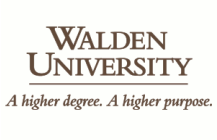

2019

Self-Directed Learning and Technology Adoption by Principals

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This is to certify that the doctoral dissertation by

Travis F. Taylor

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University
2019

Abstract

Self-Directed Learning and Technology Adoption by Principals

by

Travis F. Taylor

MAT, Webster University, 2009

BME, University of Central Arkansas, 1992

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Educational Technology

Walden University

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Abstract

The changes in educational technology present challenges for K-12 principals leading students and faculty who are more engaged with classroom technology. The role of self-directed learning and how K-12 principals adopt the technology while leading the deployment and implementation of classroom technologies is not known due to a limited amount of empirical research. The purpose of this study was to investigate the relationship between technology adoption and self-directed learning by K-12 principals. Using the Unified Theory of Acceptance and Use of Technology as the theoretical framework, a quantitative cross-sectional study was designed. The survey instruments, Unified Theory of Acceptance and Use of Technology and Personal Responsibility Orientation Self-Directed Learning Scale were used to collect data from K-12 principals in the state of Arkansas. A regression and correlational analysis of the responses from 40 principals revealed a small positive but not statistically significant relationship between self-directed learning and technology adoption. The results also showed strong and moderate statistically significant correlations between the constructs of technology adoption and self-directed learning. The results from this research may provide a framework for pre-service and ongoing professional development of educational technology leadership. This study addresses positive social change by providing insight to administrators and bringing greater awareness to technology adoption. A greater awareness may increase their understanding of classroom technologies and may provide a foundation for better stewardship over public funds and purposeful engagement with students, parents, and the community.

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Dedication

This work is dedicated to my parents for all of their years of hard work and dedication to provide for me and to support me in education. I owe this to them as fruit for their never-ending labor to instruct me in the ways of life and being committed to complete a work. This is also dedicated to Dr. David Rainey. He and my father were the role models for achievements and leadership in the field of education in our community.

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Chapter 1: Introduction to the Study

Introduction

The relationship between self-directed learning and the adoption of technology by K-12 principals is significant due to the vast amount of computers, mobile devices, and cloud- based applications that have entered U.S. schools since 1980, and the changes required of educational leadership since that time (Lim, Zhao, Tondeur, Chai, & Tsai, 2013). The lack of adequate training and sparse research has hindered a consistent path of professional development for educational leaders who are faced with the demands of educational technology leadership (McLeod & Richardson, 2011; McLeod, Richardson, & Sauers, 2015; Richardson & Sterrett, 2018). New candidates entering the field of educational leadership may have had the experience of using and learning with technology and even exposure to the National Educational Technology Standards for Administration (NETS-A), but this has not ensured a successful or smooth engagement of technology leadership (Sincar, 2013).

Experienced principals, during this transition, are now forced to adjust to the redefinition of leadership in this new era of technology integration and school reform (Banoğlu, 2011; Beytekin, 2014; Cabellon & Brown, 2017). Whether new to the field of educational leadership or a veteran, both groups are plagued by the lack of empirical studies to inform practice (McLeod & Richardson, 2011) and the marginalization of technology in educational leadership preparation (Hayashi & Fisher-Adams, 2015). Self-directed learning may offer adults such as principals the ability to face the challenges of acquiring or enhancing their technology skills sets to meet the challenges on the job (Clardy, 2000; Raemdonck, Gijbels, & van Groen, 2014). By using self-directed learning

within technology leadership development and ongoing professional development, principals can not only manage technology implementations in their schools but model the effective and appropriate use as leaders. The evolution of Web 2.0 and other forms of social media technology have linked elements of educational leadership to stakeholders' needs more systemically creating a demand for leaders to address these elements simultaneously to increase the value of the school in the community (Akcil, Aksal, Mukhametzyanova, & Gazi, 2017; Kaufman, Oakley-Browne, Watkins, & Leigh, 2003).

In this chapter, I discuss the background elements that provide a history and current developments of technology adoption, educational leadership, adult learning, and self-directed learning. The problem statement includes a discussion of the factors that support the need to study technology adoption and self-directed learning, and my purpose in this study and relevant research questions discussed are proposed to justify the study. I discuss the theoretical framework of the Unified Theory of Acceptance and Use of Technology (UTAUT) along with its origins and relevant research, and I discuss the nature of the study and my rationale for the selection of this design and associated variables and methodology.

I explained definition of the variables and other terms to provide a clear understanding of what I studied as well as assumptions that may have affected the clarity of this study. The scope and limitations aided in understanding the boundaries of what I covered in this study and the ability to generalize to other populations. I examined the potential for this study's contribution to the overall knowledge of the subjects, address gaps in the research, and provide a brief summary of the chapter and its main points.

Background

The proliferation of technology into the K-12 classroom caused a redefinition of how students were educated, how teachers instruct, and the role of the principal (Bleakley & Mangin, 2013; Chang, 2012; Sara Dexter, 2011; Sincar, 2013). The growth of K-12 classroom technology began in 1983 where the number of computers in schools was fewer than 50,000 but was estimated to reach more than 5.5 million by 1994 (Jones, 1994). Critics of the expansion of technology into the classroom during this period cited various reasons to be cautious of the new technology, being quick to invest in unproven technologies (Robertson, 2008), and measuring technology‘s effectiveness of on student achievement in the years following 1994 (Christensen & Knezek, 1994; Knezek, Christensen, & Rice, 1995; Sivin-Kachala & Bialo, 1994). Although the focus on the effectiveness of technology in schools was student achievement, the focus was also on the teacher and student relationship and preservice education’s role in this relationship.

The role of the principal in the assessment of technology’s effectiveness was not addressed within the research or was marginalized in the research describing simply overseeing the management of resources such as teacher professional development. A focus did not exist in these assessments on use of the technology by the principals. Arguments emerged examining the role of administration to meet these new challenges including the use of technology by principals, but these were merely suggestions or arguments with little to no empirical studies to support them (Bozeman & Raucher, 1991; Bozeman & Spuck, 1991; Garcia, Johnson, & Dallman, 1997; MacNeil & Delafield, 1998).

Between 1999 and 2012, a 71% increase occurred in the number of computers in educational buildings and by 2016, 95% of educational buildings contained computers (Mayclin, 2016). As the numbers of computers increased in schools, the software associated with those computers evolved due to the internet and its availability of access to the internet in schools. Shifts from desktop to laptops, mobile devices, and cloud-based technologies affected how principals, teachers and students acquire, collate, analyze, and communicate their knowledge (Holland & Holland, 2014). The Horizon Report: 2009 K12 Edition (Johnson, Levine, Smith, & Smythe, 2009) outlined several emerging trends as a result of the relationship between computers and the internet highlighting online communication tools, mobile devices, cloud computing, smart objects, and the personalization of the web.

According to Johnson et al. (2009), these technologies contribute to the increase communication, collaboration, and changes in the work and school environment that empowered student voice. Johnson et al. also argued that this change has created new virtual learning spaces and personalized the web experience to construct new knowledge. These changes are met with barriers that constrained the adoption of these new technologies and learning experiences such as the need for professional development to teach with these new technologies, new legal questions, and the acquisition of digital literacy skills.

Johnson et al. (2009) argued that the primary challenge to these changes is the redefinition of the underlying foundation of the K-12 establishment, which is incongruent with online, informal, and student control of learning. The 2012 K-12 Horizon Report suggested that mobile devices, tablet computing, and the emergence of apps pushed the

further evolution of the learning environment to include the personal learning environment and augmented reality. The trends of 2012 saw an increased attention to online, hybrid, and collaborative learning in part because the cost of devices allowed schools to increase the number of devices for students (Johnson, Adams, & Cummins, 2012). Despite these increases, K-12 education has not addressed the fundamental foundation of the educational structure, which was not intended as suitable for the needs of students in an informal and personal environment, nor was there an adequate increase toward digital literacy to better understand how the technology works or its possibilities (Cabellon & Brown, 2017; Howell, Reames, & Andrzejewski, 2014; Webster, 2016, 2017). The number of computers has dramatically expanded during the past decades, as well as the types of technology and the evolution of these types of technologies.

With continued increase of technology into school buildings, a renewed call for technology use is occurring among principals from the International Society for Technology in Education (ISTE) through the NETS-A and the U.S. Department of Education Office of Educational Technology Plan for Future Ready Learning (ISTE, 2011; U.S. Department of Education Office of Educational Technology, 2016). New terminology such as e-leadership used to describe the new methods of leadership formed by the globalization of knowledge creation and information sharing along with the number of people leaders now directly affects a constantly changing level (Akcil et al., 2017; Avolio, Sosik, Kahai, & Baker, 2014) . In this age of increased technology proliferation, leaders such as K-12 principals should be accustomed to using these technologies, even if only fundamentally, to understand their power to meet the new challenges of their leadership duties. Amid these challenges, principals face two barriers

to the successful implementation of leadership with technology initiatives supporting learning and teaching due to a lack of efficacy in the field of leadership to address the influx of technology. The barriers also include a limited amount of empirical research on educational technology research and limited curriculum in graduate educational leadership classes during licensure.

Despite the lack and limitations facing administrators, studies profiling principals and superintendents as tech savvy and being rewarded for their technology leadership emerged in the literature, but the method of evaluating and choosing these leaders varies (Levin & Schrum, 2013; McLeod et al., 2015). Also, it is not known whether and how these leaders used technology for leadership. Prior to 2003, technology adoption was measured via the models of the technology acceptance model (TAM), the behavioral theories of the theory of reasoned action (TRA), and theory of planned behavior (TPB) each measuring adoption from a different perspective.

Venkatesh, Morris, Davis, and Davis (2003) combined the TAM, motivation model (MM), TRA, TPB, innovation of diffusion theory (IDT), combined TAM and TPB (C-TAM-TPB), social cognitive theory (SCT), and the model of PC utilization (MPCU), which produced the UTAUT. The model produced four constructs that directly measure behavior intent which determined use. The model of the UTAUT predicts the technology adoption by measuring effort expectancy, performance expectancy, facilitation conditions, and social influence. The exploration of technology adoption through the UTAUT has rarely been used within the K-12 environment.

Self-directed learning (SDL) is an adult learning methodology that directs what is learned, choice of resources, and the evaluation of progress. Self-directed learning is

derived from adult learning theories, which suggests that adults learn based on a specific needs, learn in collaboration with others, and use their relative experience to guide and direct their learning (Knowles, 1979, 1980; Knowles, Holton, & Swanson, 2005b, 2005a).

The existing literature explores how these leaders adopted technology for leadership is not clear. In this study, I address self-directed learning's use by principals and the adoption of technology for use as a means to become more effective leaders. This is in lieu of a lack of technology leadership scholarship and graduate-level leadership training to addressing the literature gap.

Problem Statement

The U.S. Department of Education Office of Educational Technology Plan for Future Ready Learning suggested that "Leaders learn alongside teachers and staff members, ensuring that professional learning activities are supported by technology resources and tools, time for collaboration, and appropriate incentives" (U.S. Department of Education Office of Educational Technology, 2016, p. 40). Technology has altered the landscape of leadership and teaming; visioning and the articulation of the vision is expressed on a much broader level (Avolio et al., 2014; Brown & Jacobson, 2016). According to McLeod et al. (2011), future learning will demand informal, self-directed, personalized learning, and leadership must lead new teams and be able to "design and operationalize our learning environments to reflect these new affordances" (p. 292).

McLeod et al. (2011) suggested that leaders must establish methods of informal, self-directed learning for themselves. Avolio et al. (2014) also argued that technology has altered the role of leadership allowing for leadership to transmit extensive changes

throughout an organization by modeling the use of Advanced Information Technology (AIT). Hayashi and Fisher-Adams (2015) argued that leadership preparation programs have only provided leaders necessary technology skills that were later obsolete when put into practice.

The lack of formal technology instruction in leadership development and the rising demands of new learning environments in the classroom has left a gap in the research. This gap consists of the effectiveness of leadership of K-12 principals modeling technology use and the role of self-directed learning used by these principals to adopt technology skills. A study was needed to investigate how principals take control of their learning to adopt technology to model for leadership by examining the relationship between self-directed learning and technology adoption.

Purpose of the Study

My purpose in this study was to examine the relationship between self-directed learning and technology adoption by K-12 principals. Using a quantitative methods approach, I used the Personal Responsibility Orientation model of Self-Direction in Learning and the UTAUT to collect data from K-12 principals to measure self-directed learning as the independent variable and their level of technology adoption as the dependent variable using the G Suite for Education collaborative software.

Research Questions and Hypotheses

Research Questions

1. RQ1: What is the relationship between self-directed learning and technology adoption by K12 principals?
2. RQ2: What is the relationship between the UTAUT constructs of performance expectancy, effort expectancy, social influence, facilitating conditions, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control?

Hypotheses

H_{01}- There is not a significant relationship between self-directed learning and technology adoption by K-12 principals.

H_{A1}- There is a significant relationship between self-directed learning and technology adoption by K-12 principals.

H_{02}- There is no significant relationship between the UTAUT constructs of performance expectancy, effort expectancy, social influence, facilitating conditions, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control.

H_{A2}- There is a significant relationship between the UTAUT constructs of performance expectancy, effort expectancy, social influence, facilitating conditions, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control.

Theoretical Framework

To explore the relationship between self-directed learning and technology use, a theoretical framework based on technology was needed. The theoretical framework for this study consisted of UTAUT (Venkatesh et al., 2003). This framework combines eight well-known theories of technology acceptance into one unified framework that measures the intent of a user. The four constructs are effort expectancy, performance expectancy, social influence, and facilitating conditions. Four mediating variables are used, which are age, gender, technology experience, and voluntariness of use.

Performance expectancy described the anticipation that the technology will assist the user in performing their job better. Effort expectancy described the quality of satisfaction that user endures to operate the technology. Social influence described the belief of superiors expected uses of the technology by the user, and facilitating condition described the level of support that the organization provided to the individual. Experience, age, and gender, and voluntary use acted as moderators to the constructs in the model.

K-12 principals are uniquely challenged with technology acceptance because of the mandates from the ISTE Standards for Administrators (ISTE, 2011) and Future Ready Learning (U.S. Department of Education Office of Educational Technology, 2016) to model effective use in leadership. The four constructs and the four moderating variables provide a framework to measure the acceptance and intent to use technology by K-12 principals. The UTAUT answered 70% of the variance for behavioral intention to use technology over time and has been used in empirical studies industries such as information management, business management, medical imaging, psychology,

educational science, mass communication, and telecommunication. The models used to create the UTAUT answered only 15% to 53% of the variance. Within the field of educational sciences, only a few studies have used the model to address technology in the K-12 education setting (Pynoo et al., 2011).

Nature of the Study

The nature of this study was quantitative. Quantitative research aligns with the study by investigating the relationship between the variables of self-directed learning and the adoption of technology. I used and analyzed survey data through the statistical methods of regression analysis and Pearson correlation using Statistical Package for the Social Sciences (SPSS) software to assess whether there were relationships between the dependent variable of user intent and the independent variable of personal responsibility orientation and the subcategories of motivation, efficacy, initiative, and control. I used the cross-sectional survey method to attempt to capture the best representation of the population (Frankfort- Nachmias & Nachmias, 2008a). The use of this methodology was to measure the relationship and extent of the significance of this relationship to generalize to the larger population of K-12 principals.

Definitions

Andragogy: The study of adult learning which is driven by the independent concept held by adults, their life experiences, and the internal motivation leading to a distinction between learning by adult and that of children (Merriam, 2001).

Effort expectancy: UTAUT construct that measures the user's perception of a technology's difficulty (Venkatesh et al., 2003).

Facilitating conditions: UTAUT construct that measures the user's perception of available support when using technology in the workplace (Venkatesh et al., 2003).

Performance expectancy: UTAUT construct that measures the perception that technology will increase or support job performance (Venkatesh et al., 2003).

Personal responsibility orientation model of self- direction in learning (*PRO SDL*): A model of self-direction that focusses on self-directed learning from an external and internal aspect. Externally, the model addressed the personal characteristics of the relationship between the teacher and the learner engaging in self-directed learning and the internal aspect of the willingness of the learner to take responsibility for their learning (Hiemstra & Brockett, 2012).

Personal responsibility orientation in self-directed learning scale (*PRO SDLS*): A survey instrument used to measure self-directed learning and the responsibility of the learner in taking control of the learning. The scale consist of 35 items that measure four subcomponents, initiative, motivation, self-efficacy, and control (Stockdale & Brockett, 2011).

Self-directed learning: The concept of the learner responsibility in choosing, managing, and evaluating how, what and when learning takes place (Merriam & Bierema, 2013).

Social influence: UTAUT construct that measures the user's perception of the expectation of supervisors to use technology in the workplace (Venkatesh et al., 2003).

Technology leadership: The use of theoretical principles of leadership and standards to initiate, direct, implement and manage technology within organizations (Sauers, Richardson, & McCleod, 2015).

UTAUT: A theory for technology adoption using a fusion eight existing models of behavior and technology adoption. The UTAUT explained 70% of the variance compared to the 17% to 53% of the variance of the existing models individually (Venkatesh et al., 2003).

Assumptions

The following assumptions for this study were:

- An adequate number of K-12 principals would participate for statistical significance.
- All participants would have the means to respond to the electronic survey.
- Subjects agreeing to participate would do so truthfully and with integrity.
- Principals, on some level, were involved in instruction of technology use.

Quantitative analysis uses statistical means to represent members of the population due to impracticality of sampling every member of a population. Because no way exists to account for individual dispositions, availability of adequate technology, or trustworthiness, I assumed that individuals would participate when given adequate information, the ability to choose, and the means to participate in a truthful manner.

Scope and Delimitations

The scope of this quantitative study included K-12 principals in the state of Arkansas. Although I explored the theme of educational technology leadership, I narrowed the research to address administrative leadership of technology and the educational leadership of technology. K-12 principals have a direct relationship with the teaching and learning aspect of technology leadership that superintendents and midlevel administration do not.

I selected Google as the technology being measured because of its wide availability in school in Arkansas. Since most of the schools are small and rural, the use of Google G Suite for education allowed schools to quickly and broadly implement this platform as part of the district's network infrastructure. The availability of G Suite across the state increases the likelihood of an even distribution for surveying and a willingness to respond to the survey.

Rather than broadly addressing self-directed learning, the focus of self-directed learning in this study was based in-part on the PRO-SDLS model of self-directed learning (Hiemstra & Brockett, 2012), which involves adults taking control of their learning. This includes the choice principals make to take ownership of their learning of technology while addressing the challenges of leading schools. Learning to use technology on some level is necessary in the midst of an influx of technology and school reform initiatives. Self-directed learning also included informal learning. Although informal learning is a common occurrence in self-directed learning, informal learning is difficult to measure.

Limitations

Researchers use quantitative research to explore the existence and strength of relationships between variables and allows researchers to draw conclusions about those relationships, but quantitative research does not imply meaning from those relationships. In this study, I explored the possible relationships between self-directed learning and technology adoption, but this study did not attempt to make meaning from any relationships that may be discovered. The reason principals take control of their learning, what perceptions principals have about their learning and technology, or the lived experiences of a group of principals in Arkansas to adopt technology would have to be

addressed qualitatively through interviews and observation of K-12 principals, documents, schedules and daily operations. The existence of a relationship suggests information that may lead to further investigation of relationships and the strength of these relationships which is significant because of the lack of research to address these relationships.

Although self-directed learning offers adults a means to learn at their pace through choice and self-management, limitations to self-directed learning exist. Self-directed learning is not always the best approach for adult learning because all adults are not the same and individual differences must be taken into consideration (Merriam & Bierema, 2013). Because self-directed learning is not always the best approach for adult learners, the existence of any relationship will aid in differentiation of professional development for principals. Other limitations would include the use of G Suite for Education. G Suite maybe the predominate technology used at the district level, but other platforms from Microsoft and Apple also have a place in educational technology. The survey data collected was self-reported. Programs such as G Suite for Education logs the activities of users on the platform, but access to this data may be considered too invasive for privacy concerns and impractical to collect for a study.

Significance

This study is significant because the results help fill a research gap in the current literature of the relationship between self-directed learning and technology adoption by K-12 principals. The results might also be used to inform practice in the curriculum development for administrator licensure programs in educational technology. I also addressed issues of social change in leadership. The increase in technology

implementation in K12 schools has increased the use of public funds to support the initiatives. The resulting information from this study could inform the practice of K-12 principals by encouraging them to become more aware of their learning with and their adoption of technology. This may empower principals as e-leaders in the acquisition of technology who are entrusted with public funds.

Summary

In this chapter, I briefly described the history of K-12 classroom technology, the role of K-12 principals during this transition, and relative research surrounding these issues. These issues illuminated a gap in how the role of technology use in adoption has contributed to this success of some K-12 principals. In this chapter, I laid the foundation for exploring the possible relationship between technology use and self-directed learning. This study may offer insight into the role of technology use relates in principals' efforts to lead with technology.

In Chapter 2, I discuss the theoretical framework of UTAUT to effectively ground the phenomenon of technology use. I will discuss the origins of UTAUT to explain why this model best explains the concept of technology use despite numerous long-standing models. I will discuss other concepts such as educational technology leadership, self-directed learning, informal learning, and andragogy within the scope of the current literature as a foundation for exploring the possible relationship between self-directed learning and technology use in technology adoption.

Chapter 2: Literature Review

Introduction

This study was needed to investigate how principals take control of their learning to adopt technology in their role as leaders by examining the relationship between self-directed learning and technology adoption. My purpose in this study was to examine the relationship between self-directed learning and technology adoption by K-12 principals. According to the U.S. Department of Education Office of Educational Technology Plan for Future Ready Learning, leaders have the responsibility of learning technology to adequately support learning activities and collaboration with the necessary tools and resources (U.S. Department of Education Office of Educational Technology, 2016)

The demands of learning in the future will require that leadership and support teams be able to address informal, self-directed, and personalized classroom learning (McLeod et al., 2011), but according to Hayashi and Fisher-Adams (2015) leadership preparation programs have only provided leaders basic technology leadership skills that became obsolete when used in practice. In this chapter, I discuss UTAUT to address the topic of technology adoption along with its origins and components. I discuss educational technology leadership and compare it to the introduction of technology in K-12 education along with the state of research in the field of educational technology leadership. I will discuss the origins of adult learning in the United States, leaders in the field, and their influences, along with self-directed learning, workplace learning, and their relationship of technology.

The UTAUT (Venkatesh et al., 2003) constructed a unified view of technology adoption using eight existing theories that ranged from technology adoption to behavioral

and social frameworks. The models consisted of the TRA (Ajzen & Fishbein, 1975), TPB (Ajzen, 1985), MM (Deci, Vallerand, Pelletier, & Ryan, 1991), TAM (Davis, 1987), C-TPB-TAM (Taylor & Todd, 1995b), MPCU (Thompson, Higgins, & Howell, 1991), IDT (Rogers, 1995), and SCT (Bandura, 1991). Although these models seem varied, I discussed self-directed learning and educational leadership among K-12 principals in relation to technology adoption along with adult learning, self-directed learning models, and workplace self-directed learning and technology.

