

view of the topic. The survey can provide baseline information that could be further explored through interviews.

Third, there is a need for more research to better understand why the moderating variables of age, gender, experience, and voluntariness did not influence behavioral intention to adopt technology despite that Venkatesh et al. (2003) stated it would moderate. Future research should focus on the perceptions surrounding these variables. Researchers could look for this to be related to size of the library, type of library, and/or certain state policies.

Implications

Positive Social Change

Public librarians' main directive is to connect people with information. As technology evolves within the library these roles are ever changing. This study established a basis for understanding how public librarians feel adopting new technology and perceived adoption supports. Library administrators need to understand how public librarians feel about technology and learn it is imperative to supporting a community of information seekers, as the library is a hub for community education (Johnstone, et al., 2016; Rosa & Storey, 2016). For example, the homeless population uses the local library as lifeline to community resources, jobs, and healthcare through technology (Giesler, 2019; Wahler, Provence, Helling, & Williams, 2019; Williams, 2018) and free access at the library allows them to access support they might never receive without it. With a staff of public librarians that are better prepared for technology, this sector of the community has a better chance of reaching their goals. A public librarian skilled in technology can

not only guide the homeless community to resources, they can assist the public seeking help with their technological questions. In these ways, public libraries better serve their communities and their employees while fulfilling their mission.

Implications for Method

This study was a predictive sequential explanatory mixed method study. The methodological implications of this study were the combination of both quantitative and qualitative designs. The blend of two methods confirmed the findings to a greater degree than either of the methods could have alone. The insights from the quantitative portion informed the interview questions that created a stronger interview in the qualitative portion of this method. Drawing data from both sources is another contribution to the strength of my study. Implications of using a mixed methods study results in the ability to use the strongest elements from each of the methods.

Implications for Practice

Recommendations for practice inform practitioners and organizations. Based on the analysis of the interview and survey data, five recommendations are made. First, in the workplace it is important to consider that age, gender, experience, and voluntariness may not have an effect on the behavioral intention to use technology. Therefore, it is important to treat everyone equally when providing learning opportunities. Second, any learning opportunities should be hands-on and either one-on-one or in a formal classroom. Third, learning opportunities should give librarians ample time to understand the technology component. Fourth, the opportunity to get hands-on learning with more devices is important to develop public librarians' skillsets. Finding ways to get more

devices in front of them is a priority. Libraries will need to use resources like the state library to make that happen. Finally, it is necessary to remember that public librarians want to help their communities and they have positive outlooks on the state of technology as it evolves inside the library. Administration should continue to support the decision to use technology and to get them involved more when rolling out new technology or modifying the use of old ones.

Conclusion

With and through technology, public libraries have expanded their role in the community. From digital content to employment databases and online business resources, to Science, Technology, Engineering, Arts, and Math programs for children and technology classes for all, libraries have continued to transition so that their communities have needed and current resources. At the heart of this transition are public librarians who are struggling to sustain technology adoption. Their role in the library continues to evolve and they need additional supports to help them not only understand new technologies, but to teach these to members of their community. By supporting public librarians' adoption of technology, public libraries are supporting their community, which is the goal.

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Distinguished Professor and George and Boyce Billingsley Chair in Information Systems
Email: vvenkatesh@vvenkatesh.us
Website: vvenkatesh.com

Appendix B: Copyright Permissions (Venkatesh et al., 2003)

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October 25, 2018

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Appendix C: UTAUT Questionnaire

Purpose:
The purpose of this study is to explore factors that can influence a public librarians' intent to use and actual use of new technology in public libraries.

Types of Questions:
All of the questions on the survey are multiple choice with required answer choices ranging from completely agree to completely disagree.

Voluntary:
This study is voluntary.

Compensation:
You will not receive any compensation for participating in this study.

Risks:
Being in this study would not pose a risk to your safety or wellbeing.

Privacy:
Reports from this study will not share the identities of individual participants. Details that might identify participants, such as IP addresses will not be captured. Even the researcher will not know who you are unless you choose to identify yourself for the interview. The researcher will not sue any personal information such as demographics or any of your responses for any purpose outside of this research. Data will be kept secure and password protected. Data will be kept for a period of at least five years, as required by the university.

Contact and Questions:
If you have any questions, you may contact me via email at [redacted] If you want to talk privately about your rights as a participant, you can call the Research Participant Advocate at [redacted] from within the USA, [redacted] from outside the USA, or email address [redacted]. Walden University's approval number for this study is ############ and it expires on ##/##/####.