Literature Search Strategy

The list of databases and searches that I used were EBSCO Host, Science Direct, Sage Premiere, Taylor and Francis, ProQuest Central, Dissertations and Thesis at Walden, Google Scholar, Learn Tech Lib, Academic Search Complete, ERIC, and ProQuest Computing. The list of search keywords and phrases used are *utaut*, *unified theory of acceptance and use of technology*, *technology acceptance model*, *tpack and utaut*, *e-leadership*, *tra*, *theory of planned behavior*, *motivational model*, *technology adoption*, *actual usage*, *self-directed learning*, *self-directed learning androgogy*, *virtual leadership*, *virtual leadership conceptual framework*, and *edtech leadership*.

I used Google Scholar to find relevant material about the topics that may or may not have been accessible at Walden. I searched for journals using the Academic Guides page. For journals that were not accessible from Walden, I accessed the online library at Middle Tennessee State University.

Search topics included a wide search of the dates to view the number of hits on the topic that include the original date of publication. I modified the search by date to look for articles as of 2016. I identified researchers who were databased by Google

Scholar with a hyperlink on their name in the Google Scholar search. I used this link to view all their past and present research and to create a Google alerts when new research journals were published, or the researcher was cited in newly published journals.

Scope of Literature

Although research on the UTAUT was published in 2003, seminal works such as the TRA (Ajzen & Fishbein, 1975) extend as far back as 1969. Most the models were developed between 1990 and 2003 but were still based on the theoretical models of Ajzen and Fishbein. Venkatesh et al. (2003) synthesized the UTAUT, which has remained as a significant empirical model to measure technology adoption and usage of technology within the workplace.

Theoretical Foundation

The theoretical foundation I used in this study was the UTAUT (Venkatesh et al., 2003). The UTAUT was derived from eight different models of technology adoption and behavioral science theory. The purpose of the model was to predict the user's intent and attitude toward using technology within an organization. The major constructs of UTAUT consisted of performance expectancy, effort expectancy, social Influence, and facilitating conditions. These constructs were moderated by age, gender, experience, and voluntariness of use.

The Theory of Reasoned Action

The premise of the TRA is that a user's intent determined the behavior and that behavioral intention can be predicted and measured by examining the attitude toward behavior along with the expectations of employers and co-workers (Ajzen & Fishbein, 1969). The subjective norm is related to the expectations of the social constructs of

approval or disapproval by those in authority within an organization. Attitude is determined by the expected outcome of the behavior whether positive or negative and the individual's motivation. Ajzen and Fishbein made a distinction between a user's attitude toward a behavior and a user's attitude toward the object (Montano & Kasprzyk, 2008).

In other words, the user's attitude toward a specific behavior using a technology better predicts intent than user's attitude toward a technology in general. In summary, attitude concerning behavior and the subjective norm equals intention. Ajzen and Fishbein (1969) also suggested that to predict a person's behavioral intent, the understanding of the relationship toward choice is necessary. When an individual has a choice, the attitude toward the alternative or inaction must be considered as well. Measuring the relationships between the choices is a stronger predictor of behavioral intent then measuring the attitude of a single choice item alone.

The Theory of Planned Behavior

The TPB is an extension of the TRA (Ajzen, 1991a; Ajzen & Fishbein, 1969). The premise of TPB is similar to that of TRA in that the intention of an individual is a significant predictor of the individual's behavior influenced by their attitude and a subjective norm, but the TPB includes the user's perceived control (Ajzen, 1991a; Madden, Scholder Ellen, & Ajzen, 1992). The purpose of perceived control was to account for actions that affected intent outside of the user's control. According to Montano and Kasprzyk (2008), these controls were influenced by users' control beliefs about barriers or facilitators of these controls and how much power users believe these barriers or facilitators had over their choices. For example, an individual may do what is necessary to use technology, but may be hindered by the technology functioning, thus the

purpose of the TPB is to account for actions beyond the control of the individual. The TPB measured intent based on an individual's attitude concerning behavior, a subjective norm, and the individual's perception of control.

The Technology Acceptance Model

The TAM (Davis, 1985) was an attempt to address the phenomenon of user acceptance or rejection of technology in various environments, various users, and systems. Davis suggested that users pilot or test the technology being implemented and then measure their response to exposure to the technology. According to Davis (1987), previous studies involving use did not provide adequate empirical methods because the studies lacked valid instrument to properly measure the phenomenon. Davis posited his work in the TRA and the theoretical framework of Robey (1979) who suggested that use is influenced by the favorable view of job performance. Robey also suggested a difference between attitude and perception whereas attitude is a measurement of use and not a predictor.

Davis (1987) also argued that the acceptance of technology within an organization was a process that measured the users' rejection or acceptance of the technology at the beginning stages. The results of TAM suggested that Perceived Ease of Use (PEU) and Perceived Usefulness (PU) were the strongest predictors of the acceptance of technology by users. PU defined the strong probability that a technology will benefit job performance. PU also aligns with one of the essential needs of the Self-Determination Theory, competence, which is a user's decision to obtain various internal and external outcomes, and the efficacy involved in reaching those outcomes (Deci et al., 1991). PEU relates to the users' perception of difficulty of a technology.

Davis, Bagozzi, and Warshaw (1989) also suggested that managers could benefit by examining the responses between management, system designers, and company end-users in a pilot program. The researchers measured the strengths of the TAM by examining the relationship between behavioral intention, ease of use, attitude, and use by comparing the TAM to the TRA. The longitudinal study used 107 first- semester MBA students who were given a one-hour training session with a word processing program that was available to them but was not a required part of their degree requirement. The study revealed that behavioral intention is a strong predictor of computer usage, PU, a strong determinant of intention, while ease of use is a secondary determinant.

The Motivational Model

The MM addressed the role of motivation and self-determination in individuals based on the work of Deci and Ryan (1975). Deci and Ryan advanced the Self-Determination Theory (SDT) to differentiate the various motivational types that included intrinsic and extrinsic along with the various types of regulation of motivation such as external, introjected, and identified. The SDT provided an empirical method to investigate the basic human needs of motivation and growth and the social constructs that affect and support expansion of self-determination within humans. Although there are the positive aspects of motivation which seeks to explore, create and extend knowledge of individuals, the study of external influences of motivation include the negative aspects of coercion, guild and anxiety (Ryan & Deci, 2000b).

Deci et al (1991) argued that self-determination is maximized by meeting three needs, competence, relatedness, and autonomy, within a social context. Although self-determination is maximized within the social context, self-determination depends on

autonomy more than competence and relatedness. Davis, Bagozzi, and Warshaw (1992) and Igbaria, Parasuraman, and Baroudi (1996) discussed user enjoyment of computer use in the workplace as a construct. Davis, Bagozzi, and Warshaw (1992) argued the positive and significance of ease of use and output quality and how they effected enjoyment of use of computers in the workplace. Igbaria, Parasuraman, and Baroudi (1996) argued perceived enjoyment was a motivator for using computers within an organization. They argued that perceived enjoyment may be an intrinsic motivator because perceived enjoyment is unrelated to the extrinsic motivation of work performance.

Davis, Bagozzi and Warshaw suggested that extrinsic motivation disrupts intrinsic motivation. In their study of 200 MBA students using a word processing program, they considered computer use as an extrinsic motivator. The effect was not significant but reinforced the positive interactions of use. They also argued that usefulness is only valid to work performance when related to a user's job task. If use is unrelated to job task, then ease of use is insignificant.

The Combined Technology Acceptance Model-Theory of Planned Behavior

Taylor and Todd (1995a) extended the TAM by addressing social norm (SN) and perceived behavioral control (PBC) which were a part of the TPB. PBC was not originally included in the TAM even though the TAM was grounded in the TPB. Taylor and Todd argued that prior experience had an influence on behavioral intent over that of inexperienced users, but unlike experienced users, inexperienced users did not shift from intention to behavior. Previous studies of the TAM could not measure this factor because they relied only on experienced users as subjects.

Students in a college business school (n = 786) were surveyed after given a tour of the business college's computer resource center that provided computer access, printing, and technical support. Of the total number of students surveyed, 430 of the students had experience using the lab while 356 students did not. The students were not required to use the lab although the resource lab was available and part of the college's business department. The study revealed that inexperienced users relied on their perception of control and their perception of ease of use for a favorable influence to using technology. This distinction also suggested that the lack of experience did not give users the ability to fully assess the usefulness of the technology. Although PBC, PEU and PU align with a favorable attitude, attitude was not significant in relations to behavioral intent among experience nor inexperienced users.

The Model of PC Utilization

In the TRA, a user's attitude had a significant influence on intention toward behavior. The Personal Computer Utilization model (PCU), based on the psychological research of Triandis (as cited in Thompson et al., 1991), modified and redefined portions of the TRA by using emotions, feelings, social factors, and expected consequences. Triandis argued that attitude consisted of cognitive and affective components. In other words, the cognitive component would be a held belief about technology while the affective component consisted of favorable or unfavorable attitude toward a technology.

Several studies have addressed attitude in relation to other behaviors. Triandis (as cited in Thompson et al., 1991) argued that facilitating conditions could render attitude insignificant to behavior even though attitude measured strong in its appearance in the study. Taylor and Todd (1995a) argued that attitude was not significant between

experienced nor inexperienced users as a deciding factor of intention. Davis et al. (1989) surveyed 107 full-time students at the beginning of a four-semester MBA program that made available a word processing program but not required. After the completion of one year in the MBA program, 40 students were interviewed to understand the prominent beliefs they had about the word processing program. According to David et al., the small effect that attitude had on behavior intent was due to possible issues with all subjects having full access to the technology.

The PCU model excluded intent and addressed behavior directly on how the user's emotions were an influence on the use of the computer (affect), the influence of social expectations of the job (social factors), the available support from the job (facilitating conditions), and the expected consequences from using the computer directly on behavior (Thompson et al., 1991). Although habit is included in their model, Thompson et al. excluded it from the study because it was believed to be identical to use, thus making it tautological. The construct of expected consequences was expanded to define job fit, complexity, and long-term consequences.

Thompson, Higgins, and Howell (1994) extended the PCU model by examining the effect of experience on using computers as a direct, indirect, and moderating influence on computer use. The researchers studied 219 subjects from eight selected organizations consisting of aerospace, telecommunications, government, and software development through questionnaires. The researchers separated experience into two components, experience and expertise, to accurately measure the effect. Thomas, Higgins and Howell argued that expertise is the more reliable component when measured with skill level and length of use because a user may have the experience of spending a large

amount of time performing redundant task with a computer, but not increase their skill level. For example, teachers use electronic grade books in the classroom daily, but this does not automatically make them an expert on the software by just entering grades and attendance for the year. Expertise would be identified as increasing their skill level of use of the program's features and becoming more productive with the software. The results of the study revealed that experience had a significant direct and moderating influence on computer use and a small indirect influence for both experienced and inexperienced computer users.

Thompson et al. (1991, 1994) attempted to provide an empirical foundation for measuring the salient behaviors of emotions and feelings toward using a computer, but both studies had limitations that may have affected the outcome to provide this foundation. Thompson et al. (1991) stated that the broader aspect of affect should have been explored because the construct was only measured by three questions, but the questions used a 5 point scale. Thompson et al. (1994) only used a two-item like or dislike scale to measure affect in the study.

Thompson et al. (1994) used a single multinational organization in their study which would limit the generalization to other organizations. Thompson et al. (1991) used multiple organizations from various fields such as telecommunications and aerospace but surveyed them using a cross-sectional strategy. Considering that the study's methodology involved measurements of a user's growth in experience, a longitudinal approach of observing a cohort of users may have been more appropriate to measure over time. Both studies used self-reporting for the data gathering of the users. Thompson et al. argued that

the mainframe computer environment made objective reporting impractical for collecting the usage data from the subjects.

Innovation of Diffusion Theory

Innovation is described as a concept, procedure, or goal that is understood to be new to a group or individual (Rogers, 2003a). Rogers defined diffusion as the process by which participants in a social system transmit an innovation over a time period through conduits. IDT (Rogers, 1995, 2003a) described the methods by which groups and individuals communicate new concepts through channels over time. This research tradition included the nine distinct areas of public health/medical, anthropology, education, early sociology, rural sociology, marketing and management, general sociology, sociology, communication, and geography. Along with the nine major research traditions of diffusion research, innovativeness is one of eight types of diffusion research.

The process of moving an innovation's emergence from rejection or acceptance is known as the innovation-decision process (Rogers, 2003a). The five stages to the process move from knowledge to persuasion to decision to implementation, and finally confirmation. At the knowledge stage, the group or individual is introduced to the innovation. During the persuasion stage, attitude is introduced and plays a significant role because a favorable/unfavorable distinction is made about the innovation. It is at the decision stage where determination to officially accept or reject the innovation is made. Rogers (2003b) suggested that during the decision stage, a trial or pilot could be used to aid during the decision-making process, although at any point during the innovation-decision process the innovation could be rejected. Other models also referred to using

trials within the organization to aid adoption. Davis (1985) referred to pilots and trails in the TAM and argued that users form opinions and become motivated when exposed to innovations for a trial period.

The implementation stage occurs when the innovation moves from conception to actual use in the organization. It is during this part of the process that problems can and will appear as the innovation is realized. During the implementation phase, sustainability becomes a factor. Sustainability is the continued use of said innovation beyond the diffusion process.

As stated, innovations can be rejected during the innovation-decision process at any time. This is due to dissonance, which is an internal struggle within the individual to agree with adopting the innovation. According to Rogers (2003), dissonance occurred during the decision and implementation stage as new users were motivated to alter attitudes and actions to reduce their dissonance. This means that users were motivated to adopt an innovation without fully experiencing the innovation. Taylor and Todd (1995a) argued that the strongest predictor of PU and perceived behavioral control was from inexperienced users. During the confirmation stage, users search for indicators to reinforce the decision to adopt the innovation. Even after users adopt an innovation, an organization could discontinue the innovation in favor of a new one.

The adoption rate is gauged by the amount of individuals in an organization adopting the innovation over a given period (Rogers, 2003a). The Perceived Attributes of Innovation were included in the UTAUT (Venkatesh et al., 2003) as relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003a). Relative advantage refers to the level of the innovation and the benefit of the innovation in

comparison to what is being used. Compatibility refers to how users perceive the innovation as fitting into the social norms, needs and history of the organization. Complexity relates to the degree of difficulty of the innovation perceived by the users of the organization and how they can effectively use or interact with the innovation. Trialability refers to the degree that users may sample or try out the innovation before adopting the technology. Observability refers to the level in which users can observe the innovation being used or modeled within the organization. Both trialability and observability were effective for the diffusion of innovation throughout an organization.

Social Cognitive Theory

The UTAUT model adopted the concepts of output expectations, affect, self-efficacy, and anxiety from the SCT (Venkatesh et al., 2003). Although feelings, emotions and attitudes played an important role in how humans react and interact with the world, empirically measuring these roles have not been simple. Social Learning and SCT (Bandura & Walters, 1977) addressed the role of self-efficacy, internal behavior, and the relationship to external forces. Bandura argued that human behavior was not completely a product of unintended internal stimulus, nor only external forces, but a complex interplay of both internal and external compulsions influenced by choice of the individual. Self-efficacy is described as a person's convictions towards their power over occurrences that influence outcomes in their life (Bandura, 1989). Through self-efficacy, an individual is motivated to initiate, act and respond as a means of reaching a goal or expected end.

Bandura and Walters also suggested that observing the behavior of others affects how individuals are motivated to learn and puts the behavior into a perspective that can be conceptualized and duplicated by those observing. They also argue that observing the

behavior of others is more beneficial to the learner than trial and error. Learners have the benefit of being guided and questioning behavior being observed that could be detrimental to the learner if attempted unaided such as operating machinery or manipulating chemicals.

Compeau and Higgins (1995) addressed the effectiveness of training methods based on the favorability of the outcome to individuals and the role of self-efficacy to apply effort and remain persistent against barriers to reach an expected outcome.

The Unified Theory of Acceptance and Used of Technology

Venkatesh et al. (2003) constructed the UTAUT to predict use in the workplace by combining the eight models of technology use and behavioral intention combining the models' theoretical and conceptual concepts into a unified model. This longitudinal study spanned six months across organizations in entertainment, telecom, banking and public administration. They measured technology acceptance and usage as users were introduced to new technology through training in both voluntary and involuntary settings. On three different occasions, subjects were given questionnaires after each training that aligned with the eight models.

Venkatesh et al. (2003) argued that out of the eight models, only four studies, Davis et al. (1989), Mathieson (1991), Plouffe, Hulland, and Vandenbosch (2001), and Taylor and Todd (1995b), provided empirically based comparisons among the models' concepts. Venkatesh et al. also addressed the gaps in the research left by the eight models and the four comparison studies. The gaps consisted of simple technology use compared to the more complex technology usage, and the attention to organizational usage of technology as opposed to individuals. The other gaps in the research between the eight

models and four comparison studies included the type of participants addressed in their study, the level of experience of the subjects in the studies, the nature of the measurements of the subjects, and whether the studies addressed voluntary or mandatory use. The four comparison studies in the UTAUT, Davis et al. (1989), Mathieson (1991), and Taylor and Todd (1995b) used between-subject or within-subject comparisons of students and not employees of an organization as participants for model comparison.

To address the gap in the literature concerning a user's experience level or technology understanding, Venkatesh et al. (2003) wanted to examine experience through the different stages starting from no experience with the technology to experience with the technology over various stages of time. Most of the eight studies used subjects that had some level of experience with the technology. Taylor and Todd (1995a) specifically addressed experience by users with technology in their study as hybrid model of the TAM and the TPB adding social influences and perceived behavioral control to the TAM. The purpose was to explore relationships between experience and inexperience under this hybrid model. Of the four empirical comparison studies addressed by Venkatesh et al. , only Davis et al. (1989) addressed users who were new to the technology.

One of the other limitations of the studies examined by the UTAUT was the nature of the measurement gap which was addressed by measuring all participants longitudinally as opposed to the four comparisons studies that used cross-sectional analysis. The gap in voluntary or mandatory use was addressed in Venkatesh et al. (2003) by measuring the subjects in both voluntary and mandatory situations while all four model comparisons assessed the students in voluntary situations only. Venkatesh et al. revealed that UTAUT accounted for 70% of the variance in behavioral intention. The

main determinants of intention of technology use that emerged from the creation of the UTAUT were performance expectancy (PE), effort expectancy (EE), facilitating conditions (FC) and social influence (SI) use while experience, age, gender, and voluntariness of use were moderators of behavioral intent.

PE is the user's belief that the technology will increase their production on the job, and it has remained as the strongest determinant of intentional behavior (Venkatesh et al., 2003). EE is the level of difficulty of the technology that the users believe will be involved with using the technology in the workplace. SI described the expectations that the users believe are the superior's expectation for using the technology. FC described the environment, barriers and support the users believe affect their technology use in the workplace.

Age, gender, experience, and voluntariness of use are four moderating variables between the constructs and intentional behavior, but the four variables do not moderate all the constructs simultaneously. Gender moderates between behavioral intention and performance expectation, effort expectancy and social conditions. Experience moderates between behavioral intention and effort expectancy, social conditions, and facilitating conditions. Age moderates between all four of the constructs as well as behavioral intention while voluntariness of use moderates behavioral intention and social influence only.

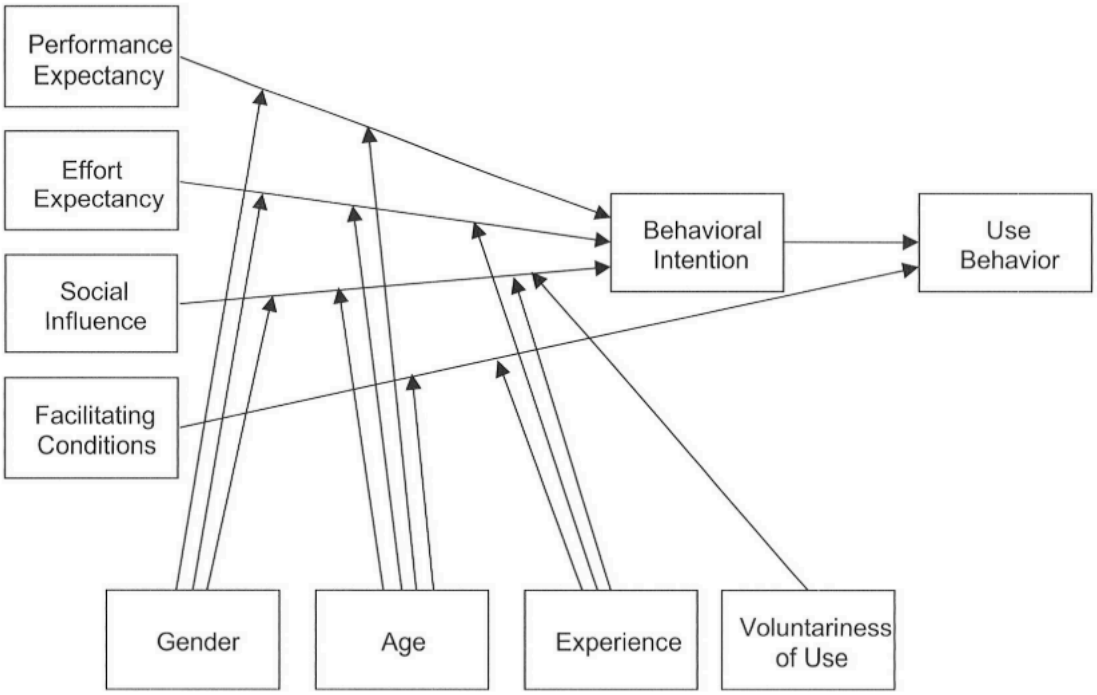

Figure 1. UTAUT research model Adapted from "User acceptance of information technology: Toward a unified view," by Venkatesh et al., 2003, MIS Quarterly, 27(3), p. 447 Copyright © 2003, Regents of the University of Minnesota. Used with permission (See Appendix I).

The UTAUT in Research

The UTAUT was created in 2003 and has remained in use since then in various fields of professional use and fields of study in research (Venkatesh, Thong, & Xu, 2016). Williams, Rana, and Dwivedi (2015) conducted a review of research articles published between 2004 and 2011 of 174 studies from 494 authors. In this study, 219 individual universities contributed research from 36 countries. Although the UTAUT research originated in 36 different countries, Williams, Rana and Dwivedi revealed that the range of countries contributing research ranged from the United States contributing

140 articles to Uganda contributing only 4. The number of conferences that have published articles on UTAUT range from The Americas Conference of Information Systems with six to the European Journal of Information System with two articles. The structures under which the research was performed included information management, business management, medical imaging, psychology, educational science, mass communication, and telecommunication.

Venkatesh, Thong, and Xu (2016) used a more succinct approach by analyzing the theory and theoretical extensions of UTAUT from 2003 to 2014 and the various ways the theory was used in studies. The authors categorized their review is several ways. One way was addressing the areas of general citations of UTAUT in which the theory was only mentioned but not applied to the study. Sarker and Valacich (2010) studied the value of group research as opposed to seeing groups through the lens of being a collection of individuals when adopting technology. UTAUT was only mentioned as a citation that technology adoption research exists and that it addressed adoption only from the viewpoint of individuals. The UAUT was not used directly in the study.

The researchers also looked at how the UTAUT theory was applied in studies. Workman (2014) used a convenience sample of participants from a shopping mall in central Florida using the UTAUT to predict the use of social media and mobile device applications for product information. Although the study addressed the main constructs of UTAUT, it only addressed experience as a moderator of behavioral intent to use the technology. The researchers hypothesized that age and sex were not significant effects on the results.

Venkatesh et al. (2016) meta-analysis also addressed the methods in which UTAUT theories was integrated in the research studies. Lian and Yen (2014) integrated the UTAUT and the Innovation Resistance Theory to provide a broader perspective of the drivers and barriers older adults face when shopping online. The UTAUT and its constructs were used to measure the drivers of acceptance while the Innovation Resistance Theory was used to measure the barriers by comparing college students in Taiwan ranging in ages 21 to 25 and older adults ranging in age from 56 to 70 in Taiwan taking a computer class for older adults. Venkatesh et al. also reviewed studies that extended the UTAUT.

Wang, Jung, Kang, and Chung (2014) extended the UTAUT by examining Enterprise 2.0 applications such as company blogs and wikis, and the influence they have as exogenous mechanisms or external predictors of the four main constructs of the UTAUT. The authors studied the motivation of users who actively engaged in Enterprise 2.0 application on the job by sharing and collaborating with other workers, and the motivation of users who just read or monitored the activity of others but did not engage. Venkatesh, Thong, and Xu (2012) extended the UTAUT to measure usage and adoption of consumer technology and called it UTAUT2. Prior to this study, subjects consisted of those in the workplace and their relation to technology in their job performance. This study measured the adoption of technology in the context of consumer use with mobile Internet technology. The UTAUT was extended by adding hedonic motivation, price value and habit to the four main constructs and eliminating voluntariness of use as a moderator.

Hedonic motivation was described as pleasure from using technology and was argued to be a predictor of behavioral intent for consumers (Venkatesh et al., 2012). Pleasure from using technology is rooted in the MM (Igbaria et al., 1996) which recognized the enjoyment from using technology in the workplace. Price value was described as the relationship between the cost of the technology and what the consumer perceives as the benefit of using the technology. Venkatesh et al argued that the perceived benefit of using the technology outweighed the cost, thus price value is a determinant of intent.

Experience was also included as moderator in UTAUT2 similarly to its relationship to the original UTAUT model in which experience was rooted in the development of the original UTAUT (Taylor & Todd, 1995a; Thompson et al., 1994). Venkatesh et al. (2012) defined habit as different levels of automatic behavior created by experience. The relationship of habit and experience is similar to that of experience and expertise (Thompson et al., 1994). Experience is necessary for both to exist, but both habit and expertise exist as different concepts demonstrated by levels, and prolonged experience does not guarantee an increase is either habit or expertise (Thompson et al., 1994; Venkatesh et al., 2012)

The study revealed that hedonic motivation, price value and habit were important determinates to consumers in the use of mobile Internet technology. Hedonic motivation demonstrated a higher determinate of intentional behavior than PE outside of the organizational environment especially among younger men while price value demonstrated to be higher among women using the consumer technology.

Despite the extensive research internationally and the existence of UTAUT in journals and professional conferences in various professional fields, Venkatesh et al. (2016) argued that very few of the studies measured all the moderators in their studies which called into question the ability to predict and generalize their findings. Only one study, Pynoo et al. (2011), measured adoption of a period of three different instances to measure the effects of the process in its entirety. According to Venkatesh et al., only three studies (El-Gayar & Moran, 2007; Liao, Shim, & Luo, 2004; Pynoo et al., 2011) had been conducted within the educational setting. Only two (El-Gayar & Moran, 2007; Liao et al., 2004) were conducted in the United States, and of those two, none involved K-12 education.

Venkatesh et al. (2016) argued that the generalization of the model could be affected by the lack of studies including all of the moderators. Several studies eliminated constructs or added external theories and variables to conduct studies with the UTAUT. Dwivedi, Rana, Chen, and Williams (2011) conducted a meta-analysis on the use of the UTAUT in research. Between the years of 2004 and 2010, 870 articles were discovered with only 450 being obtainable for analysis and only 43 of the 450 actually used the constructs of the UTAUT in the research. Of the 43 articles, only 27 were adequate for use in the meta-analysis because the articles were quantitative in nature (Dwivedi et al., 2011). Dwivedi et al. discovered that the external theories used in conjunction with the UTAUT were the TAM, the extended TAM, IDT, SCT, and Task Technology Fit.

Only 21 of the 43 articles that used the constructs of the UTAUT, solely used UTAUT constructs. The researchers discovered that the use of external theories with the UTAUT multiplied over the time period and that there was significance between external

variables and the constructs of the UTAUT. They also argued that there was a threat of redundancy because many of the external theories such as the TAM, IDT, and SCT were models that made up the UTAUT. They also revealed that the use of the moderating variables was not analyzed as argued by Venkatesh et al. (2016).

Šumak, Pušnik, Heričko, and Šorgo (2017) conducted a quantitative research method to assess 1040 Slovenian teachers' perception of PE and EE utilizing an interactive whiteboard (IWB) by investigating the possible factors that may affect their perceptions. Using a snowball sampling method, a questionnaire with quantitative and qualitative questions was used to measure 27 indicators. Different types of teachers were studied based on their usage of the IWB as either being new to the technology, a current user of the technology or those who have abandoned the technology.

EE, user interface quality, technology compatibility, perceived pedagogical impact, personal innovativeness, student expectations, management support with user type as a moderating variable. The studied revealed that perceived pedagogical impact had the most significance on PE and EE and that current users of the technology scored higher than new users or those who have abandoned the technology.

Moore (2012) examined the relationship between personal innovativeness and the constructs PE, EE, SI, and FC using a Pearson correlation. Moore wanted to know if a relationship existed between school administrators' readiness for trying a new technology and their acceptance of that technology. The researcher wanted to know what behaviors influenced administrator to adopt technology as they consider budgets, professional development and support that may affect their ability to perform their jobs as administrators.

Moore used a convenience sample from a mid-sized school district of 30 school administrators in the southeastern United States using tablet technology in their observations of the classroom. The UTAUT instrument was used along with an instrument to measure personal innovativeness. There were strong positive correlations between personal innovativeness and PE, personal innovativeness and EE, and personal innovativeness and FC. No significant relationship existed between personal innovativeness and SI, nor was there significance between either of the moderators of age and gender.

Ssekibaamu (2015) used a quantitative methodology to examine gaming as a tool for instruction among instructors of higher education by measuring its adoption with the UTAUT. Ssekibaamu proposed that gaming would provide a way to engage, motivate, and increase the higher order cognitive skills in learners within higher education because of higher education's lack of speed to adopt this method of teaching. Ssekibaamu surveyed 160 participants from higher education within the United States consisting of graduate and undergraduate faculty.

The study measured the behavioral intent to use gaming as a teaching tool and its relationship to PE, EE, SI and FC. The study revealed that there were strong positive correlations between behavioral intent and PE, behavioral intent and EE, behavioral intent and SI and moderate positive correlation between behavioral intent and FC.

Lawson-Body, Willoughby, Lawson-Body, and Tamandja (2018) examined the factors of the UTAUT and the effect of accounting majors considering the use of e-books in their courses using a quantitative methodology. The participants for the study were 107 accounting majors which included freshman, sophomores, juniors, and seniors. Over 50%

of the students had taken up to five accounting courses and over 90 % of the students used e-books previously and planned to in the future.

The study examined PU, PEU, innovativeness, perceived risk, and attitude toward e-book as factors to measure the students' e-book acceptance. The 28-item survey consisted of five scales using partial least squares analysis because the assumption of normality is not required. According to the study, PU was significant towards the attitude of using e-books. The students held a negative attitude for the PEU and e-books, and a negative attitude towards the PEU and perceived ease of usefulness. Students also held a negative attitude toward perceived risk and the use of e-books. There was a positive influence of innovativeness and PU, and a positive influence of innovativeness and ease of use.

Lawson-Body et al. (2018); Moore (2012); Ssekibaamu (2015); Šumak, Pušnik, Heričko, and Šorgo (2017b) each used the UTAUT in various ways ranging from using maintaining the UTAUT model (Moore, 2012; Ssekibaamu, 2015) to exchanging and adding additional variables to the model (Šumak et al., 2017) to not using any of the constructs of the UTAUT model (Lawson-Body et al., 2018).

Moore (2012) and Ssekibaamu (2015) used the UTAUT model closet to the original model developed by Venkatesh et al. (2003). Moore used the constructs of PE, EE, SI and FC as independent variables and personal innovativeness as the dependent variables. Moore also attempted to address two of the moderating variables, gender and age. Ssekibaamu modeled the UTAUT strategy similar to the Venkatesh study. The study measured the effect the four constructs of the UTAUT as independent variables on the gaming as an instructional tool as the dependent variable of behavioral intent, but the

study did not address the moderating variables. Although Lawson-Body et al. (2018) claimed to use variables from the UTAUT, but actually used constructs from two other models. The study actually used PU, PE which are constructs of the TAM and personal innovativeness. PE and PE are related to the constructs of the UTAUT because they were used to create the model, but they are not the same.

Criticisms of the UTAUT

Bagozzi (2007) criticized the UTAUT and the TAM for their oversimplification of the link between intent and actual use. Bagozzi argued that the link between intent to actual use neglects the concept of the end goal by focusing on the behavioral intent as the primary objective, thus creating a gap in the research. Bagozzi believed that the link from intent to behavior was widely accepted in social science without any critical evaluation, but Bagozzi attempted to criticize the TAM and the UTAUT interchangeably. Bagozzi failed to differentiate between the TAM and the UTAUT by focusing only on their relationship to behavior intent and the TRA and TPB.

The UTAUT included constructs from several other theoretical frameworks such as the MM (Deci & Ryan, 1975; Ryan & Deci, 2000a) which addressed the various construct of motivation both internal and external, positive and negative, and their relationship to the adoption of technology. The lack of an end goal for using technology may not be necessary when using technology for the sheer enjoyment of using it. Davis et al. (1992), which included Bagozzi, researched the enjoyment of using technology in the workplace and suggested that enjoyment was a positive and indirect influence on behavioral intent.

Straub (2009) reviewed the adoption and diffusion theories discussing the difference and relationship of those theories. The models included the IDT, TAM, the Concerns-Based Adoption Model (CBAM), and the UTAUT. Straub specifically questioned whether the UTAUT was adequate for the K-12 environment because users would not have a choice when using mandated technology, but the significance of the UTAUT is not determined by what Straub calls mandated use. Mandated use is defined by the lack of voluntariness or the freedom of choice to use the technology instead of using the technology because of a directive, but mandated use is not necessarily a deterrent to motivation. One of the eight models that comprised the UTAUT is the MM (Vallerand, 1997) that explored the aspects of the internal and external motivation which was also a significant part of SDT (Deci & Ryan, 2008; Deci et al., 1991). Deci et al. (1991) argued that certain types of external motivation or mandates can be internalized by an individual because the behavior of the mandate is perceived as valuable to the individual.

The UTAUT is designed to consider mandated use within its construct and how mandated used affects behavioral intent. The TRA (Ajzen & Fishbein, 1975) involved the attitude toward the behavior which could be affected by mandated use. The TPB (Ajzen, 1985, 1991a) extended the TRA to include perceived control could affect behavioral intent as well. The purpose of the UTAUT was to allow an organization to predict users' acceptance of technology introduced to the organization. The model would inform the organization on the extent that mandated use had, if any, on the intent of the users to accept and use the technology.

Dwivedi, Rana, Jeyaraj, Clement, and Williams (2017) used a combination of meta-analysis and structural equation modeling to suggest a different theoretical model of the UTAUT. Dwivedi et al. argued that attitude mediated the relationship between PE and EE and behavior intent which had been considered spurious by Venkatesh et al. (2003) and the moderating variable of age, gender, experience and voluntariness may not be appropriate to address all of the conditions of technology implementation. Venkatesh et al. considered the variable spurious because it was only significant to behavioral intent in the cases involving TRA, the TPB/DTPB, and the MM, but not in cases involving the C-TAM-TPB, PCU, and the SCT. Venkatesh et al. argued that the attitude was only significant when performance and effort expectancy were absent from those models.

Although Dwivedi et al. (2017) focused on the user's attitude toward the technology, Montano and Kasprzyk (2008) argued that many who theorize about attitude should focus on the attitude toward the object and not on the attitude toward the behavior involving the object as Ajzen and Fishbein (1975) suggested. This same behavior also holds beliefs about the outcomes of the attitude towards the behavior. Dwivedi et al.'s (2017) research suggest that attitude is formed after or during exposure to the technology, but according to Montano and Kasprzyk, the attitude toward the behavior of the object can exist before exposure to the object which can be reinforced positively or negatively. In other words, the attitude toward a training method using the technology is formed with an expected outcome before the training takes place, and what Dwivedi et al. considers mediation may only reinforce the established positive or negative outcome beliefs of the training.

Educational Technology Leadership

According to the U.S. Deptartment of Education Office of Educational Technology (2016), principals were directed to learn along with teachers to demonstrate and use technology to make sure that proper tools and support are available to students. Principals' use of technology within the school is a subject with various perspective and viewpoints. The levels at which principals are expected to use technology, the kind of technologies that best support the administrator and how these skills are acquired are topics that have not been only within the past decade but are topics that have been discussed well before the current proliferation of technology. The use of technology by administrators through leadership and the graduate-level technology leadership training are two areas of importance for the advancement of educational technology leadership.

The calls for more engagement of technology from leaders and the skills needed to lead with technology were similar to the arguments of today. Kearsley (1988) argued for a rigorous course on administrative computing that called for core competencies. These competencies described what administrators should do with computers, appropriate applications for schools, hardware and software selection, implementation plans, and personal use of computers by administrators. Kearsley argued that the course layout should involve lectures, demonstration of various software, hands-on demonstrations, collaborative activities with a final project to demonstrate understanding in a real-world setting. Bozeman and Spuck (1991) outlined the various development stages of computer processing of International Business Machines (IBM) mainframe systems used in automated educational data processing. Data processing for educational use was the level of involvement for administrators with technology of this time. Although applications

such as student scheduling, basic office desktop applications, statistical analysis, and test evaluation were available and being used by administrators, the administrators were not to merely process data to find solutions for student attendance or discipline.

The authors suggested that the purpose of data analysis was to lead to deeper inquiry to make the data more understandable by using heuristic investigation. The school leadership team would make inferences of the data by connecting the data points of multiple applications to discover emerging themes. Administrators and teachers had the ability to provide interventions for student achievement, student discipline, and parent involvement by cross-referencing the data from the multiple sources (Bozeman & Raucher, 1991). These multiple data points would be used to direct student outcomes in the same manner as administrators are expected to do today. Past administrators were attempting to guide instruction based on the technology of their time. Although the process was more tedious, there was an expectation of administrators adopting and using technology for leadership.

Bozeman and Spuck (1991) discussed the merger of instructional decision making and data application software which was the precursor for today's Learning Management System (LMS) known at that time as "Instructional Management Systems" (p. 521). Bozeman and Spuck also argued that the role of school administrators would be augmented due to the merging of "computer awareness" and "technology comfort" (p. 522). They predicted that the computer would be used as a support tool for instructional decision making for student achievement the same way an accountant would advise clients in the matters of taxes and financial management. Technology leadership does not exist only within the confines of the leader's office and the technology used by the leader,

but technology leadership should expand outward toward the rest of the organization. Teachers and other staff members would be affected by the changes as well.

Collis and Moonen (1994) discussed the three-stage diffusion process of technology integration in an educational system and the role that leaders should play to move to system wide integration. They defined the three-stages as individual initiatives, special projects, and system-wide integrations. Individual initiatives involved experiences with technology on an individual or group level that could exist on any level of hierarchy in an organization that ignites exhilaration and stimulates ideas for future growth without influence from leadership. Special projects were described as an environment constructed with specifically chosen individuals in mind with complementing tools and resources.

These individuals were given time to explore the depths of the technology and tools as a means to later showcase the results to the rest of the system in hopes that many of the discoveries and ideas would be adopted throughout the system and become self-sustaining in its impact (Collis & Moonen, 1994). The role of leadership at the special projects level was to bring together and orchestrate the people, resources and environment and to be a catalyst for experimentation and innovation from the various individuals and backgrounds involved. The leader could not be enticed strictly by the newness and excitement of the project, but regulate the progress, supplant individuals and end the project if necessary. During the system-wide integration, the technology diffusion to the organization becomes the focus. The technology must be integrated into the daily routine of the organization which differed from the special project status where the group, time and environment was free of the time constraints and demands of the normal organizational routine.

Collis and Moonen (1994) argued that the leader's role would be similar to the special project, but on a greater level and different dimension. The leader must simultaneously monitor all aspects of the technology and personnel in the use of the technology throughout the organization, evaluate its effectiveness, and make necessary changes to maintain the synergy in a delicate balance of organization and leadership. The leader must also look to the future for special projects, individuals to lead them and be able to redefine goals and outcomes. The authors highlighted a case study on leadership based on four periods of technology integration into the schools in the Netherlands between 1984 and 1993. The four periods were described as the grassroots development period, the unorthodox or special project period, transitional and blending of new policy, and the system-wide integration period.

Kearsley and Lynch (1994) argued that there was a lack of analysis of educational technology leadership and that such analysis would be critical to move forward with the increasing amount of technology entering the schools. Teachers training was being spotlighted as serious need for successful use of technology in the classroom, but not administrators. They suggested that technology leadership should be viewed from a unique perspective even though technology leadership aligns with some traditional modes of leadership due to the need for a consistent response to innovation. Kearsley and Lynch also suggested that technology leadership and the necessary skills needed should be categorized based on levels such as state, district, principal, teacher and technology specialist adopted from Collis (as cited by Kearsley & Lynch, 1994).

Today, the discussion about educational technology leadership reveals similar concerns and issues. Levin and Schrum (2013) used a cross-analysis case study to explore

technology leadership from school leaders around the country from various settings. These settings included public schools, private schools, elementary, and secondary schools of various sizes that were selected based on state and national recognition. Using classroom observations, focus groups, interviews, and document analysis, the researchers wanted to understand the lessons that were learned by the leaders in their technology implementations.

Levin and Schrum used systems thinking as a conceptual framework and discovered eight factors that the leaders needed to address to be successful. Systems thinking is not only concerned about the organizational structure, but how the different departments of an organization are connected. The eight factors that emerged were curriculum and instruction, vision, distributed leadership, professional development, funding, school culture, technology support and community partnerships. The authors argued that all eight of the factors had to be addressed simultaneously because of the systemic structure of schools and community and that a failure in any one factor could cause a collapse of the entire system of technology leadership.

The Levin and Schrum (2013) argument was similar to that of Collis and Moonen (1994) who argued that leaders must stay aware of changes within the various parts of the system and understand that decisions made to address issues within these various parts may initiate conflict between other parts of the system. Levin and Schrum (2013) also mirrored Kearsley and Lynch (1994)'s suggestion that technology leadership was not only necessary, but required training to address the complexity of technology within an organization, but can adapt to emerging technologies and the changes they bring into an organization.

Today, the arguments are still being made for the need for technology leadership in schools. Garcia and Abrego (2014) conducted a qualitative study of thirty principals and their perception of the needed skills to be technology leaders that were aligned with the NETS-A. In the study, thirty-subjects were given a thirty-five-question survey to assess high level of technology proficiency, sixteen scored above the mean cutoff demonstrating high technology competency. Five of the sixteen were selected randomly for face to face interviews. The main themes that aligned to the NETS-A were similar to the core competencies needed by technology leaders suggested by Kearsley (1988). The themes were an understanding of software and hardware, planning of resources, gathering data and using information, and communication with stakeholders (Garcia & Abrego, 2014).

Sauers, Richardson, and McCleod (2014) interviewed 11 district superintendents in a phenomenological study to understand their perspective of leading with technology and the associated challenges. The superintendents were selected from a list of technology savvy superintendent award winners described by *eSchoolNews* between the years of 2001 and 2010. From the interviews, four specific topics emerged, shared vision, infrastructure resources, communication and professional development.

According to Sauers et al. (2014), the participants revealed that a shared vision often meant a paradigm shift from the entire organization. Fear and addressing the status quo were challenges to be overcome with instituting a shared vision. Articulating the shared vision to the other stakeholders meant dealing with resistance from the staff and community and the fear of what those changes would mean. Although, the fear existed mainly within the superintendents, all the superintendents were considered risk takers.

Around the theme of infrastructure, the superintendents argued that the need for adequate technology infrastructure was paramount, but it was a controversial topic because of it its scope. The scope of infrastructure often required a major investment from the district, so promoting, articulating and gathering the needed support was uncomfortable for the superintendents even though they realized that it had to be done. The superintendents also agreed that communication was necessary to facilitate the previously mentioned topics of shared vision and infrastructure. Using technology assisted them in effective communication with all stakeholders and reduced the confusion and pushback from the community that arises when information is either not shared or articulated well.

The superintendents agreed on the importance of professional development for teachers although they had various ways of addressing professional development (Sauers et al., 2014). They all saw the need for professional development, the corresponding funding, and they suggested that it was a way of alleviating the fears of teachers. Both Garcia and Abrego (2014) and Sauers et al. (2014) was as example of engaged administrators understanding their role as educational leaders and managers which yielded successful results. The subjects in both studies could describe in detail the efforts and demonstrate the knowledge of emerging subjects of the study. The fact that one group was superintendents and the other were K-12 principals was evidence that school leaders should address similar topics regardless of their current level as an administrator.

Vision, teacher professional development, and infrastructure needs were themes discussed in both studies. Although technology literacy was not mentioned in Sauers et al. (2014), it can be surmised that technology literacy played a role among the

superintendents on some level. There must be some understanding of technology literacy to create a vision or understand the need for infrastructure when leading as a superintendent because of the broad effect that this position holds. It also stands to reason that superintendents have a greater effective systemically across an organization while principals have the greater effect within the schools with technology that touches the faculty and students. This is different than an administrator merely understanding technology to be important at any level.

Administrators can view technology integration as important without fully understanding their role as technology leaders. Richardson and Sterrett (2018) revisited the study of Sauers et al. (2014) by performing a comparative qualitative study on superintendents who were recognized as tech-savvy between 2001 and 2010 and those who were recognized as tech-savvy between 2011 and 2014 by *eSchool News*. There were eleven superintendents that participated in the original group between 2001and 2010 and fourteen superintendents that made up the second group who were award winners between 2011 and 2014. The purpose of the study was to understand any shifts in the conversations in their experiences within the scope of educational technology leadership between the two time periods. Richardson and Sterret discussed five areas of comparison and change that included vision setting, infrastructure, communication with stakeholders, professional development, and addressing fear.