Obtaining Your Consent:
To protect your privacy, no consent signature is requested. If you feel you understand the study well enough to make a decision about it, please indicate your consent by continuing with this survey. You may print or save this consent form for your records

Interview
If you are available to be interviewed after this survey, please type your name, email address, and phone number below. If you are not available for interview, please continue with the survey, as your responses are still valuable to this study:

Name: _____
Email: _____
Phone Number: _____

1. In what county do you work?
    a. Abbeville
    b. Aiken
    c. Allendale
    d. Anderson
    e. Bamberg
    f. Barnwell
    g. Beaufort
    h. Berkeley
    i. Calhoun
    j. Charleston
    k. Cherokee
    l. Chester
    m. Chesterfield
    n. Clarendon
    o. Colleton
    p. Darlington
    q. Dillon
    r. Dorchester
    s. Edgefield
    t. Fairfield
    u. Florence
    v. Georgetown
    w. Greenville
    x. Greenwood
    y. Hampton
    z. Horry
    aa. Jasper
    bb. Kershaw
    cc. Lancaster
    dd. Laurens
    ee. Lee
    ff. Lexington
    gg. Marion
    hh. Marlboro
    ii. McCormick
    jj. Newberry
    kk. Oconee
    ll. Orangeburg
    mm. Pickens
    nn. Richland
    oo. Saluda
    pp. Spartanburg
    qq. Sumter
    rr. Union
    ss. Williamsburg
    tt. York

2. What is your age?
    a. ___ → < 21
    b. ___ → 21 – 30
    c. ___ → 31 – 40
    d. ___ → 41 – 50
    e. ___ → 51 – 60
    f. ___ → 61 – 70
    g. ___ → 71 – 80
    h. ___ → ≥ 80

3. What is your gender?
    a. ___ → Male
    b. ___ → Female
    c. ___ → Non-Binary

4. How many years have you had your MLIS degree?
    a. ___ → < 1
    b. ___ → 2 – 5
    c. ___ → 6 – 10
    d. ___ → 11 – 15
    e. ___ → 16 – 20

f. ___ → 21 – 25
g. ___ → 26 – 30
h. ___ → 31 – 35
i. ___ → 36 – 40
j. ___ → 41 – 45
k. ___ → 46 – 50
l. ___ → ≥ 50

5. How voluntary is the use of new technology in your library?

Completely Mandatory	Mostly Mandatory	Somewhat Mandatory	Neutral	Somewhat Voluntary	Mostly Voluntary	Completely Voluntary

6. I would find new technology useful in my job.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

7. Using new technology enables me to accomplish tasks more quickly.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

8. Using new technology increases my productivity.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

9. If I use new technology, I will increase my chances of getting a raise

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

10. My interaction with new technology would be clear and understandable.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

11. It would be easy for me to become skillful at using new technology.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

12. I would find new technology easy to use.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

13. Learning to operate new technology is easy for me.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

14. People who influence my behavior think that I should use new technology.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

15. People who are important to me think that I should use new technology.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

16. The senior management of this business has been helpful in the use of new technology.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

17. In general, the organization has supported the use of new technology.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

18. I have the resources necessary to use new technology.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

19. I have the knowledge necessary to use new technology.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

20. New technology is not compatible with other technologies I use.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

21. A specific person (or group) is available for assistance with new technology difficulties.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

22. I intend to use new technology in the near future.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

23. I predict I would use new technology in the near future.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

24. I plan to use new technology in the near future.

Completely Agree	Mostly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Mostly Disagree	Completely Disagree

Appendix D: UTAUT Survey Items Developed by Venkatesh et al. (2003)

Table 16. Items Used in Estimating UTAUT

Performance expectancy

U6:	I would find the system useful in my job.
RA1:	Using the system enables me to accomplish tasks more quickly.
RA5:	Using the system increases my productivity.
OE7:	If I use the system, I will increase my chances of getting a raise.

Effort expectancy

EOU3:	My interaction with the system would be clear and understandable.
EOU5:	It would be easy for me to become skillful at using the system.
EOU6:	I would find the system easy to use.
EU4:	Learning to operate the system is easy for me.

Attitude toward using technology

A1:	Using the system is a bad/good idea.
AF1:	The system makes work more interesting.
AF2:	Working with the system is fun.
Affect1:	I like working with the system.

Social influence

SN1:	People who influence my behavior think that I should use the system.
SN2:	People who are important to me think that I should use the system.
SF2:	The senior management of this business has been helpful in the use of the system.
SF4:	In general, the organization has supported the use of the system.

Facilitating conditions

PBC2:	I have the resources necessary to use the system.
PBC3:	I have the knowledge necessary to use the system.
PBC5:	The system is not compatible with other systems I use.
FC3:	A specific person (or group) is available for assistance with system difficulties.

Self-efficacy

I could complete a job or task using the system...

SE1:	If there was no one around to tell me what to do as I go.
SE4:	If I could call someone for help if I got stuck.
SE6:	If I had a lot of time to complete the job for which the software was provided.
SE7:	If I had just the built-in help facility for assistance.

Anxiety

ANX1:	I feel apprehensive about using the system.
ANX2:	It scares me to think that I could lose a lot of information using the system by hitting the wrong key.
ANX3:	I hesitate to use the system for fear of making mistakes I cannot correct.
ANX4:	The system is somewhat intimidating to me.

Behavioral intention to use the system

BI1:	I intend to use the system in the next <n> months.
BI2:	I predict I would use the system in the next <n> months.
BI3:	I plan to use the system in the next <n> months.