In each concept, the change included either a continuation, broadening, focusing, or sustaining of the concept. For instance, vision setting should be broadened to include the community at large and not just individuals within the school environment such as the school board or staff. There was a shift in the conversation from obtaining funding for

infrastructure to improving and better planning. Communication with stakeholders was seen as an on-going need with better communication tools that the modern technologies provided. Professional development became more focused on the individual needs of the staff than a very broad district-wide approach, and finally, moving from acknowledging the need to be a risk taker to being able to accept the unknown that comes from new technology initiatives.

In contrast to (Garcia & Abrego, 2014), Machado and Chung (2015) used a phenomenological approach to explore the experiences of 42 principals from four diverse districts in California. The median income of districts ranged from $29, 583 to $60,114 and the number of schools within these districts ranged from 14 to 84 schools. Machado and Chung wanted to measure technology integration based on the perceptions of the principals. Principals in Machado and Chung (2015) did not value or understand their influence in the use of technology integration among the teachers.

Out of the 42 principals, 25 ranked teacher willingness to integrate technology first while 25 principals ranked principal support as third. 18 of the principals ranked professional development second while 15 principals ranked professional development third. Even though, 98% of the principals agreed that technology integration was either important or highly important, the researchers suggested that the principals did not understand the importance of their influence of leadership on teacher technology use and effectiveness. Despite these findings, the influence of the principals on the adoption of technology by teachers has been studied in more depth and has shown to have a significant influence and predictive power on how teachers, and ultimately students, engaged with technology.

Chang (2012) explored this relationship between the technology leadership of principals, technology literacy and effectiveness of 1,000 elementary teachers in Taiwan. The randomly selected teachers came from 100 schools while the actual teachers were randomly selected by the Director of Academic Affairs Division within the schools. Based on the NETS-A, Chang measured the relationship between the principals and teachers in three main areas, principals' technology leadership, teacher technology literacy and teacher effectiveness with 5-point Likert scales on each area resulting in a 101-question survey.

Chang (2012) suggested that the principal's technology leadership had a statistically significant effect on teacher effectiveness and teacher technology literacy and that teacher technology literacy had a mediating effect on the principal's technology leadership. Chang (2012), Garcia and Abrego (2014), and Sauers et al. (2014) each recognized the involvement of the NETS-A in their studies as the foundational framework for technology leader. Although the NETS-A provides adequate guidance in the matters of technology leadership, it cannot be assumed that relying on the framework alone will bring success (Sincar, 2013). Sincar argued this point and that the various challenges associated with technology leadership do not necessarily provide a blueprint for successful leadership. Beyond the previously mentioned themes associated with technology leadership such as vision, professional development and infrastructure, Sincar suggested that a common set of barriers may affect technology leadership and may constrain or frustrate concepts such as vision, professional development and infrastructure. The barriers were listed as training, resistance, equity and bureaucracy, resources and poverty. Sincar (2013) conducted a qualitative study interviewing six

elementary principals in Turkey to understand the challenges faced by them within the context of their country. According to, Sincar bureaucracies hindered the timely availability of equipment requested by schools from the Ministry of Education. In some cases, equipment that was requested by the principals were either delayed or denied after being told that it would be available for them. The delays caused newer technology from being available to teachers and students and often setback many planned projects within the schools. The principals explained how the Ministry of Education did not provide adequate resources or support for the resources such as training and technical support. Although the principals may have requested new equipment, they often received older devices. The added restrictions of parents and community donation of equipment further hindered the process of technology integration in the schools.

Many of the principals were also affected by the resistance to use technology from the older teachers who were polar opposites of the younger, early adaptors (Rogers, 2003a). The lack of training of principals also served as a barrier because many of the principals felt overwhelmed by the regular duties of the being an administrator and could not find the time for personal development of their technology skills. Finally, poverty served as a barrier because students in high poverty areas could not afford the technology resources such as computer and tablets in their homes, and because their schools had high poverty, technology resources were not available at the building level as well. Sincar (2013) argued that the NETS-A should be considered in the context of the countries that the studies were conducted because challenges vary between countries and systems of government. In the American educational system, there is a varied and diverse technology implementation and leadership on the state and national levels despite the

U.S. Department of Education initiatives such as the Future Ready Learning (U.S. Department of Education Office of Educational Technology, 2016). Whether within the local school or at the national level, the concepts of vision, infrastructure, professional development and community involvement of technology leadership (Sauers et al., 2014) remain the same and can have an even greater effect on the successful outcomes of technology resources, planning and engagement.

Towndrow and Vallance (2013) studied the decision-making process of leadership implementing a 1:1 deployment on the national level from case studies from Japan and Singapore. There was stark contrast in the outcomes of the initiatives. Singapore sought to capitalize on digital media as a source of prosperity and to position themselves as leaders in this market, so the government invested in the necessary infrastructure and personal devices to support a highly collaborative, personalized learning system around digital media content creation. Teachers had the freedom to create the class content in-line with what the students needed, not use requited textbooks and plan the length of the curriculum in association with a mobile learning environment.

According to Towndrow and Vallance (2013), Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT) has not taken the same approach as Singapore. A general sense of apathy for digital literacy extends from the MEXT down to the student level. Towndrow and Vallance revealed that less than 5% of the students used computers in the classroom. University professors have attempted to raise digital literacy awareness in students by offering lectures on mobile devices and engage students to use more digital tools for their classwork, but student insist on the standard lecture, textbooks, paper and pencil. Because of a lack of awareness of digital literacy skills,

Japan is suffering in its place technologically and academically in the global community. Students remained locked into the norms of lectures becoming increasingly digitally illiterate with less than 5% of 2010 incoming students using laptops in higher education.

Even though there were stark differences between the Japanese and Singapore systems, there remained gaps between the availability of the digital tools for the country's goals and the implementation from their teachers. According to Towndrow and Vallance (2013), the 1to 1 program in Singapore's Fox Hill school was hampered by lack of training, unclear vision and goals. Despite the availability of vast amounts of equipment, teachers restricted the free and openness of the implementation from students, falling short of the intended use and outcomes of the Ministry of Education. Similar schools in America, there were spots or instances of personalized engagement with the technology. Towndrow and Vallance displayed a complex web of relationships between the Ministry of Education, teachers, school leadership, head of information technology, researchers, professional development coordinators, and school information technology trainers.

Although Levin and Schrum (2013) argued that technology leadership is delicate balance of several complex themes that must be address simultaneously, educational leadership studies have only viewed leadership from one dimension with that leadership must "do" more in order to effectively manage, promote and engage stakeholders using technology. According to Kowch (2013), these complex relationship will only become bigger and encompass more people in organizations around the world, creating tensions that spawn more knowledge and innovation; therefore, today's educational leaders and organizations must be able to adapt quickly. McLeod et al. (2011) suggested that the new technology leadership must be able to design new learning environments for students that

reflect their characteristics, needs, and motivations arising from the constant shift of technology. These new leaders must go beyond being risk-takers (Sauers et al., 2014) but be bold in their endeavors to create, articulate and disseminate a paradigm shift. This ability to create a paradigm shift that is received and promulgated throughout multiple organizations is the main purpose behind e-leadership. Avolio, Sosik, Kahai, and Baker (2014) argued that the complex structures that have been created from social media and Web 2.0 technologies have caused a reciprocal relationship with leadership in which both parties can influence change on each other. Leadership can now address multiple groups simultaneously reacting to their request, demands and responses, thus giving new direction or altering the vision, disseminating new information, and providing resources in real time.

Educational Technology Leadership Training

Another barrier to successful educational technology leadership has been a lack of adequate instruction in schools of leadership concerning the use of technology by administrators. The framework of the content was rooted in the NETS-A standards which addressed a wide range of competencies much of which are aligned with the Interstate School Leaders Licensure Consortium (ISLLC) standards. Even though these standards provided a balanced approach to educational technology leadership, much of the deeper content was rarely explored or grounded in leadership curriculum. Despite the importance of the NETS-A standards and the ability of these standards to provide direction for the expectation of educational leaders, there still lacks a method of using the standards to drive educational leadership instruction. Bennett (1996) and Garcia et al. (1997) argued that principals should be involved and model the use of technology by becoming familiar

with as much of the technology as possible, but Bennett (1994) suggested that a disconnect existed between having an awareness of the need for technology leadership and actually putting it into practice. Regardless of how leaders are to perform, leader preparation and training are necessary to the successful implementation and adoption of technology in schools. The role of educational leadership training was found to be lacking for candidates seeking to become educational leaders (Bennett, 1994, 1996; MacNeil & Delafield, 1998; Mcelroy, 1997).

McLeod et al. (2011) reviewed educational leadership programs and suggested that there were three different levels of technology usage in educational leadership courses. At the most basic level, there were courses that relied on technology to only enhance the delivery of the curriculum but lacked any transformative change in the content. The content delivered to the prospective leaders did not involve the use or leading with technology but was delivered to the classes by newer technology.

The second type of courses reviewed engaged the classes in using technology tools to get a better understanding of how students in the classroom use technology using multimedia and student portfolios. The goal of the course was to equip the classes with the skills of using multimedia to articulate and engage stakeholders with better communication. The third type of course work focused on technology leadership as the content in order to build leadership capacity with technology initiative such as 1:1 device deployment and distributed leadership models. McLeod et al. (2011) argued the capacity building with technology for leadership was the most relevant to address the needs of aspiring leaders as well as those working in the field. Since McLeod et al., there have been other studies that have identified the quality of content presented in educational

leadership courses, the perception of the course content and level of engagement from the participants.

Richardson (2013) used a phenomenological approach to explore vision setting by two cohorts of doctoral students participating in a blended course for technology and leadership in an educational leadership doctoral program. The two-year study used the NETS-A as a conceptual framework to understand how setting a vision for technology leadership may be influenced. The study revealed that the students made significant changes in what they thought was an adequate vision for technology leadership after being exposed to the NETS-A standards. The students also felt that the NETS-A gave them a deeper insight to planning for technology leadership.

Yu and Prince (2017) examined the relationship between aspiring principals' perceived technology abilities according the NETS-A and their interesting in continued professional development to aid those abilities. The researchers relied on self-reporting surveys of 56 educational leadership graduate students from a university in the southeastern United States. The researchers administered one- 21 question 5-point Likert scale questionnaires that measured the students' perceived abilities on the NETS-A standards, and another 21 questions, 5-point Likert scale survey that measured their desire to acquire professional development for their NETS-A standards skills assessment. Yu and Prince reported that the aspiring principals' desire to engage in professional development was greater than their perceived abilities with the standards. The students' perceived abilities for the standards was greater for the standards than they were per individual standard.

Both Richardson (2013) and Yu and Prince (2017) addressed graduate level students and their relationships to the NETS-A standards with positive outcomes. Richardson deliberately exposed students to the NETS-A and one specific standard, vision setting, while Yu and Prince did not disclose how the students had come to recognize the standards. Richardson had one advantage in his study because of the study specifically addressed educational technology and leadership in a hybrid environment. The Richardson study also was more aligned with the third type of educational leadership program suggested in McLeod et al. (2011) as attempting to build capacity in leaders with technology for more relevancy with the students. Both studies provided valuable insight into how graduate students perform when exposed to technology standards, but neither gave an indication into how they would put the information into practice.

Kruse and Buckmiller (2015) conducted a study of 26 aspiring principals from a different perspective exploring the conceptual framework of the Nature of Technology (NOT) on students of a Midwestern university graduate-level educational leadership class. Unlike studies which sought to only understand the positive perceptions of technology leadership, the NOT framework was used to understand how aspiring leaders can evaluate technology adoption by considering the trade-offs of using the technology. The push to use technology's benefit for students and classrooms are often only seen from a positive aspect student achievement, particularly. Kruse and Buckmiller wanted to investigate how aspiring leaders weigh the negative concepts of technology adoption as instructional leaders. Some of the questions used in the survey asked the subjects to consider the losses as well as the gains from using the technology, and to consider the broader aspect of the technology adoption beyond student and classroom use. The

researchers also wanted to explore the movement from the managerial side of technology leadership to instructional among the participants.

Although Levin and Schrum (2013) and Sauers et al. (2014) both detailed the positive aspects of award winning technology leaders to address the instructional needs of the classroom and teachers, both sets of participants mainly addressed the managerial sides of leadership in their efforts. Kruse and Buckmiller (2015) wanted to explore whether the subjects could or would make the shift from manager to instructional leader by asking probing questions about the technology and their plans for its use. Although Kruse and Buckmiller did recognize the NETS-A as being a foundational concept for using educational leadership, they did not see the NOT as counter-productive to using the NETS-A, but rather working in tandem.

The researchers argument for using the NOT framework along-side the NETS-A supports Sincar (2013) who argued that using the NETS-A alone will not guarantee a leader's success. Sincar argued that other factors that leaders address may make technology leadership difficult. Kruse and Buckmiller (2015) suggested that the NOT framework could cause administrators to consider the deeper and lasting implications of technology adoption beyond the pragmatic issues of budgets, infrastructure and cost. The participants marginally addressed the issues of teaching and learning while gravitating to more managerial issues of leading with technology. When the participants were questioned about the trade-offs of the technology, the response focused on aspects such as the loss of traditional writing and reading skills and the possibility of personal interactions with teacher may diminish. Kruse and Buckmiller also reported that some of the participants suggested that the teaching and learning aspects could suffer such as

original and critical thought, higher order thinking skills, distractions, and overall sound practices of teaching. The researchers suggested that the participants had only a basic understanding of technology for the classroom and the possibilities that they could bring which is why they viewed only the possible negative outcomes.

Marcos and Loose (2015) explored the transformation of educational leadership programs in California by interviewing faculty and administrators of ten organizations comprised of nine private institutions and one state university. These institutions migrated their face to face educational leadership program to a fully online one to address the need of the millennial and generation iY students. One clear focus of the study was the development of authenticity within the online program by using issues or problems within the candidates' setting in their schools. This was a way to engage them for real-world learning experiences by addressing issues that the students chose to be the focus of their study throughout the program. Other themes that were discussed in the study were major goals and outcomes, course quality and rigor, and the future of fully online licensure programs.

Marcos and Loose (2015) reported the advantages to the approach of authenticity by the universities as having 95% retention rates among the students in their persistence in other administration programs. This was due to focusing on the needs of the candidates by giving attention to the problem the student was addressing in the program and being culturally sensitive to needs of the populations in the students' study. Keeping to the focus of developing authenticity of the students, relevancy was also a main goal of the program. According to Marcos and Loose, many of the faculty were still active in the fields that they were instructing, and the faculty maintained a rigor of professional

development and certifications. This attention of relevance attributed to highly successful careers of students who left the program as stated by interviews of the faculty of the programs. This, however, has not been substantiated by any empirical studies.

As argued by McLeod et al. (2011), the only focused use of technology in the program studied by Marcos and Loose (2015) was through part of the assessment protocol which involved the use of ePortfolios to document the students' progress in the program and provide the necessary artifacts. The student also requested that social media usage increase within the program as a tool for communication and collaboration. Despite the reported success of the program, educational leadership with technology was not addressed in any way, and it should also be noted that the study only presented the perspective of the faculty and not the candidates themselves.

Hayashi and Fisher-Adams (2015) used a different approach when they surveyed 275 alumni who participated an educational administration master's degree program between 2007- 2012. The alumni were now holding positions as either teacher or principal. The program's curriculum was a combination of the California Commission on Teacher Credentialing (CCTC) and the NETS-A. Although the participants gave favorable responses to the Likert survey about the program's attention to technology as a part of leadership, interview responses differed by revealing that the program only gave an overview of the different aspects of technology leadership. Respondents revealed that the program did not go in depth on any of the topics used in the survey question. School law, digital-age learning, sustainability, collaboration, support and technology management were topics that the alumni desired that the program covered with more

fidelity. The perspective of those in the field was unique because many of these leaders were present when the shift in education began with the technology.

Dexter, Richardson, and Nash (2017) suggested that educational leadership should adopt the pipeline concept for developing leadership. The pipeline concept would be more comprehensive concept by connecting many aspects of leadership development such as preparation, development and evaluation based on existing leadership standards. This method goes beyond the standard leadership curriculum because the development process would not stop at graduation but would extend into practice where on-going development would continue with formative evaluations. Because of this shift in the leadership paradigm, the external relationship would also change. School district, colleges and external partners would collaborate to implement, sustain and shape the on-going process.

Educational Technology Research

Despite the calls for more training and research for technology leadership from Kearsley (1988), the amount of actual research done over the years is limited. McLeod and Richardson (2011) conducted a meta-analysis of the availability of research from professional outlets about technology leadership. Over a 9-year period from 2000 to 2009, two leading journals were explored for themes relating to technology leadership, Education Administration Quarterly (EAQ) and Journal of School Leadership (JSL). Over a 12-year period between 1997 to 2009, McLeod and Richardson researched three leading conferences on educational leadership, American Educational Research Association (AERA), University Council for Educational Administration (UCEA), and National Council of Professors of Educational Administration (NCPEA).

According to McLeod and Richardson (2011), there were only 25 professional journals with 80 or more citations found with the topic of technology leadership, but out of the 25 journals, there was only 10 articles that came from peer-reviewed journals. Staff development, international leadership, policy, ethics, technology tools, and management were the themes that emerged from the journal research. Of the professional conferences, only 2.12% of the AERA, 2.94% of the UCEA, and 7.40% of the NCPEA had presentation topics on technology leadership (McLeod & Richardson, 2011). From this study, it was suggested that meaningful literature and research on educational leadership was scant and lacked sufficiency for a theoretical base.

Andragogy and Self-Directed Learning

To understand how K-12 principals adopt technology with little or no formal instruction, the role of self-directed learning must be addressed. The roots of self-directed learning (SDL) reside in the concept of andragogy. Andragogy is the discipline or skill of aiding adults in their learning (Merriam, 2001), and much of what is known about andragogy in America is derived from the work of Matthew Knowles. Knowles was not convinced that teaching and learning was delegated only for children. Earlier teachers such Jesus, Plato, and Aristotle and cultures such as the Chinese and the Greeks taught adults and designed methods of inquiry such as Socratic questioning and case methodology (Knowles et al., 2005a).

Because the education of adults at that time was fashioned like that of children, Knowles was concerned with the fact that children were led and indoctrinated with the teacher's ideas and experiences as opposed to relying on the experiences of the adult students (Knowles, 1979). Pedagogical approaches were teacher led and teacher centered.

Knowles wanted to make a distinction between the learning of adults and the learning of children, and he was more concerned with the experiences that adults had to offer toward their own learning. Starting in the seventh century, education was primarily focused on the education of children in religious schools, but after World War I, the acknowledgement of adult learning began to surface in schools in Europe and America (Knowles et al., 2005a; Merriam & Bierema, 2014). It was also in the late 19th and early 20th centuries that Knowles credited the work of clinical psychologist and humanist for their contributions to adult learning. Although researchers such as Freud, Pavlov, Piaget, Maslow, and Rogers did not directly research adult learning, their research into how humans learned laid the foundation of learning in general. According to Knowles et al. (2005a), Freud's research into the subconscious' influence on behavior and Maslow and Roger's research into the psychological development and self-actualization of humans provided a foundation to understanding the deep inner processes of human behavior and development.

Beginning in 1926, investigations into adult learning emerged in two forms due to the creation of the American Association of Adult Learning from which two forms of investigations approached adult learning from either a scientific or reflective perspective (Knowles et al., 2005a). Both approaches attempted to discover new knowledge about adult learning much like the quantitative and qualitative methods of today. The scientific approach used classic scientific experimentation techniques to develop a theoretical basis while the reflective approach used intuition to understand the experiences of adults. Two leading researchers emerged from the two approaches, John Thorndike and Eduard Lindeman.

According to Knowles et al. (2005a) and Merriam & Bierema (2014), Thorndike was the first researcher to use experimental investigation into adult learning in 1928 instead of focusing on the learning of children or social philosophy with the publication of *Adult Learning*. Thorndike (1935) provided an empirical basis to suggest that not only could adults learn where previously held beliefs of adult learning were just speculation, but that adults would learn whether it was intrinsically interesting or not. It was the work of Eduard Lindeman in 1926 which had the most influence on Knowles' work. Lindeman's work relied on the artistic approach to understand what took place within adults as they learned. It was the Lindeman's perspective that supported Knowles' argument that there was a clear distinction between children and adult learning although Lindeman believed that children could learn in ways similar to adults when the learning became student focused (Knowles et al., 2005a). Lindeman (1926) delved deeply into the meaning of adult learning by focusing on the value of experience and the individual. Pedagogical approaches did not include the experience of children because it was believed that children did not possess enough experience to matter, therefore, teaching could not be dictated to adults as it was with children. Adults, on the other hand, had a wealth of experience to draw from to approach their learning because of their relationships to family, community, and life in general. Adults used their experience to interpret new challenges and then reflect on what was learned by using the experience. According to Lindeman, life and education were synonymous and interchangeable for adults and intelligence was used to regulate emotion and experience to gain knowledge. Knowles summarized Lindeman (1926)'s views of adult education and later created his own assumption about adult learners.

1. Adults learn based on their experiences and real-life needs that motivate their learning.
2. Adults take charge of their learning by being self-directed
3. The experience of the adult is the foundation for their learning.
4. Adult see learning through the lens of life experiences
5. As adults get older, differences in individuals greatly vary due to experiences.

Knowles (1980) and Knowles et al. (2005a) developed assumptions of andragogy.

1. Adult learners have a need to know the reason for learning.
2. The self-concept of an adult grows from a personality of dependency to self-directed.
3. There is a vast amount of experience gained as a person matures into adulthood that is used for learning
4. Job-specific or other social roles determine an adult's readiness for learning in a situation.
5. Adults have an orientation to learn because of an immediate need not the need for future learning.
6. Internal, not external, motivation drives adult learners.

Initially, Knowles argued that pedagogy and andragogy were opposites with pedagogy being considered bad and andragogy being considered good, but Knowles' perspective of pedagogy and andragogy changed to that of a continuum after teachers from elementary to higher education stated they had used andragogy with some of their students and received positive results (Knowles et al., 2005a). Knowles et al. argued that

pedagogy was widely used due to an ideology which excluded andragogy and dictated a level of allegiance and compliance from the educational system. They argued that the andragogical model was not based on ideology but assumptions that included both andragogical and pedagogical assumptions.

Two main critiques of andragogy were related to how andragogy was defined and whether andragogy and pedagogy were mutually exclusive to adults and child, respectively. The definition of andragogy has shifted considerably between the decades of 1980 and 2000. Knowles (1980) suggested that andragogy was a science, but there have been many critiques of Knowles' perspective, in part, because of the deep philosophical and humanistic backgrounds that influenced Knowles and the lack of empirical research to support andragogy (Knowles, 1979; Knowles et al., 2005a; Merriam & Bierema, 2014). Although andragogy did not have an empirical base, it was widely adopted, globally, by many as a means of understanding how adults learn and how they should be instructed in various learning environments (Pratt, 1993).

Darbyshire (1993) was concerned how widely and uncritically that andragogy had been accepted in the field of nursing while negating pedagogy. According to Darbyshire, the field of nursing was struggling with being defined as credible in academia. Knowles' original perspective of andragogy being an antithesis of pedagogy was simplistic and offered the field a more progressive view of the profession. The need to be accepted as a profession and to be seen as progressive caused any critical view of andragogy to be seen as subversive and influenced the marginalization of pedagogy in nursing. Rachal (2002) argued that the definition of andragogy was fluid which opened it to various interpretations and made any empirical investigations conflicting and sparse. Because of

this fluidity, studies could not be generalized to other populations, nor could they be compared. A mixture of design among the studies compounded the problems is specific areas such as the use of adults and children in the same study and learner control/freedom (Rachal, 2002). Rachal also argued that one of the contradictions of andragogy as theory was that empirical investigation of learning is measured by assessment which is incongruent with ideals of andragogy as part of the learning process.

The question of mutual exclusiveness of andragogy and pedagogy was address by Knowles when he changed the title of his work to view pedagogy and andragogy as a continuum (Knowles et al., 2005a). More recent studies have addressed the notion of pedagogy and andragogy being mutually exclusive as well. Nikolova, Zafirova-Malcheva, and Stefanova (2013) suggested that the use of Game Based Learning (GBL) and storytelling which existed in child education could be transferred to adults while Project-Based Learning (PBL) and Inquiry-Based Learning (IBL) could be transferred from adult education to the education of children. The researchers cited studies that demonstrated the concepts of pedagogy and how they could be transferred to adults through GBL and storytelling as well as how PBL and IBL could transfer andragogical concepts to children.

According to Nikolova et al. (2013), children used virtual worlds and game play to simulate real-life environments and situations. The use of these types of simulations could be used in adult learners for practical training in environments that could be too costly or dangerous to maintain. The use of PBL/IBL with children took advantage of experience that students have with virtual world and simulations. Nikolova, Zafirova-Malcheva, and Stefanova argued that the use of projects and inquiry offers students the

ability to solve problems and discover ideas in a real-world scenario which was similar to their attempts to simulate the real world with games. The shifting of game play to real world stimulated the andragogical concepts in children.

The learning centered environment allowed for the learner to direct the choice of the content, the pace of how the content is used, assessment, and evaluation of their learning. With learners operating at different levels at different times, empirical investigations would be difficult in andragogy.

The roots of SDL stemmed from one of the assumptions from Knowles (1980) and Knowles et al. (2005) view of andragogy which related to the development of self-directedness in adult learning. Knowles' work was influenced and mentored by Cyril Houle in the 1950s whose work was later continued by Alan Tough (Merriam, 2001). Tough and Houle extended the work of adult learning by using the process of interviews with small groups of adults to study continuous learning (Knowles et al., 2005a). Although Houle and Tough's approach to studying adults were similar, they studied from slightly different perspectives (Knowles et al., 2005a).

According to Knowles et al., Houle observed small groups of subjects to understand what was learned and why they learned as continuous learners while Tough was concerned with what was learned and how they learned it. In either case, the emerging theme of their work suggested that the learners took the initiative to control the learning and directed each step in the process from knowing what was to be learned, finding and evaluating the resources to be used, and collaboration with others to facilitate the learning. Adults may have the capacity for SDL because of their experiences, but the depth of the learning, and motivational influences vary because of these experiences

(Merriam & Bierema, 2013). Merriam and Bierema also argued that the collective work of Houle, Knowles, and Tough suggested that SDL is an attribute of an individual with a tendency to take control of their learning and be comfortable with it while at the same time, SDL is a learner- controlled procedure toward gaining knowledge.

According to Brockett and Donaghy (2011), Cyril Houle has been credited for work in SDL although he did not specifically use the term. Brockett and Donaghy argued that Houle was mostly concerned how adult learners could study beyond the environment of high education which would include nontraditional methods. Houle suggested that adults create patters for their learning that develop and change over time. From the concept of SDL being a personal attribute, Houle suggested that individuals could be classified into three groups, goal-oriented, activity-orientated, and learning-oriented (Brockett & Donaghy, 2011; Knowles et al., 2005a).

Goal-oriented learners have specific goals in mind as they learn and may not be continuous in their learning, automatically, but choose to continue their learning as needed. *Activity-oriented* learners must find meaning in the activity of their learning apart from their stated goal. It is the immediacy of their need that initiates their on-going learning process, and they seek to be social in their efforts by remaining in a group or interacting with several groups at the same time. The *learning-oriented* enjoys learning for the sake of learning, is a continuous learner and has been for some time. These learners are social as well and may join various group if only for the pleasure of learning from others.

The learner-controlled procedure concept can be seen in the work of Tough (1978). Tough suggested that adult learners engaged in projects which were described as

purposeful attempts to obtain comprehension and proficiency or to alter some form of behavior and in that process, the learning would be segmented into what he called as *episodes*. Tough characterized the learning individual as an iceberg. Whereas the iceberg described the totality of the learner's educational experience, only the visible portion of the iceberg analogy represented the professionally guided and initiated educational experience. Most the learner's educational experience was the unseen self-initiated projects that the learner initiated and controlled. Tough suggested that adult learners engaged in numerous episodes in their learning process that ranged from guided instruction, group learning, learning without credit, and reading. Tough also suggested that assisting the learner in these episodes to become more competent as they learn could be useful in supporting the adult learner's efforts (Knowles et al., 2005a; Tough, 1978).

Tough categorized the project process into phases. According to Knowles et al. (2005), there were three phases of the project concept suggested by Tough, the deciding phase, the choosing of the planner, and the learner engagement. In the deciding phase, the learner makes all the necessary preparations for the learning including assessing what is needed, searching for information resources such as media and people, and evaluating the cost and time needed for the learning wanted. During the choosing of the planner phase, the learner looks for media, person, group, or program to facilitate the knowledge and instruction that is collaborative. In the choosing, the quality and validity of the resource is important. Also, it is in this phase that the learner maps out the process that will be used. Although these examples of SDL seem to imply that self-direction is an informal process only, away from any formal structure of learning or apart from the confines of the

workplace, it should be noted that self-direction can take place in both formal and informal environments within or outside of the workplace or classroom.

Clardy (2000) addressed the phenomenon of self-directed learning projects (SDLP) in the workplace. According to Clardy, prior research in SDL in the workplace focused on administration and management, but not the non-exempt workers in the company. This type of SDL was called vocational oriented self-directed learning projects (VO SDLP) which described SDL projects that occurred when the worker chooses to learn in order to improve job performance on their current job, gain new skills to move to a better job within the company, or gain new skills in preparation for new employment (Clardy, 2000).

The study used a grounded theory strategy to explore how the formal organizational structured approach of the human resource departments determined how VO SDLP occurred among 56 adult nonexempt employees using a semi-structured interview process (Clardy, 2000; Merriam & Bierema, 2013). The subjects were randomly selected from six organizations in the mid-Atlantic section of the country which included a community bank, a transit department of a state agency, an agriculture products distributor, a hospital, an air condition systems company, and an international research and development firm. The three emerging themes for VO SDLP revealed in the study were induced, voluntary, and synergistic.

Induced VO SDLP (Clardy, 2000) occurred because of an imbalance between the worker and their current job duties due to a new work requirement or a performance standard change or increase. The new skill required to confront the imbalance is not

dictated by management or supervisors, nor are they given any formal instruction, but the worker decided to increase their skill or learn a new skill to meet the need.

Voluntary VO SDLP (Clardy, 2000) occurred when the worker chose to learn a new skill or task without an explicit reason from the employer, or a change in job duties. The worker sought out the learning because of an interest in learning a new skill. Synergistic VO SDLP (Clardy, 2000) emerged as workers were motivated to learn a new skill along with the idea of improving the job performance for themselves or others in the company. As with voluntary VO SDLP, the changes were not mandated by the employer or because of a new job requirement but rather a decision was made just to take on the task.

According to Clardy (2000), acting on the motivation to learn along with seeing a need or opportunity within the workplace must be present for there to be synergistic VO SDLP. Two cases in the study involved working with another employee that either motivated or supported the new idea of the employee. It should be noted in each case of voluntary VO SDLP discussed in the study, the worker sought new learning from observing changes around them or within the organization even though those changes did not demand a new skill from the employer. Clardy seemed to suggest that the workers saw changes that could eventually be mandated or cause the loss of their employment. Although management may dictate much of the process of a worker's action on the job, on some level, the worker has choice on the job which amounts to a level of control even if the choice is inaction (Ajzen & Fishbein, 1969).

Raemdonck et al. (2014) explored the relationships between self-directed learning orientation, job control, job demands, social support, and workplace learning behavior

using quantitative methods to survey 817 workers. The workers ranged between 18 and 65 years of age who had been employed for a minimum of six months. Job demands was defined as the effort, both physical and mental, exerted by the workers on the job daily. Job controlled referred to the amount of pleasure the workers had in their job duties by being able to control some part of the activity such as the pace, and social support measured the amount of support given to the worker by supervisors and other works in their job duties. Self-directed learning orientation in this study measured the intent of the individual to have a positive attitude when learning on the job while workplace learning behavior measured the number of times the worker engaged in learning on the job activities.

It was suggested in Raemdonck et al. (2014) that SDL and job demands had a positive effect on workplace learning. Raemdonck et al argued that self-directed learners exhibited an attitude towards learning on the job for the sake of growing and developing and were pleased by the experience of learning. Although adult learners need to have control of their learning and do not learn in insolation (Merriam & Bierema, 2013), job control and social support were not enough to have a significant effect on workplace learning behavior in the study. It was only when job control and social support were combined with high levels of self-directed learning orientation were there positive effects of workplace learning behavior.

Self-directed learning orientation was significant because of the combination of job control, job demand, and social support exhibiting a significant interaction effect between self-directed learning orientation, social support, job demand, and job control (Raemdonck et al., 2014). This meant that the interaction of the predictor variables

suggested an explanation to the positive effect of self-directed orientation and workplace learning. These results also seem to support Clardy (2000)'s description of synergistic VO SDLP where the motivation to learn on the job must be present along with the opportunity to learn.

Clardy argued that unlike the induced VO SDLP, the need to learn in the workplace is generated simply from the worker's efficacy to learn along with an opportunity to learn. There is no mandate or increased performance task driving the need to learn a new skill. The worker just understands or has the attitude for the adoption of a new skill on the job. In Raemdonck et al. (2014), the opportunity to learn could be considered in the job demand variable because mental and physical requirements on the job could influence a new skill to perform better or with less effort. The overarching theme to SDL is choice regardless of external motivation or internal motivation.

According to the assumptions of andragogy, it is the adult learner's experience that fuels the inquiry, motivation, problem solving, and overall learning which supports SDL learning (Knowles, 1979), but SDL is not automatic and can be affected by new experiences. The greatest strength of andragogy can also be its greatest weakness. Woodilla and Stork (2016) argued that the experience adults acquired learning a skill can become a hindrance or barrier causing adult learners to experience a "learning jolt" when faced with newer learning experiences. Woodilla and Stork explored the concept of the learning jolt using an autoethnography focus about what they experienced when faced with attempts to learn new skills apart from their fields of professional experience. Both discussed frustrations anxieties as they faced new learning challenges from courses that they chose to take.

Both researchers were established professors with an earned Ph.D. and decided to take courses apart from their current positions as academics and become students. Woodilla enrolled in a course on fundamental design while Stork enrolled in an interior design diploma program. Although they made the choice to experience new learning opportunities, both researchers experienced a breakdown in learning the new material because they were required to adopt new methods of learning apart from the methods that had become the foundation for their careers and practice. The new methods of learning were equated to dropping the tools that they had become accustom to as adult learners to develop new tools for the challenges of the new learning. Woodilla and Stork (2016) grounded their study in the conceptual framework of dropping tools based on the work of Weick (2007). Weick studied the phenomenon of forest firefighters who died within several hundred feet of safety zones during a forest fire because they failed to drop their firefighting tools and gear in time which would have enabled them to run faster and arrive at the safety zones avoiding the oncoming fire.

Woodilla and Stork (2016) suggested that the learning jolt derived from the sudden and abrupt realization that established methods for learning and skill development were of no use for what is required for the new learning challenge, thus the learner experiences a breakdown. Anxiety, frustration and emotional imbalance created by the breakdown from new learning challenges had the ability to damage an individual's self-efficacy for performance and learning. This, in turn, caused both Woodilla and Stork to no longer control the planning and evaluation of their learning, thus halting the self-directed process.

According to Woodilla and Stork (2016), their performance self-efficacy was hindered but not their learning self-efficacy. Both researchers had to adopt new strategies of learning to meet the new challenges which caused them to drop their tools of familiar preferences and assumptions about their learning and embrace failure from a new perspective to perform.

Models of Self-Directed Learning

Several researchers have constructed models of SDL over the years which conceptualize the phenomenon from different perspectives (Hiemstra & Brockett, 2012; Song & Hill, 2007). Garrison (1997), Hiemstra and Brockett (2012), and Song and Hill (2007) provided differing perspectives, but each addressed the topics of the personal attributes of the learner, the process of the learner engagement, and the context in which the learner engages with the learning and instructional support. Garrison (1997) argued that many of the views of SDL were focused on the external relationship that learners had with their learning. Garrison argued that SDL was more than an external relationship of choosing what, when, and how to learn, but an internal relationship of setting relevant goals that provide meaning, cognitive strategies, critical thinking, and assessment that learner that needed to consider.

Garrison suggested that there was a comprehensive model that provided a balance between the external and internal procedures for learning and knowledge construction. Garrison's model for comprehension contained three dimensions, self-management, self-monitoring, and motivation.

Garrison (1997) suggested that self-management was part of a formative process of the methods, support, and outcomes of the learning that affected the transactional learning

relationship between the teacher and the learner. This transactional relationship represented the collaboration between the learner and teachers. The learner taking responsibility for the learning and the teachers allowing the learner the freedom to do so.

The teacher readily provides the materials and resources for the learner to choose and the learner is given options on how to use the materials for the learning. The idea of self-management seemed to be paradoxical because the notion of self-management and collaboration (Garrison, 1997). According to Garrison, collaboration defined the context of the learning for the student and is also defined by the skills and competencies of both to perform their roles as teacher and student. Garrison also suggested that learner control through self-management increased the responsibility given to the student for their learning.

Self-monitoring is the balance between the internal and external feedback which is used to assess the current needs of the learning (Garrison, 1997). Garrison also suggested that the student takes responsibility for monitoring what is needed, missing, or adequate for knowledge construction which is crucial because if the teacher is controlling the activities and goals then the teacher controls the student's action toward the learning. Motivation provides the start to pursue SDL and maintains the continuity of the effort. Motivation mediates the relationship between student control of the learning and responsibility for the learning and gives effort its value.

Personal Responsibility Orientation (PRO) Model

The Personal Orientation Model (PRO) of SDL addressed many of the same concepts of Garrison (1997) in how he viewed the person, the process, and the context as well as the internal and external conceptual framework of SDL (Hiemstra, 1994;

Hiemstra & Brockett, 2012). Hiemstra and Brockett highlighted the "personal responsibility" aspect to focus on the learner action of taking ownership of all aspects of the learning including the consequences from those actions (Hiemstra, 1994). Hiemstra and Brockett summarized the concept of person to include individual characteristics such as life experience, critical reflection, motivation, and resilience. Their concept of process was defined as the transaction between teaching and learning included learning skills and style, organizing, evaluating, teaching styles as well as technological skills. Hiemstra and Brockett used the similar concept of environment and sociopolitical climate as Garrison (1997) to describe factors such as sex, race and power as a way of conceptualizing context which defined what the learner has to contend with while engaging in SDL.

Both Hiemstra and Brockett (2012) and Garrison (1997) agreed that the SDL did not exist in a vacuum and that social interaction, whether between the teacher and student or student peers, played a role in knowledge development and management. They also both acknowledged the concept of the internal and external factors of SDL, but Garrison (1997) approached the internal actions of SDL from a deeper perspective of metacognition and criticized Hiemstra and Brockett for not addressing it in that manner (Hiemstra & Brockett, 2012). Garrison's conceptual model delved deeply into the relationship between internal and external factors of SDL which defined the transactional relationship between the teacher and student while Hiemstra and Brockett's model conceptualized SDL as an umbrella as an overarching relationship to the internal and external factors of SDL.

The elements that make up the initial motivation to purse SDL are expectations, attitudes, and belief systems. These elements also similar the basics for the TRA which

define an individual's intent based on their attitude toward performing an action based on beliefs that influence the attitude (Fishbein & Ajzen, 1975b; Madden et al., 1992).

Although Hiemstra and Brockett (2012) acknowledged the use of technological skill as part of the learner's process in SDL and Hiemstra (1994) acknowledged a growing movement to include technology within the International Symposium of Self-Directed Learning conferences, the relationship between SDL and technology had not been deeply addressed. Song and Hill (2007) also addressed personal attributes, processes, and context but through the lens of online learning. Song and Hill argued that the uniqueness of the online environment required special attention to personal attributes, process, and context to a greater degree due to the uncertain nature of the online environment because previous research focused on face-to-face learning environments.

Song and Hill (2007) argued that the uncertainty of the online environment increased the need for students to be self-directed specifically in the area personal attributes and context. Personal attributes included resources, strategies, and motivation and context included planning, monitoring, and evaluating. Song and Hill argued that the resource of text-based online communication between the instructor and the student was an advantage for the personal attributes of the learner because the direct insights and words were continually available for review and reflection for the students.

Because of the asynchronous aspects of online learning, immediate access to the instructor and delayed responses from the instructor and peers could be a challenge. The lack of a physical classroom did not allow for learners to interpret facial expressions and moods of the classroom, thus strategies had to be developed to offset the lack of availability and access to the instructor by setting guidelines. Strategies had to be

developed as well to interpret and communicate views well enough to engage conversation and thought in the absence of being able to interpret physical expressions. Motivation could be a barrier due to procrastination because learners were not confined to the same time and schedule mandates of the physical environment.

Song and Hill (2007) also discussed that open nature of the online environment required greater scrutiny from the learner for critically evaluating resources and how they may be used. Although Garrison (1997) and Hiemstra and Brockett (2012) were seen as only addressing face-to-face learning environments, both models could be applied to the online environment. Both models have suggested that there was personal responsibility on the part of the learner, but Garrison's comprehensive model addressed much deeper metacognitive skill sets that conceptually could be applied to the online environment. Garrison suggested that self-management and self-monitoring were linked although they were discussed in an individual context. According to Garrison, it was the learner's responsibility to develop the strategies to navigate the relationship between the instructor, the materials and the learning.

Issues such as time management, contact and communication with the instructor were a part of the self-management process which did not mean isolation, but rather shaped the conditions to meet the learning goals as negotiated between the learner and instructor (Garrison, 1997). Garrison also argued that self-monitoring required critical review of the materials, process and relationship of the materials for the learning goals because the learner was responsible for constructing meaning from those sources, so the barriers and threats to the learning by unreliable resources would also be a part of the self-monitoring process of his comprehensive model. Motivation to overcome

procrastination would be related the amount of control that the learner has over the learning, the initial learning goals being perceived as meeting the needs of the student, and an expectation that the outcomes can be achieved (Garrison, 1997).

Studies that have used the Personal Responsibility Orientation Self-Direction Learning Scale (PRO SDLS) have found varying degrees of significance to technology integration, attitude, experience, and computer anxiety. Fogerson (2005) examined the correlations between certain readiness factors such as self-direction, online collaborative environment experience, computer-related experience, online course experience, online learning environment confidence, subject matter, and age along with satisfaction with the overall online experience. Fogerson addressed satisfaction related to technical support, instructor interaction, the total learning experience, class participation interactions, and content interactions. The study consisted of 217 graduate and undergraduate participants at the University of Tennessee enrolled in a distance learning course that was offered only online.

The study revealed that computer experience and online environment correlated to online distance learning confidence. There was a small positive correlation between SDL and age related to the whole group of participants, and a small positive relationship between self-direction and the younger participants in the study. There was also a small positive relationship between self-directions and computer experience. Some of the correlations diverged by age. Computer-related experience and online course experience was correlated higher for the older participants as well as online course experience and online distance learning confidence.

Holt and Brockett (2012) explored the relationship between SDL and technology use by examining computer self-efficacy using the PRO SDLS. The study participants were 572 graduating students from a 4-year southeastern university in the United States who responded to a survey distributed through university email. Holt and Brockett want to know the extent SDL was related to factors affecting technology use of graduating students entering the workforce.

Computer anxiety, computer anxiety and attitude toward technology use were used as the factors influencing technology along with gender, age, GPA and major were used were used to measure the relationship to initiative, control, self-efficacy, and motivation which are the factors of the PRO SDLS (Holt & Brockett, 2012). Using a hierarchical multiple regression analysis, Holt and Brockett revealed that self- efficacy, initiative, major, and age were significant predictors of computer self-efficacy and self-efficacy, initiative, motivation, and control were significant predictors of technology use. The study also revealed that initiative, control, self-efficacy, and motivation were significant predictors of computer anxiety. Although the relationship between SDL and technology use was significant, the relationship was weak. Holt and Brockett also acknowledged that the CTUS instrument used had low reliability for measuring technology attitude.

Beard (2016) investigated SDL and technology integration confidence using the PRO SDLS and the Technology Integration Confidence Scale (TICS). The participants for the study included 102 preservice teachers from a large university in the southeastern United States. Previous studies on SDL and technology integration confidence had been conducted on classroom teachers actively working in the field. This study examined

preservice teachers who had been accepted into the licensure program and were enrolled into two of the programs' core courses.

One of the core courses included technology integration into the curriculum. Beard wanted to know if there was a relationship between SDL and technology integration confidence and if SDL predicts technology integration confidence. A quantitative approach using Pearson correlation and hierarchical multiple regression was used to investigate the relationship and revealed that there was a significant relationship between SDL and technology integration confidence and that SDL predicts technology integration confidence.

Informal Learning

To explore the relationship between SDL among K-12 principals informal learning should be addressed. Informal learning is a type of learning that takes place outside of the confines and structure of a classroom and can take place anywhere (Marsick & Watkins, 1999, 2015). Informal learning is a form of SDL that exist outside of the confines of the formal classroom structure. Marsick and Watkins also introduced the concept of incidental learning which takes place at any time within or outside of the formal classroom structure unconscious to the learner. Incidental learning develops and is seen as a consequence of an interaction, relationship, or error.

Marsick and Watkins (2015) suggested that incidental and informal learning occurred on a continuum and that the growing level of awareness from the learner is the causation of the shift from being unaware that the learning has occurred to an understanding that learning has occurred. Both incidental and informal learning emerge

within a normal interaction in a particular space that is not formal, but just how the learner perceives the learning can make the difference.

Informal Workplace Learning

Marsick and Volpe (1999) advanced informal learning aimed at the workplace to address the shifts in employee job performance and training. The rigid structure and predictability had given way to uncertainty and loss of knowledge capital due to globalization, downsizing, and the reorganization of companies. This altered the structure of knowledge among leaders who were no longer were the ones that employees relied upon for answers because the managers did no longer had the answers (Marsick & Volpe, 1999). This loss of knowledge equity pushed companies to focus on learning instead of just training. Training was episodic and required that the time of the employee be taken away from production to learn a specific task while learning, on the other hand, was a continual process that could take place in and around production engaging with other employees giving the employees the tools and skills to adapt to the changes and uncertainty more efficiently.

According to Marsick and Volpe (1999), the downsizing of employees as well as changes from technology may initiate a jolt which brings about an awareness and reflection. The awareness and reflection pushed the employees to view available opportunities in the organization differently which leads to informal learning. Marsick and Volpe also suggested that organizations must provide space for informal learning as well as space for experimentation in order to see the benefits of informal learning even though informal learning may not lead to an expected or fixed conclusion. Informal

learning also affects the social structure within organization because the collaborative space energizes the learning and affects the social structure in many ways.

Marsick, Volpe, and Watkins (1999) discussed how informal learning related to the four frameworks used to study organizations by Bolman and Deal when the organizations were subjected to conflicts and reorganization due to downsizing. In each framework, informal learning became the method to re-establish their perceived social role in the organization rather than learn new skills or increase productivity. When supported by the organization, informal learning in the workplace provides the employee an environment to advance knowledge and skills to adjust to the unpredictability of the workplace increasing the organization's value (Noe, Tews, & Marand, 2013). Noe, Tews and Marand also argue that regardless of how the managers accept or understand how informal learning can benefit the organization, informal learning depends on how the individual learner chooses to work with others, seek new knowledge, and use reflection to assess progress because the learner makes the choice based the most pressing need.

Learning Technology with Self-Directed and Informal Learning

Boyer et al. (2013) explored SDL and technology using case studies to understand three specific concepts, using technology to learn technology, facilitating and promoting learning, and using technology for scaffolding to aid the self-directed process. The study approached SDL and technology in the areas of the workplace, higher education and daily life. According to Boyer et al., adults have increasingly been confronted with the use of technology on the job and in daily life. It has become impractical to attempt to completely learn a new technology application or device due to the rapid innovation of technology. Instead, users should adopt a method of learning that supports a general

overview of the technology to support the continuous and expanding offerings of technology (Boyer et al., 2013), thus SDL offers users this ability by allow them to learn at their own pace according to their schedule. Boyer et al. (2013) also argued that SDL are not automatically ready for technology use and adoption, but rather the technology should be effortless and usable along with the motivation to learn the technology which also supports the constructs of the UTAUT (Venkatesh et al., 2003) as well.

The study examined cases in everyday life, business, and higher education. In the case example for higher education, SDL was identified with the industrial engineering students from the University of South Florida Polytechnic Ergonomics class. As a means of using SDL suggested by the instructor, the students entered an ergonomics design student competition as part of a senior project. The competition required the students to study the ergonomics of musical instruments and the ergonomic risk they entail. The students compiled a matrix based on the risk of using these instruments over time, and were required to research the instruments, learn the software to analyze and justify their findings. The students felt overwhelmed by the project, but reported that they learned from the experience (Boyer et al., 2013).

Although the project in this study was considered to SDL, the students did not actually seek out the learning and the materials. This case failed to exemplify true SDL because so much of the learning and outcomes were predetermined by either the instructors who were seeking something to use as a senior project or the judges of the competition. The fact that the students did not control the learning supports Garrison (1997) concept of self-management where the students increasingly take control of the learning shifting it away from the instructor. Ideally, having the students come up with

the project and controlling more of what was learned and the assessments for the learning would be a better example.

Ranvar (2015) used quantitative methods to measure the relationship between SDL and the parameters affecting adult education which included performance, assessment, motivation, anxiety, and academic engagement. Using a stratified sample by gender, 214 employees of an Insurance Company attending specialized courses. Ranvar wanted to predict SDL readiness from judicial and executive thinking styles to develop better training opportunities for employees.

Ranvar argued that determining an employee's readiness for SDL determined what type, level and method of training is needed for individuals, thus organizations could plan training accordingly and not waste time and resources. The study revealed that between executive and judicial thinking styles, the readiness for SDL and subscales, a positive and significant relationship existed. The multiple regression analysis also revealed that thinking styles predicted SDL although judicial thinking styles is the only thinking style to predict the SDL.

Bullock (2013) explored how participants in a teacher education program undertake SDL to use digital technologies for use in the classroom as part of the curriculum. Thirty-three secondary teacher education candidates were selected to have their course work examined using the self-study of teacher education practices (S-STEP) methodology. This methodology uses a mixed method approach to the research to gain a better understanding of student learning experiences. The students were required to purchase a laptop as part of the curriculum requirements which came with several software programs installed. Bullock's arguments suggesting that attempting to learn all

aspects of software technology is not feasible due to the time constraints and constant shifts in the field of technology aligned with that of Boyer et al. (2013) who argued a similar concept of SDL and adults .

Teacher candidates should learn with the technology as well as learning from the technology (Bullock, 2013). The candidates were also given a choice of the digital technology to learn and develop a SDL plan for learning the technology, execute the plan created and produce a two-minute digital presentation of their experience with the technology (Bullock, 2013). The candidates also kept a journal of their experience learning to use the technology and Bullock kept a journal as well. Two candidates were highlighted in the study with one choosing a SMART interactive whiteboard and the other choosing a Photostory as a plan. According to Bullock (2013), the concepts of self-management, self-monitoring and motivation from Garrison (1997) emerged in the journals of the participants. The candidate using Photostory as their learning project described how various methods were used to meet the projected goal including prior knowledge of PowerPoint, seeking out resource information from peer-reviewed journals, professors, and the software help menu.

All of the candidates revealed that their overall self-monitoring skills were lacking and that implementation goals should have been set. Their reflections revealed that there were considerable gaps in prior knowledge of the technology that they assumed they understood. All candidates discussed issues with keeping their motivation during the process due to external pressures such as available time to spend actually using the technology.

Rashid and Asghar (2016) studied the intersection of SDL, student engagement and academic performance using a quantitative approach in a higher education setting. Previous research has provided data on either the role of student engagement in the classroom or student engagement with technology, but there has not been much research on the interrelation of both (Rashid & Asghar, 2016). Rashid and Asghar also reported that the studies on the benefits of technology integration have been mixed and offer no clear suggestion to the advantages or disadvantages of technology and academic performance that there is a lack of empirical studies on the relationship between SDL and technology. The researchers surveyed 761 female students from a private university in Saudi Arabia using an online survey instrument to measure the interrelationship between technology use, SDL and academic performance.

The researchers reported that there were positive correlations between technology use and engagement, self-direction and engagement, and self-direction and achievement. They also reported that technology was a significant predictor of engagement, SDL and academic performance despite there being a negative effect on academic performance in their path analysis. Although the study was conducted using multiple regressions while investigating interrelationships, there were no mentions of moderation or mediation analysis to test for interactions or mediating effect between the variables which may have explained the negative correlation between technology and academic performance. The medical field has also embraced SDL in its process to educated medical students.

Because of the rate of advancements of medical technology, medical knowledge along with the need to maintain accreditation, schools of medicine have been forced to acknowledge that medical students must be continuous and self-directed learners in order

to meet the demands of accreditation and standards using the new technologies (Boyer et al., 2013). SDL has been embraced in the medical field in the form of innovative curriculum models that rely on SDL and student choice to address students whose educational experience has only been through lecture-style models of learning. Within the business field, organizations such as multinational energy companies have benefitted from SDL as it is blended with the advantages of social media and collaboration. Where companies once relied on the CD, DVD and other physical media for job training, companies have embraced the use of the web, virtual learning environments (VLE), mobile devices, and mobile learning to engage in their e-learning efforts to give the employees choice of time and place when and how they learn (Boyer et al., 2013). Boyer et al. also described how the availability of choice has given way to increased collaboration between employees through discussion portals and blogs where employees shared ideas and professional knowledge to solve problems within organization.

Informal Learning in the Workplace with Technology

Without the restricts of a classroom, informal learning along with Web 2.0 technology offers a rich collaborative experience for employees. Because of the collaborative nature of Web 2.0 technologies such as blogs and wikis as well as social networking sites such as Facebook and LinkedIn, Web2.0 technology provides an optimal environment for informal learning in the workplace. Zhao and Kemp (2012) discussed the advantages of using Web 2.0 and social networks in the workplace and how the platform of social networking aspect of informal learning in the workplace allows for employees to gain and maintain knowledge about the job and share their findings. Exploration into new areas of productivity and problem solving are also an advantage by

the creation of communities of practice (Zhao & Kemp, 2012). Zhao and Kemp also suggest the organization make space and encourage social media use within the organization and develop long-term strategies to maintain its use.

Ab Rashid, Yahaya, Rahman, and Yunus (2016) used an ethnographic approach to explore 22 Malaysian English language teachers who posted teacher-related information to their Facebook timelines. Between December 2012 and May 2013, the teachers submitted 178 teacher-related post which generated 1226 comments over the six-month period. According to Ab Rashid et al., 105 of the status updates were primarily the sharing and seeking of teacher knowledge while three status updates were about general teacher information. Content knowledge, knowledge of curriculum, general pedagogical knowledge, knowledge of learning and knowledge of educational context were the emerging themes from the status updates which the teachers preferred to use rather than face to face (Ab Rashid et al., 2016).

Gu (2016) investigated the relationship between mobile Web. 2.0 and informal workplace learning and how SDL is supported. Gu used multiple case studies consisting of five employees from companies in China which consisted of an accountant, human resource specialist, technical sales representative, computer engineer, and a magazine editor. None of the participants were acquainted. The subjects were interviewed about their current environment for learning in the workplace, their goals and issues for developing their careers which was important due to opportunities from international business endeavors of their companies. The researcher customized an app called Moblearn@Work based on their responses and logged their use of the RSS reader, podcasting, web searching, and microblogging.

The participants used the apps to further their skills in the workplace mainly to access information through the RSS reader and to improve their language skills through the podcasting apps. There was generous use of the web searching, but very little use of the microblogging. Gu (2016) believed that the lack of microblogging use was due to each of the participants lack familiarity with each other despite many having similar goals and experience with the technology and data collections showing their activity in their personal microblogs.

Summary

The UTAUT (Venkatesh et al., 2003) consist of eight models that have been widely used in measuring the adoption of technology by individuals and organizations. The models used to create the UTAUT were the TRA, TPB, TAM, IDT, MM, C-TPB-TAM, MPCU, and SCT. The purpose for combining the models was to measure usage based on user intention as a predictor. From the combination of the other eight models, Venkatesh et al. suggested that the following constructs were a result of their study.

The call for educational technology leadership has been in the forefront of the increased technology implementations in the classroom. Although a number of empirical studies such as Levin and Schrum (2013); McLeod et al., (2015); Sauers et al. (2014) have called for a deeper investigation into educational technology leadership and scholarship, calls for standards for educational technology leaders have been made as early as Kearsley (1988) calling for the inclusion of core competencies such as the appropriateness of applications for schools, how leaders select hardware and software, how leaders implement plans, and for the personal use of computers by administrators. Other studies such as Bozeman and Spuck (1991) highlighted the use of data systems by

administrators to make informed decisions about the educational needs of the students and for managing the functions of the organization more efficiently. Calls for educational leaders to implement system-wide integration of technology was a constant theme as well using vision setting, understanding systemic thinking, relevant and on-going professional development for teachers, and collaboration with various stakeholders and partners in the community.

Scholarship for educational technology leadership is lacking as well. Over a nine-year period between 2000 and 2009, only 10 peer-reviewed journals articles were found between a total of 25 academic journals for educational leadership and between 1997 and 2009, roughly 12.5 % of the topics covered at 3 of the leading professional conferences discussed educational technology leadership in the sessions (McLeod & Richardson, 2011). This lack of attention to research has created a weak theoretical base to inform leadership practices for educational technology. Unlike pedagogy, which addresses how children learn, andragogy relates to how adults learn.

Much of the work of adult learning can be contributed to Matthew Knowles who sought to make a distinction between learning for children and that of adults. The attention of learning was directed toward children starting in the seventh century due to the education of children in religious schools, and the ideas of andragogy surfaced in Europe after World War I (Knowles et al., 2005a). Knowles was convinced that the learning for children was not the same for adult, in part, because of the relative experiences that children had compared to that of adults (Knowles, 1979; Knowles et al., 2005a).

Knowles' work was not without critics. Despite the amount of work and adoption of andragogy, the field yet lacked an empirical base in the eyes of some researchers and in the field of nursing, some were concerned that the swift adoption of andragogy at the expensive of pedagogical practices was without a true scientific foundation (Darbyshire, 1993).

SDL emerged from Knowles' assumption about andragogy which was influenced by the works of Cyril Houle and Alan Tough. According to Knowles et al. (2005), both Houle and Tough were interested in what adults learned in their studies, but Houle was interested with why they learned and Tough was interested in how they learned. Houle classified self-directed learners into three groups, activity-oriented, goal-oriented, and learning-oriented and Tough suggested that adult learners engage in projects that they segmented into episodes which are numerous over a lifetime (Knowles et al., 2005a; Tough, 1978).

Clardy (2000) advanced the phenomenon of the learning project through a study that qualitatively examined nonexempt employees and how they addressed SDL in the workplace called vocational-oriented self-directed learning projects (VO SDLP). Technology supports SDL by providing the user the ability to learn technology with technology and scaffold the learning to support SDL (Boyer et al., 2013). The internet, mobile and web application as well as virtual learning environments (VLE) can provide the adult learner the ability to learn at their own pace, in their specific space of time with collaboration. Technology supports the adult learner by being able to adapt to the needs and demands of the user as the need arises. Technology also offers that adult learner the immediate feedback to make continued choices for what is needed for learning and

evaluate the progress through formative and summative assessments. Business, education and schools of medicine are some of the significant promoters and recipients of SDL (Boyer et al., 2013; Gu, 2016; Rashid & Asghar, 2016).

SDL affords adult learners the freedom to choose their learning and the management of their learning (Garrison, 1997; Hiemstra & Brockett, 2012). Self-directed models such as Garrison (1997)'s comprehensive model of self-direction addresses both the external methods of managing the learning and the internal metacognitive aspect of SDL. Like Garrison, Hiemstra and Brockett (2012)'s PRO SDL model acknowledges the role of personal respsonsibility for the learning exhibited by adults. Although SDL provides avenue for expanding knowledge, informal and incidental learning offers more expansive avenues and even more potential for learners. Informal learning offers the learner the opportunity to direct their learning outside of the confines of the classroom and incidental learning provides learning within in any context, but organizations must be willing to allow space for learners to collaborate and generate new knowledge (Marsick et al., 1999; Marsick, Watkins, Callahan, & Volpe, 2006; Marsick, Watkins, Scully-Russ, & Nicolaides, 2017; Marsick & Watkins, 2001).

What is currently known about SDL and technology adoption among K-12 principals is that calls for educational technology leadership have been made as early as 1988 and continuing into the decade of 1990 despite the limited proliferation of technology in schools and in the classroom. Calls suggest that leaders be trained not only in using the technology for themselves but to be effective in student achievement, discipline, management of resources, professional development, system-wide adoption, and connecting with the community (Bozeman & Raucher, 1991; Collis & Moonen,

1994; Kearsley, 1988). Since then, calls from the field of educational leadership and educational technology leadership have emphasized even more the importance of sound educational technology leadership, but insisting that the needs of technology leadership in K-12 education in the 21st century causes leaders to work simultaneously on all requirements and maintain this balance for effectiveness (Levin & Schrum, 2013; McLeod et al., 2015; Richardson, 2013; Sauers et al., 2014; Sincar, 2013).

The government set new standards for educational technology leadership that included more effective use of technology by leaders who were expected to learn and demonstrate use alongside teachers (U.S. Department of Education Office of Educational Technology, 2016). What is also known is that educational technology leadership training is not mandatory in all programs, is not required for licensure, and varies in depth and availability (Kruse & Buckmiller, 2015; McLeod et al., 2011; McLeod & Richardson, 2013; Richardson, 2013; Yu & Prince, 2017). Educational technology leadership empirical studies are lacking as well. The topic of leadership in educational technology is sparse in the major journals and even less, are the number of peer-reviewed articles along with the number of discussion and presentations on topics involving educational technology leadership at major professional conferences (McLeod & Richardson, 2011).

It is also known that despite the lack of significant leadership preparation in graduate schools, and a lack of strong theoretical base for technology leadership in K-12 schools, leaders have been recognized for their successful leadership on various levels and types of schools across the country (Levin & Schrum, 2013; McLeod et al., 2015). What is not known is how leaders adopted technology to provide the necessary leadership in their schools for effective leadership and what role, if any, does SDL play in the

adoption of the technology. What is also not known is if SDL predicts technology adoption.

The study of technology adoption by K-12 principals will attempt to fill the gap in leader preparation and training. Leadership training curriculum has addressed the concepts of leadership and management, but not effectively only to marginalize use of technology by K-12 principals and the benefits to organization. Although leadership training has been addressed in research, there has been little to no evidence of leadership development programs addressing adult learning concepts or SDL in the preparation of the curriculum. The plan of this study was to measure the relationship, if any, between SDL and technology adoption by K-12 principals.

By addressing SDL and informal concepts with technology adoption, this study may extend knowledge in curriculum development beyond the 20th century models of face to face classes and current e-learning models. It may be instrumental in developing models for informal learning with technology bringing it more in line with the student focused, highly collaborative and personalized model that is needed to address student achievement in the 21st century (McLeod et al., 2011).

This study measured the relationship between the constructs of the UTAUT which measures adoption and what effect SDL has on technology adoption. Because the gap in the research addresses a relationship, a methodology will be used to test for the existence of the relationship and measure the strength of the possible relationship between the UTAUT and SDL which will be covered in Chapter 3.

Chapter 3: Research Method

Introductions

As stated in Chapter 1, my purpose in this study was to examine the relationship between SDL and technology adoption by K-12 principals. Using a quantitative methods approach, I used the PRO SDLS and the UTAUT to collect data from K-12 principals to measure SDL and their level of technology adoption of G-Suite.

By understanding this possible relationship, methods for professional development for both preservice and existing principals may be created to support technology leadership to be more responsive to the needs and changes of the modern student-centered classroom. In this chapter, I explain the methodology, variables, the choice of the research design as related to the research questions, population, sampling and sampling procedures, instruments, collection of data, and procedure for analysis.

Research Design and Rationale

I used a quantitative research design. The use of the quantitative research design supports the research questions by investigating the relationship between the variables of SDL and the adoption of technology. The independent variables I used in this study were the components of SDL, which are initiative, motivation, self-efficacy, and control and the constructs of the UTAUT which are PE, EE, SI, and FC. I included the moderating variables of sex, age, experience, and voluntariness of use as independent variables as well. The dependent variable was behavioral intention. It is not known how K-12 principals are adopting technology for leadership because of the various methods that principals have available to them which includes graduate leadership programs, K-12

professional development, conferences, and collaborating with peers (McLeod et al., 2015).

Studies such as those by McLeod et al. (2015) have been qualitative in nature which sought to understand why and how principals adopted technology, which may have implied self-direction and adult learning principles but have not specifically argued that a relationship between SDL and technology adoption exist. The purpose for using a quantitative research design was to investigate any pattern of relationship that may exist between the variables (Frankfort- Nachmias & Nachmias, 2008a). Because I conducted the study in the K-12 environment, time constraints were a factor. Few, if any, public school operate year-round, so the availability of the subjects was constrained to the normal academic school year. Within the school, the attention to holidays and annual testing was also considered for having access to subjects' time and availability.

Methodology

Population

The population that I addressed in this study was principals in K-12 schools in Arkansas. The population that I selected for this study offered a diverse enough membership to resemble other populations of rural and urban school districts at the national level. Arkansas is largely a rural state with a majority of small and medium-sized districts and a smaller population of larger urban school districts along the border. The sampling unit of K-12 principals was finite and introduced several variables such as age and sex, which I addressed in the UTAUT framework due to their relationship as moderating variables (Venkatesh et al., 2003).

Sampling and Sampling Procedure

The Arkansas Department of Education (ADE) provided the sampling frame (Frankfort- Nachmias & Nachmias, 2008c) by providing a publicly accessible database of all of the schools in the state, which includes demographic information. The state database offered contact information including emails of all K-12 administrators, which I downloaded into a spreadsheet, and the database offered enrollment numbers that I used to determine which schools to be sampled using a stratified random sampling strategy.

The schools in Arkansas are majority small and medium sized districts scattered throughout the state with a small number of large districts, a representative sample using simple randomization was not adequate because a sample of this type is not likely to measure the true population. Therefore, I used a stratified sampling procedure. Stratified sampling allowed for the grouping of a population using a common likeness to get a more even distribution of samples that could not be obtained by sampling the population as a whole (Frankfort- Nachmias & Nachmias, 2008c). The strata that was used was small, medium and large sized districts based on average daily attendance (ADA). The first strata were small school districts with an ADA of 0 to 3,000 students. The second strata were medium-sized districts with an ADA between 3,001 and 9,000 students, and the third strata were large school districts with an ADA between 9,001 and 25,000 students. I selected random samples from each stratum based on the proportion of each strata to the population. Using GPower 3.1 software (Faul, Erdfelder, Buchner, & Lang, 2009) and a priori power analysis of .80, a sample size of 131 was required for the detection of a medium effect size of .15.

The technology measured for adoption was G Suite for Education (Google, 2017). G Suite, formerly known as Google Apps for Education, a web 2.0-based, collaborate environment that allows users to communicate with email, create, share and manipulate documents without the need for software installed on the computer. Although G-suite consist of several applications, the applications are integrated allowing users to move from application to application or easily combine applications. G-suite is free for educational institutions and allows for the management of the Chromebook laptop computer that is paired with the service to provide a complete technology ecosystem. K-12 educational systems have adopted this system world-wide because of its lower cost and ease of management including administrators (Railean, 2012). There is a large presence of G Suite for Education in Arkansas in both small and larger school districts. This level of availability serves as the best technology platform to answer the research questions concerning technology adoption and SDL.

Data Collection

Letters were sent to Dr. Venkatesh at the University of Arkansas in Fayetteville (Appendix A), and Dr. Susan Stockdale at Kennesaw State University in Georgia (Appendix B), and Dr. Ralph Brockett at the University of Tennessee at Knoxville (Appendix C) for permission to use their survey instruments for this research study. Permission was granted by Dr. Venkatesh and Dr. Stockdale. Permission was also granted by MIS Quarterly (Appendix I) to publish charts and figures from Venkatesh et al. (2003). Following IRB approval, letters were sent to district superintendents (Appendix D) from the randomly selected groups of the strata to inform them that principals would be contacted, and data collected. The emails contained all of the

necessary information as required by the IRB to obtain informed consent (Appendix J) with an opportunity for the superintendents to opt out.

I sent an email informing the principals that superintendents have been notified that principals would be contacted (Appendix F). I included the necessary information about the study, what the study entailed, how their involvement will aid the study, the potential outcomes and their choice to participate in the email. The participants had seven days to respond. After seven days, I sent a follow up email (Appendix G) as a reminder about the study, and additional seven days was given if there was no response (Appendix H). Survey Monkey (Survey Monkey, 2015) was used to collect the data for the survey instrument. An option to participate was presented to the principals in an email that will give them the choice to participate with informed consent (Appendix J). They were informed that their participation was strictly voluntary, and that they had the right to decline participation at any point before, during or after taking the survey prior to submitting their survey results. If they decided to participate, they were taken to the survey. To address privacy and security concerns, prospective respondents were informed that survey data was transmitted through an SSL connection for security and anonymous settings were used so that IP address data was not collected and collected data files will be stored on a secure network drive.

Survey Instruments

Questionnaires were constructed using validated items from the previous research of the UTAUT (Venkatesh et al., 2003) modified for use in K-12 environment, and the PRO SDLS (Stockdale & Brockett, 2011) to measure SDL. In the preliminary research of Venkatesh et al. measuring the constructs of PE, EE, SI, and FC in four separate

organizations introducing new technology to employees, the UTAUT has shown to have an internal consistency of the constructs of .70 or greater. Sundaravej (2003) measured the constructs of the UTAUT in a different setting of 262 undergraduate business administration students and revealed that the validity of the constructs for PE (.90), EE (.92), and behavioral intent (.96) were higher with a different set of subjects which suggested that the model generalized significantly across populations and settings.

Stockdale and Brockett (2011) developed the PRO SDLS framework to address how users make the decision to take control or take responsibility for their learning and growth by surveying 518 undergraduate educational psychology students from a southeastern university using a convenience sample. Although this was an undergraduate course, the course was required by all seeking teacher certification, thus the participants included traditional undergraduate students and adult graduates seeking teacher certification (Stockdale & Brockett, 2011). The PRO SDLS uses 25-items to measure learner self-direction using four components that addressed initiative, motivation, self-efficacy, and control. The PRO SDLS has shown to have a validity coefficient of .91 with each of the constructs measuring as follows motivation (.82), control (.78), initiative (.81), and self-efficacy (.78) (Stockdale & Brockett, 2011).

The PRO SDLS directly addresses the research question of principals taking control of the learning to adopt technology for leadership. The PRO in the PRO SDSL model refers to “personal responsibility orientation” which addresses the responsibility of the learners select and manage their learning. Hiemstra and Brockett (2012), Stockdale and Brockett (2011) regarded the concept of personal responsibility as an overarching

construct of the SDL concept that manages and directs the learning, assessment and reflection process.

Operationalization

The dependent variable I used in this study was behavioral intent (BI). BI is a direct determinant of use (Venkatesh et al., 2003) and SDL is the independent variable. BI and SDL was measured using the survey instruments consisting of 5-point Likert scales. The UTAUT was measured with using a 5-point Likert scale to assess the constructs of PE, EE, SI, FC, BI, age, sex, experience and voluntariness of use. I used a regression strategy to address the research question of relationship between adoption and SDL.

A regression analysis allows for the investigation of a relationship that may influence or predict the relationship as a whole (Warner, 2013). SDL was measured with four components of initiative, control, motivation, and self-efficacy. Along with a composite score for SDL, each sub-component was to be measured against BI for significance. The components of SDL were also to be measured against PE, EE, SI and FC along with the moderating variables of age, gender, experience and voluntariness of use. Because PE, EE, SI, and FC are direct determinants of BI (Venkatesh et al., 2003), a multiple regression would have been used to assess the possible effect that SDL will have on the constructs and the dependent variable of BI. There was also the possibility that a relationship did not exist between SDL and BI, but there could be significance relationships between the individual constructs and moderating variables of UTAUT and the components of SDL. Therefore, a Pearson correlation was used to examine the roles of the UTAUT variables and the PRO SDLS variables in lieu of the low sample size.

Data Analysis

The software used for data analysis was SPSS statistical software (International Business Machines, 2017). The output from Survey Monkey was reviewed for missing or incomplete data. Once the dataset was imported into SPSS, the data validation tools will be used to check for missing data or data from the surveys that is not complete.

Research question 1: What is the relationship between self-directed learning and technology adoption by K12 principals?

H_o- There is not a significant relationship between SDL and technology adoption by K12 principals.

H_1- There is a significant relationship between SDL and technology adoption by K12 principals.

Research question 2: What is the relationship between the UTAUT constructs of PE, EE, SI, FC, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control?

H_o2- There is no significant relationship between the UTAUT constructs of PE, EE, SI, FC, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control.

H_A2- There is a significant relationship between the UTAUT constructs of PE, EE, SI, FC, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control.

The statistical test that I conducted to address each research questions was also analyzed for linearity, homoscedasticity, and residuals. I did not run a check for multicollinearity to see if the model met the required assumptions for multiple regression.

I did not run a standard multiple regression to test the relationship between the independent and dependent variables and provide information concerning the strength of the relationships and the predictive power of the independent variables. Due to low sample size, a multiple regression was not used instead I used a linear regression. I used a Pearson correlation to produce a correlation matrix to examine the relationship between the components of the PRO SDLS scale of initiative, motivation, self-efficacy, control and PE, EE, SI and FC. The moderating variables of sex, age, experience, and voluntariness were included. The results were to determine the statistical significance of the overall model, the correlation of the independent and dependent variables and the interpretation correlations matrix of the variables of the UTAUT and the PRO SDLS.

Threats to Validity

The threats to external validity were sample size and sample validity. An inadequate sample size affects the power of the analysis to detect effect size of the relationship, and the sample validity is affected by an inadequate sampling of the population which affects the measuring instrument (Frankfort- Nachmias & Nachmias, 2008b). I used a stratified sample strategy to address the threat of an inadequate sampling of the population. The threat to sample size produced by a low number of respondents to the survey instrument. To address this threat, I made multiple attempts to prospective participants to encourage their response and reassurances of anonymity and security. The timing of the surveys was important as well. Based upon IRB approval, I attempted to avoid surveys overlapping with the holiday season and end of the year. This was necessary to avoid low responses on surveys.

Another significant threat to validity was the selection of the predictor variables and multicollinearity. Multicollinearity exist when predictors are so highly or perfectly correlated that no distinction can be made between the amount of variance between the variables and the outcome variable (Warner, 2013). I did not run a test of multicollinearity. If multicollinearity had been found to exist, I would drop variables to get a clearer analysis of the variables and relationships.

The other threats to internal validity included the meeting of certain assumptions for a standard regression and Pearson correlation such as linearity, homoscedasticity, and outliers. When any of these assumptions were not met, I made adjustments to the analysis or other test were considered.

Summary

In this chapter, I discussed the research design and rationale in support of quantitative methods for exploring the relationship of SDL and technology adoption by K-12 principals. I acquired a stratified sample of K-12 principals in Arkansas who use G Suite for Education from the population of principals in Arkansas. The stratified sample consisted of Arkansas school districts grouped by ADA of students proportioned to the number of schools within each group.

I used a quantitative method to measure for the possible relationship that may exist between the independent variable of SDL and BI using the PRO SDLS survey instrument and the UTAUT survey instrument. There is an additional research question addressing the existence of a relationship between the individual constructs and moderating variables of the UTAUT and the components of the PRO-SDL scale.

Using SPSS software, I analyzed the data using a linear regression and correlation analysis to identify and measure the possible relationships between the variables. The threats to validity in the study were sample size, sample validity, linearity, homoscedasticity, and outliers. In chapter 4, I will discuss the outcomes of the data collection procedures, and changes or discrepancies, and how they were addressed. In the remainder of the chapter, I will discuss the data analysis, findings, tables, and figures.

Chapter 4: Results

Introduction

My purpose in this study was to investigate the relationship between technology adoption and self-directed learning by K-12 principals using G-Suite for Education. The research questions and hypotheses were as follows:

Research Question 1: What is the relationship between SDL and technology adoption by K12 principals?

H_0: There is not a significant relationship between SDL and technology adoption by K12 principals.

H_{A1}: There is a significant relationship between SDL and technology adoption by K12 principals.

Research Question 2: What is the relationship between the UTAUT constructs of PE, EE, SI, FC, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control?

H_{02}: There is no significant relationship between the UTAUT constructs of PE, EE, SI, FC, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control.

H_{A2}: There is a significant relationship between the UTAUT constructs of PE, EE, SI, FC, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control.

This chapter includes the data collection procedures including the data collection timeframe, recruitment, response rates, data discrepancies, demographic characteristics

and the representation of the sample population. Following the data collection procedures, I will provide a report on the results of the data collection process.

Data Collection

The population for the study were the K-12 principals in the state of Arkansas. The Arkansas Department of Education provided contact information for all superintendents and principals in the state to the public on the department's website as Excel files. I selected the district and superintendent information by stratifying the districts by size based on average daily attendance and placed into separate sheet in an Excel workbook. I used separate sheets for each stratum. The worksheet included a column that identified the school district as well as the name of the schools' principals and school districts' superintendents.

Using the RAND and sort function in Excel, I randomized the rows containing the principals. I selected 250 principals from the small district list, 59 principals from the medium-sized list, and I selected 19 principals from large school districts. Because the Department of Education made the contact information available publicly, I notified superintendents by email that principals would receive an invitation to participate in the study. I explained the information about the study to the principals in the email and invited them by email to participate in the survey, and I provided a copy of the informed consent as an attachment and a link in the email to the survey constructed in Survey Monkey. I again presented the informed consent to the principals at the beginning of the survey, and if they agreed to the consent form, the program took them to the survey. If the principal chose not to participate, there was a link that exited them from the survey thanking them for their consideration. Only one superintendent responded to specifically

decline that principals in the district not participate. During the initial 4-week period, I received a total of eight completed responses into Survey Monkey from a total of 328 invitations, which was response rate of 2.4%.

After consulting with my committee, a request change form was submitted to the Walden IRB to request that additional invitation be sent to more principals with an initial invitation and two reminder emails sent 7 days apart. After receiving approval from Walden IRB to invite more principals, I sent two additional rounds of invitations. The invitation included 284 principals randomly selected from a list of small district principals, 97 principals randomly selected from medium-sized school districts, and 88 principals from large-sized districts. After running a match function in Excel on the names to make sure previous principals were not selected, I sent additional email invitations, yielding an additional 16 responses. I sent the final invitations to 86 small-sized school principals, 39 medium-sized school principals, and 57 large-sized school principals yielding a total of 50 responses submitted. The survey included a section of questions related to the UTAUT and a section of questions related to the PRO SDLS. Ten of the submissions were blank which left 40 responses. Of the 40 responses, 34 included responses to the UTAUT and the PRO SDLS instruments in the survey due to 6 of the 40 submissions only responding to the UTAUT instrument questions in the survey. A sample size of 131 was required for the detection of a medium effect size of .15. A sample size of 40 participants was actually acquired. The response rate of the second round was 6.9%.

Descriptive and Demographic Information

A total of 50 responses were submitted with 10 (20%) of the responses missing due to participants just selecting submit without answering any questions leaving a total of (n = 40) responses. The descriptive statistics for gender (Table 1) were (M = 1.53, Mdn = 2.00, SD = .506). Gender was coded as 1 = male and 2 = female. Ages ranged from 30 to 63 years (M = 48.75, Mdn = 48.00, SD = 7.246). Of the 40 responses, 21 (52.5%) were female and 19 (47.5%) were male (Table 2). The sample is representative of the population in that the participants were randomly selected. I used a stratified method was used to select participants from small, medium, and large-sized school districts. I did not collect the size of the districts as a survey response.

Table 1

Demographics (n = 40)

Variable	Minimum	Maximum	*M*	*Mdn*	*SD*	Skewness
Gender	1	2	1.53	2.00	.506	-.104
Age	30	63	48.75	48.00	7.246	-.008

Table 2

Percentages

Gender	*f*	%	Cum %
Female	21	52.5	52.5
Male	19	47.5	100
Total	40	100	

Descriptives of Instruments

Two instruments were used in the survey. Technology adoption was measured by the UTAUT (Venkatesh et al., 2003) and SDL was measured with the PRO -SDLS

(Stockdale & Brockett, 2011). The UTAUT instrument measured the variables of PE, EE, SI, FC, BI, age, gender, experience, and voluntariness. The PRO-SDLS provided an overall score of self-directed learning and the individual factors of initiative, control, self-efficacy, and motivation. The survey used a Likert scale of 1 to 5 for responses of *strongly disagree*, *disagree*, *sometimes*, *agree*, and *strongly agree*.

Missing Response by Instruments

Out of the 40 participants that responded to the survey, only 34 participants responded to both the UTAUT and PRO SDLS instrument questions. Six of the 40 participants only responded to the UTAUT instrument questions.

UTAUT Descriptives

The descriptive results for UTAUT constructs were PE (M = 3.73, SD = .695) responses ranged from a minimum value of 2.00 and a maximum value of 5.00. EE (M =3.89, SD = .617) responses ranged from a minimum value of 2.25 and a maximum value of 5.00. SI (M = 3.30, SD = .834) responses ranged from a minimum value of 1.00 to a maximum value of 5.00. FC (M = 3.46, SD = .576) responses ranged from a minimum value of 1.00 to a maximum value of 4.00. BI (M = 4.19, SD = .857) responses ranged from a minimum value of 1.00 to a maximum value of 5.00. Experience (M = 2.73, SD = .716) responses ranged from a minimum value of 1 to a maximum value of 4. Voluntariness (M = 1.18, SD .3.85) responses ranged from a minimum of 1 to a maximum value of 2.

Skewness and kurtosis measures how much empirical frequencies differ from the normal distribution (Warner, 2013). The results from the UTAUT descriptives analysis (Table 3) revealed that BI was negatively skewed (-1.66, SE = .374), and FC was strongly

negatively skewed (-2.33, *SE* = .374) while Voluntariness was positively skewed (1.78, *SE* = .374).

Table 3

UTAUT Descriptives (n = 40)

Variable	Minimum	Maximum	*M*	*SD*	Skewness
Performance expectancy	2	5	3.73	.695	-.125
Effort expectancy	2.25	5	3.89	.617	-.192
Social influence	1	5	3.30	.834	-.471
Facilitating conditions	1	4	3.46	.576	-2.332
Behavioral intent	1	5	4.19	.857	-1.663
Gender	1	2	1.53	.506	-.104
Age	30	63	48.75	7.246	-.008
Experience	1	4	2.73	.716	.023
Voluntariness	1	2	1.18	.385	1.778

PRO SDLS Descriptives

The results for the PRO SDLS survey instrument were Initiative (*M* = 19.53, *SD* = 2.53), Control (*M* = 20.73, *SD* = 3.11), Self-efficacy (*M* = 23.15, *SD* = 3.06), Motivation (*M* = 25.38, *SD* = 2.41). The overall score of self-directed learning was identified as SDL (*M* = 88.79, *SD* = 9.06). The values of initiative, control, self-efficacy, motivation and self-directed learning did show any abnormal skewness in their values.

Table 4

PRO-SDLS Descriptives (n = 34)

Variable	Minimum	Maximum	*M*	*SD*	Skewness
Initiative	14	23	19.53	2.53	-.546
Control	14	28	20.74	3.11	.269
Self-Efficacy	17	29	23.15	3.06	-.188
Motivation	21	31	25.38	2.41	.029
SDL	73	107	88.79	9.06	.146

Research Question 1

What is the relationship between SDL and technology adoption by K12 principals?

H_o- There is not a significant relationship between SDL and technology adoption by K12 principals.

H_{A1}- There is a significant relationship between SDL and technology adoption by K12 principals.

Assumptions

The assumption requirements for a regression analysis are as follows: continuous independent and dependent variables, a linear relationship between independent and dependent variables, independence of observations, no significant outliers, homoscedasticity, and normally distributed residuals.

Normality. The residuals of the dependent variable of behavioral intent was not normally distributed due to a Shapiro-Wilk statistic (Table 5) being statistically significant p = .00., and a negative skewness value (Table 3) of -.1.66, SE = .374,

kurtosis of 4.74, SE = .79. The independent variable of SDL was normally distributed with a skewness of .146, SE = .403, kurtosis of -.297, SE = .788 with a p value that was not statistically significant p = .200.

Table 5

Test of Normality

	Shapiro-Wilk		
Variable	Statistic	*df*	Sig.
Behavioral intent	0.726	34	.000
Self-directed learning	0.969	34	.430

Linearity. Using a scatterplot of behavioral intent versus self-directed learning, a linear relationship did not exist between the variables. (Figure 2.)

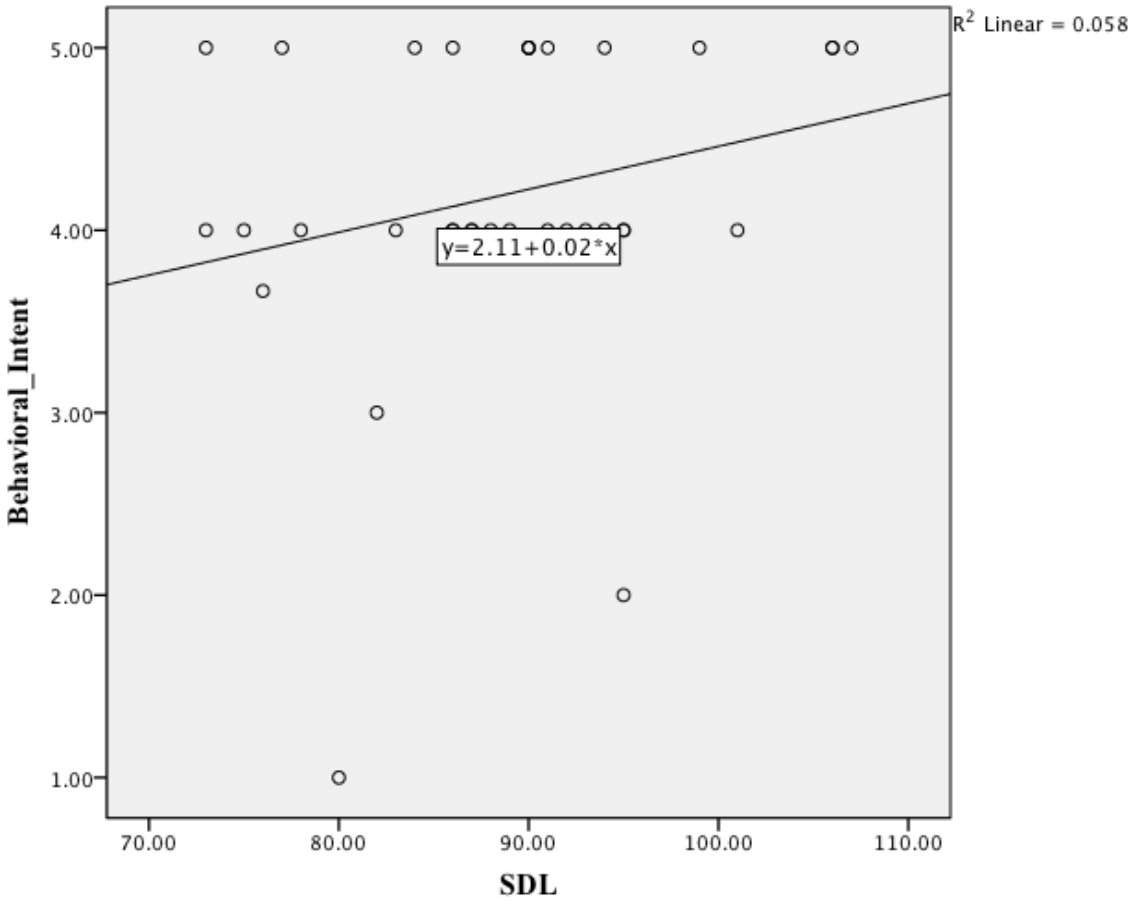

Figure 2. Scatterplot of linearity.

Outliers. To test for outliers, a chi-square distribution with the same degrees of freedom was compared to the Mahalanobis variable created from the analysis. The chi-square distribution probability statistic did not reveal any outliers. The minimum value of the probability statistic was $p = .044$, $p < .001$.

Table 6

Probability Statistic (n = 34)

Statistic	Minimum	Maximum	*M*
Chi-Square Probability Statistic	.044	.982	.515

Note: $p < .001$

Homoscedasticity. A visual analysis of a plot assessing standardized residuals compared to standardized predicted values (Figure 3) did not indicate homoscedasticity.

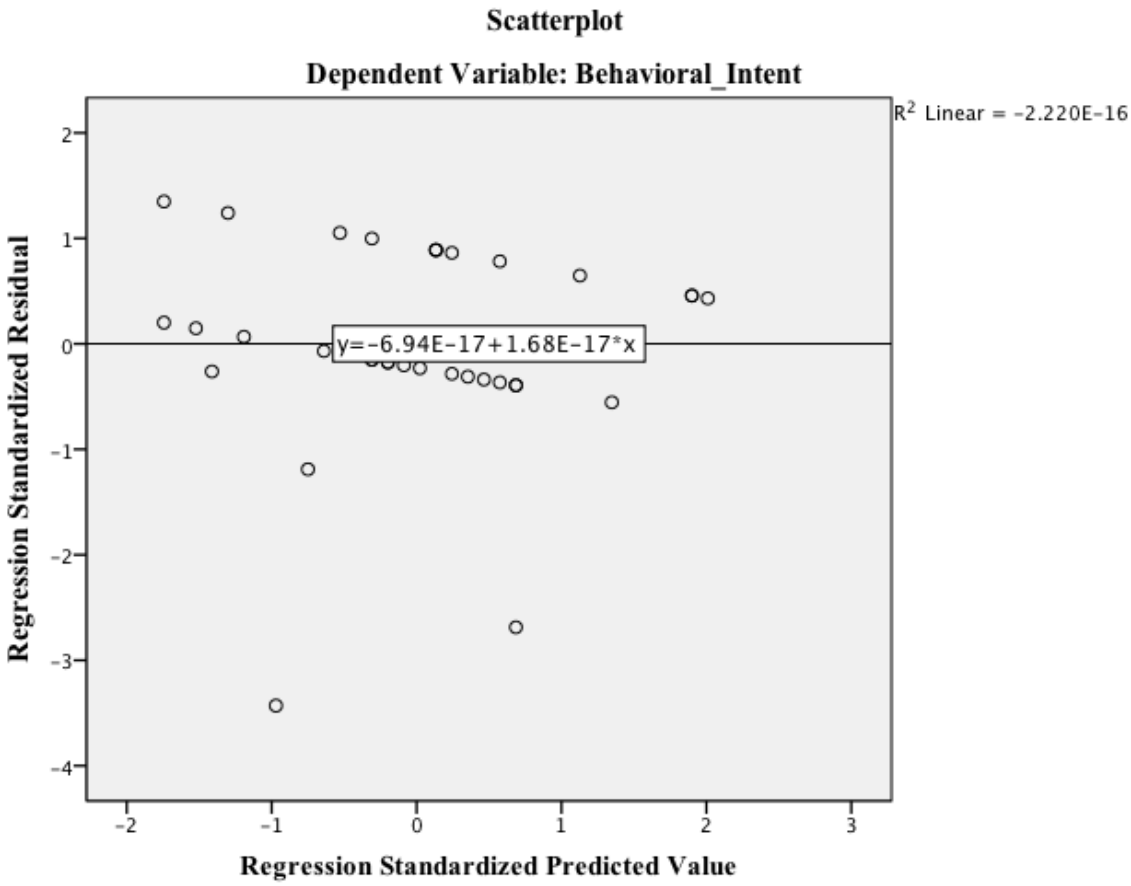

Figure 3. Homoscedasticity

Residuals. A visual analysis of a normal probability plot revealed that residuals were also not normally distributed (Figure 4).

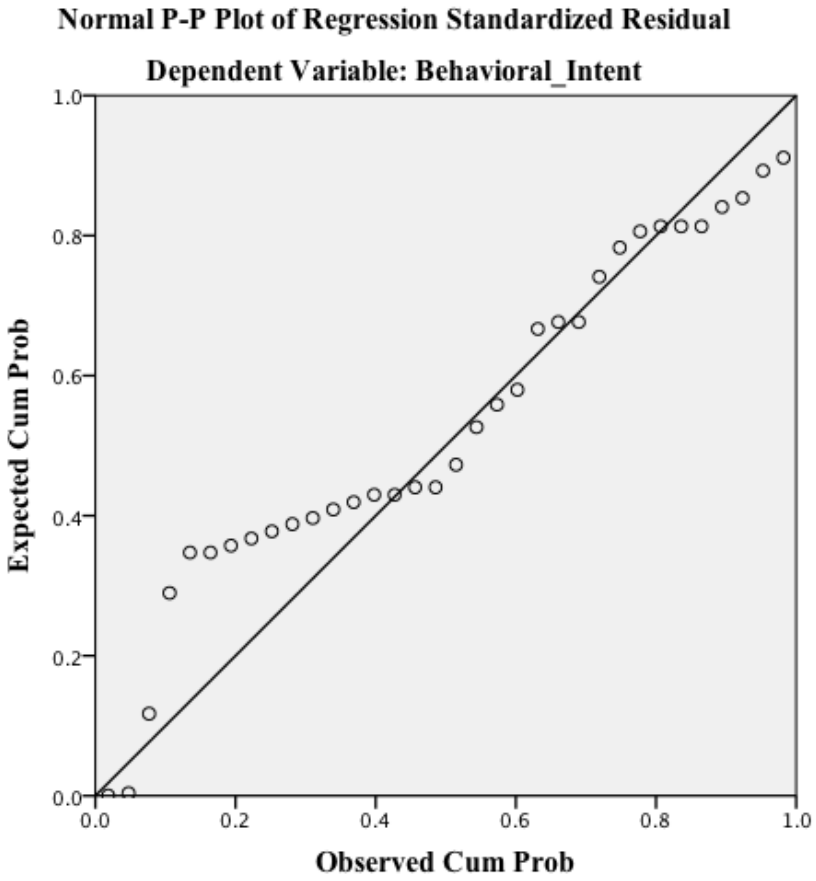

Figure 4. Normal p-p plot

Due to a lack of assumptions being met for a parametric regression analysis, the non-parametric Spearman rank order correlation was conducted to answer the research question. The assumptions for the Spearman Correlation were as follows;

- Assumption 1- Both variables of behavioral intent and self-directed learning are ordinal.
- Assumption 2- There are paired observations for both variables (n = 34).
- Assumption 3- There is a monotonic relationship between the two variables of behavioral intent and self-directed learning.

A Spearman's rank order correlation was used to determine if a relationship existed between the dependent variable of BI and SDL. An analysis of the scatter plot revealed a monotonic relationship between the two continuous variables (Figure 5). There was small positive relationship between BI and SDL, $r_s(32) = .249$, $p = .155$. There was not a statistically significant relationship between BI and SDL, therefore, the null hypothesis was not rejected.

Table 7

Spearman Rank Order Correlations

Variable	*n*	SDL
Behavioral Intent (BI)	40	0.249
Self-directed learning (SDL)	34	--

Monotonic Relationship.

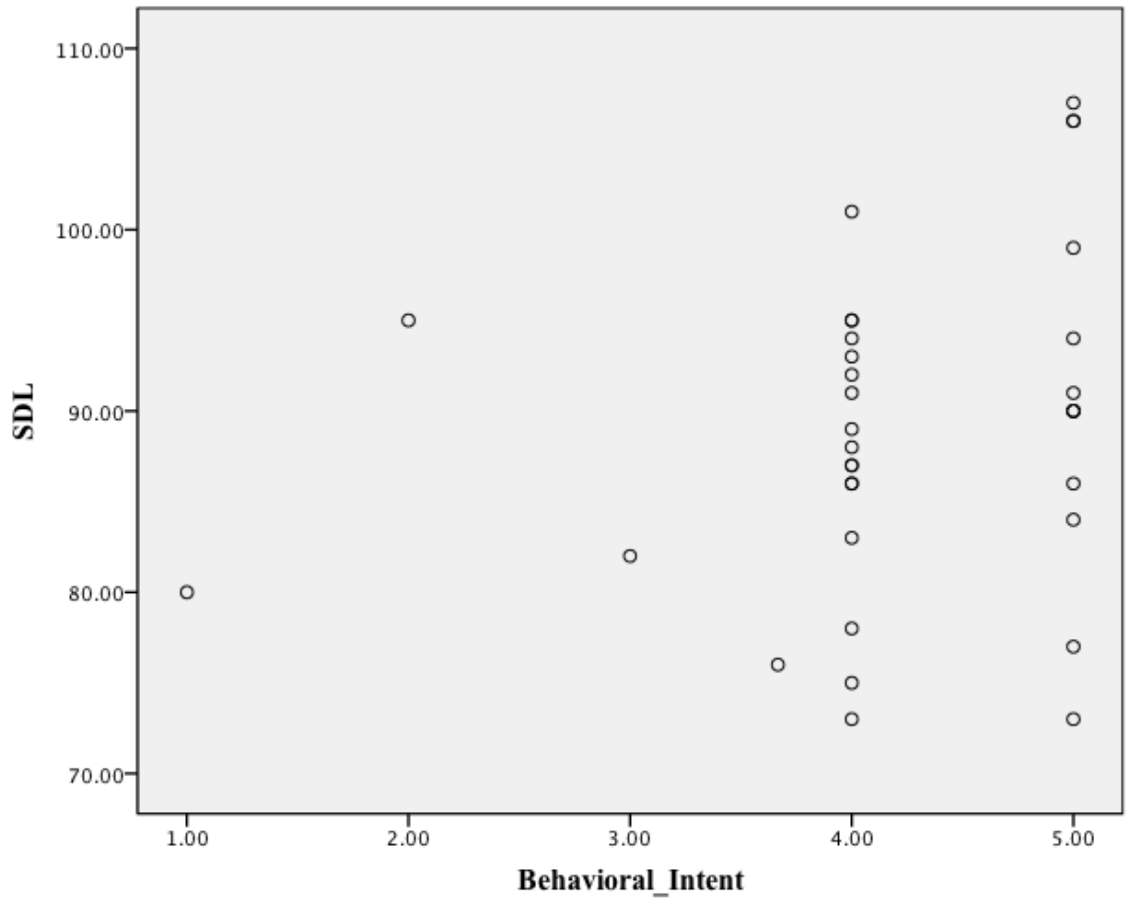

Figure 5. Scatterplot for monotonic relationship

Regression

Although the variable BI lacked normality, the variable SDL was normally distributed. The lack of normality does not automatically disqualify a model from being analyzed. The lack of heteroscedasticity, the presence of outliers and the lack of linearity within the residuals have a greater effect of reducing the strength of the analysis than making the analysis invalid (Tabachnick & Fidell, 2013).

Analysis

The ANOVA, $F(1, 32) = 1.97$, $p = .170$ was not statistically significant $p < .03$. There was small positive correlation between behavioral intent and self-directed learning ($r = .241$, $p = .09$) that was not statistically significant $p < .03$. The null hypothesis was not rejected.

Table 8

ANOVA

	Sum of Squares	*df*	Mean Square	F
Regression	1.50	1	1.50	1.97
Residual	24.31	32	.76	
Total	25.80	33		

Table 9

Correlation of Behavioral Intent and Self-directed learning (n = 34)

	SDL	*M*	*SD*
Behavioral intent (BI)	.241	4.20	.88
Self- directed learning (SDL)	--	88.79	9.06

Research Question 2

What is the relationship between the UTAUT constructs of PE, EE, SI, FC, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control?

H_o2- There is no significant relationship between the UTAUT constructs of PE, EE, SI, FC, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control.

H_A2- There is a significant relationship between the UTAUT constructs of PE, EE, SI, FC, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control.

Pearson Correlation

The Pearson product moment correlation or Pearson *r*, a measurement of the strength and direction of linear continuous variables (Laerd Statistics, 2017; Warner, 2013) was used to measure the possible relationship between UTAUT constructs of PE, EE, SI, FC, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control. Correlation analysis is sensitive to extreme outliers, and this can be compounded by small sample sizes (Warner, 2013). Warner argues the small sample sizes have an effect of the Pearson correlation coefficient's ability to discern any differences that may exist between the various correlations due to a lack of power. According to G*Power (Buchner, Erdfelder, Faul, & Lang, 2013), a sample size of 84 is needed to detect a medium effect size of .3 with a power level of .80 with an alpha of .05.

Assumptions

- The scores of X and Y should be normally distributed and quantitative in nature.
- The values of X and Y should be linear.
- There should be a bivariate distribution between the variables of X and Y.

Normality Test. The variables of facilitating conditions, gender, experience, and voluntariness were not normally distributed as indicated by a significant Shapiro-Wilk test value of p <=.004. Initiative was significant with a value of p = .023. EE was

significant, p = .052.

Table 10

Test of Normality of Variables

	Shapiro-Wilk		
	Statistic	*df*	Sig.
Performance Expectancy	.963	34	.302
Effort Expectancy	.937	34	.052
Social Influence	.978	34	.723
Facilitating Conditions	.735	34	.000
Gender	.638	34	.000
Age	.963	34	.301
Experience	.827	34	.000
Voluntariness	.464	34	.000
Initiative	.926	34	.023
Control	.965	34	.328
Self-Efficacy	.963	34	.291
Motivation	.955	34	.178

Transformed Variables.

Table 11

Normality of Test of Transformed Variables

	Shapiro-Wilk		
	Statistic	*df*	Sig.
Performance expectancy	.963	34	.302
Effort expectancy	.937	34	.052
Social influence	.978	34	.723
Facilitating	.938	34	.054
Age	.963	34	.301
Experience	.821	34	.000
Voluntariness	.464	34	.000
Gender	.638	34	.000
Control	.965	34	.328
Self- efficacy	.963	34	.291
Motivation	.955	34	.178
Initiative	.948	34	.108

When a lack of normality exist among variables due to negative or positive skewness and kurtosis, transformation is suggested to alleviate normality issues and bring the variables to a level that does not inhibit the accuracy analysis (Tabachnick & Fidell, 2013; Warner, 2013). FC and voluntariness were the variables that were the most skewed. FC had a negative skewness of -2.33, and voluntariness had a positive skewness of 1.78. An attempt to transform FC and voluntariness resulted in a lower negative skewness of -.135, but voluntariness remained the same with the positive skewness of 1.78. FC remained significant, $p = .026$, and voluntariness, $p <= .004$. The only transformed variable used was FC.

Table 12

Transformed Variables Descriptives (n = 40)

Variable	Skewness	*SE*	Kurtosis	*SE*
Facilitating conditions	-.135	.374	-.397	.733
Voluntariness	1.778	.374	1.22	.733

Table 13

Transformed Variable Test of Normality

	Shapiro-Wilk		
	Statistic	*df*	Sig.
Facilitating Conditions	.936	40	.026
Voluntariness	.462	40	.000

Linearity. A visual inspection of the scatterplot matrix of PE, EE, SI, FC, age, control, self-efficacy, motivation, and initiative suggest that the relationships between the variables was linear. Visual inspection of the variables gender and voluntariness did not suggest a linear relationship. (Figure K1).

Outliers. Using SPSS, the Mahalanobis distance value was used to determine if outliers existed. Mahalanobis distance is a chi-square variable which also uses with the number of independent variables as degrees of freedom (Tabachnick & Fidell, 2013). Using SPSS, the Probability value was calculated using a chi-square distribution probability statistic from the Mahalanobis distance variable s to determine if outliers existed at the p = .001 level. In Table 14, a range of the probability values were displayed demonstrating that none of the probability values were below the $p = .001$ level. The closest value being $p = .029$

Table 14

Probability Statistic (n = 34)

Variable	Minimum	Maximum
Probability	.0290	.9962

Correlation Results

The results of the Pearson correlation conducted to examine the relationship between the constructs of the UTAUT, PE, EE, SI, FC, age, gender, experience, and voluntariness and the factors of the PRO- SDLS, motivation, control, initiative, self-efficacy, are presented (Figure R1). Between the variables of the UTAUT and the variable of the PRO-SDLS, there were strong positive and medium correlations but no small correlations with only one medium negative correlation (Table L2).

Strong Correlations

There were strong positive correlations (Table L2) between PE and EE $r(38) = .77$, $p = .001$, EE and initiative $r(32) = .73$, $p = .001$, motivation and self-efficacy $r(32) = .64$, $p = .001$, PE and SI $r(38) = .62$, $p = .001$, motivation and control $r(32) = .61$, $p = .001$, initiative and PE $r(32) = .59$, $p = .001$, SI and EE $r(38) = .58$, $p = .001$, self-efficacy and control $r(32) = .57$, $p = .001$, experience and EE $r(38) = .57$, $p = .001$, control and EE $r(32) = .55$, $p = .001$, control and SI $r(32) = .53$, $p = .001$, FC and PE $r(38) = .50$, $p = .001$.

Moderate Correlations

There were moderate positive correlations (Table L2) between facilitating conditions and effort expectancy $r(38) = .48$, $p = .001$, FC and SI $r(38) = .48$, $p = .001$, initiative and experience $r(32) = .48$, $p = .001$, self-efficacy and experience $r(32) = .48$, p

= .001, motivation and experience $r(32) = .48$, $p = .001$, experience and PE $r(38) = .44$, $p = .001$, initiative and FC $r(32) = .44$, $p = .001$, motivation and EE r(32) = .42, $p = .05$, motivation and gender $r(32) = .42$, $p = .05$, experience and FC r(32) = .39, $p = .05$, self-efficacy and initiative r(32) = .39, $p = .05$, control and PE $r(32) = .39$, $p = .05$, motivation and experience $r(32) = .38$, $p = .05$, self-efficacy and gender $r(32) = .36$, $p = .05$. There was one moderate negative correlation between experience and age $r(32) = -.40$, $p = .001$, and there were no small correlations that were statistically significant. There were no statistically significant correlations between the UTAUT variable of voluntariness or the other UTAUT or PRO-SDLS variables.

Summary

In summary, the analysis of RQ1 of whether a significant relationship existed between behavioral intent and self-directed learning, a linear regression and Spearman correlation was used to analyze the possible relationship due to a smaller than expected sample size for a multiple regression and differing violations of assumptions. In both analyses, the null hypothesis was retained. The linear regression revealed that there was a small positive relationship that was not statistically significant between the variables of behavioral intent and self-directed learning. The Spearman correlation revealed that there was small positive relationship between behavioral intent and self-directed learning that was not statistically significant.

The analysis of RQ2 of whether a relationship existed between the between the constructs of the UTAUT, PE, EE, SI, FC, age, gender, experience, and voluntariness and the factors of SDL, initiative, control, motivation, and self-efficacy revealed strong and

moderate positive relationships that were statistically significant at the $p = .001$ and $p = .05$ levels.

PE and EE $r(38) = .77$, $p = .001$, EE and initiative $r(32) = .73$, $p = .001$, motivation and self-efficacy $r(32) = .64$, $p = .001$, PE and SI $r(38) = .62$, $p = .001$, motivation and control $r(32) = .61$, $p = .001$, initiative and PE $r(32) = .59$, $p = .001$, SI and EE $r(38) = .58$, $p = .001$, self-efficacy and control $r(32) = .57$, $p = .001$, experience and EE $r(38) = .57$, $p = .001$, control and EE r(32) = .55, $p = .001$, control and SI $r(32) = .53$, $p = .001$, FC and PE $r(38) = .50$, $p = .001$ suggested strong positive correlations.

FC and EE $r(38) = .48$, $p = .001$, FC and SI $r(38) = .48$, $p = .001$, initiative and experience $r(32) = .48$, $p = .001$, self-efficacy and experience $r(32) = .48$, $p = .001$, motivation and experience $r(32) = .48$, $p = .001$, experience and PE $r(38) = .44$, $p = .001$, initiative and FC $r(32) = .44$, $p = .001$, motivation and EE r(32) = .42, $p = .05$, motivation and gender $r(32) = .42$, $p = .05$, experience and FC r(32) = .39, $p = .05$, self-efficacy and initiative r(32) = .39, $p = .05$, control and PE $r(32) = .39$, $p = .05$, motivation and experience $r(32) = .38$, $p = .05$, self-efficacy and gender $r(32) = .36$, $p = .05$ suggested moderate positive correlations. Experience and age $r(32) = -.40$, $p = .001$ suggested the only negative correlation which was moderate. There were no small positive or negative correlations that were statistically significant. The UTAUT variable of voluntariness was the only variable that did not correlate significantly between either of the UTAUT or PRO-SDLS variables.

The next chapter will describe and interpret the findings from this chapter in relation to the literature that supports the theoretical framework and topics that were being analyzed. Also, the limitations and generalizability will be discussed and the

relation to the findings and the initial proposal. Finally, recommendations will be made to further the research of this topic and the implications for social change.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

My purpose in this study was to investigate the possible relationship between technology adoption and SDL of K-12 principals in the state of Arkansas. I used instruments such as the UTAUT to measure technology adoption and the PRO SDLS to measure SDL. To investigate this relationship, I used a quantitative research strategy to measure the effect of the independent variable of SDL on the dependent variable of technology adoption. I also investigated the relationship between the constructs of the UTAUT and the factors of the PRO-SDLS.

The results from this study would add to the current literature addressing the phenomenon of educational technology leadership in response to the rapid changes of technology use in the classroom, teacher professional development with technology, student achievement, and the concerns of stakeholders. The results from this study would provide insight on how professional development could be constructed to support new educational leaders entering the field of educational leadership and the requirements for leadership licensure. There is a limited amount of empirical research to support and inform practice for new educational leaders and the need for educational technology leadership for licensure.

Interpretation of Findings

To investigate the relationships between technology adoption and SDL, I planned a multiple regression as the strategy not only to measure the strength of a relationship but also measure the predictability of numerous independent variable's relationship to the dependent variable while controlling for and accounting for the variance in each predictor

variable (Frankfort- Nachmias & Nachmias, 2008b; Green & Salkind, 2014; Warner, 2013). The use of a multiple regression would have allowed for the standard regression and hierarchal models to be used for analysis. A sample size of 131 participants was needed for the multiple regression analysis, but a sample size of 40 participants was actually collected. The smaller sample size reduced the amount of power needed to detect a statistically significant medium effect size for the study. According to Tabachnick and Fidell (2013) and Warner (2013), an $N = 106$ is the minimum amount of cases necessary for multiple regression of only two predictor variables and should be greater to compensate for adverse normality issue or outliers. I had 13 predictor variables. The low sample size presented issues in the use of multiple regressions and correlation analysis. Knudson and Lindsey (2014) argued that small sample sizes in correlational design comparing multiple variables often reveal statistically significant correlations due to chance as well as a significant number of Type II errors. Therefore, the results should be taken with caution due to the likelihood that these results are inflated to due spurious correlations (Haig, 2003).

Research Question 1

What is the relationship between self-directed learning and technology adoption by K12 principals?

$H_0$1- There is not a significant relationship between self-directed learning and technology adoption by K-12 principals.

H_A1- There is a significant relationship between self-directed learning and technology adoption by K-12 principals.

Although the variable of self-directed learning displayed normality (Table 5), the variables of behavioral intent did not even after attempts to transform the variable. I measured the lack of normality with the Shapiro-Wilk test (Table 5) due to the small sample size rather than just with the visual inspection of the histogram because larger sample sizes are more robust to small changes in normality than smaller sample sizes (Tabachnick & Fidell, 2013). Despite the lack of normality, linearity of residuals and homoscedasticity, a linear regression was used to answer the research question as well as with a Spearman correlation analysis. The lack of these assumption in parametric analysis diminishes the ability of the analysis to fully detect the relationships between the variables due to a lack of power rather than invalidating the analysis (Tabachnick & Fidell, 2013), but the small sample size was a factor in the reduction of the power analysis as well.

The Spearman correlation (Table 7) and the regression analysis (Table 8) revealed similar outcomes for the Spearman (r_s = 2.49, p = .15) and a Pearson (r = .241, p = .09) for the regression of small effect sizes in which neither was statistically significant. A small positive effect size between self-directed learning and technology was revealed in Holt and Brockett (2012) where a weak but significant relationship was revealed between SDL and attitude toward technology use. Attitude toward a specific behavior using technology is at the foundation of the TRA and TPB (Ajzen, 1985, 1991a; Fishbein & Ajzen, 1975a; Montano & Kasprzyk, 2008) which make up the UTAUT (Venkatesh et al., 2003) and is a strong determinant of behavioral intent which leads to use. Holt and Brockett (2012) had 572 participants in their study while I had 40. More participants may

have had a similar effect in this due to small effect sizes require large samples to detect minute effect sizes (Tabachnick & Fidell, 2013; Warner, 2013).

Research Question 2

What is the relationship between the constructs of the UTAUT performance expectancy, effort expectancy, social influence, facilitating conditions, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control?

$H_0$2- There is no significant relationship between the constructs of the UTAUT performance expectancy, effort expectancy, social influence, facilitating conditions, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control.

H_A2- There is a significant relationship between the constructs of the UTAUT performance expectancy, effort expectancy, social influence, facilitating conditions, age, gender, experience, and voluntariness of use and the subcomponents of the PRO-SDLS, motivation, efficacy, initiative, and control.

The constructs of the UTAUT in this study refer to the use of G Suite for Education by the K-12 principals are:

1. Performance Expectancy (PE)- The belief that G Suite will help them perform their expected job.
2. Effort Expectancy (EE)- The belief that G Suite will have a certain level of ease of use when using it.
3. Social Influence (SI)- The belief that there is an expectation from superiors to use the G Suite.

4. Facilitating Conditions (FC)- The belief that there is adequate technical and organizational support to use G Suite.

Moderators

The moderators of age and gender are self-explanatory.

1. Experience- The amount of experience a user has with G Suite for Education.
2. Voluntariness- Whether the use of G Suite is mandated within the organization.

UTAUT correlations

The strongest correlation among the UTAUT variables was with PE and EE (r = .77, p = .001), PE and SI (r = .62, p = .001), PE and FC (r = .50, p = .001). This is consistent with the literature that PE is the strongest predictors of technology use, and that EE, SI and FC are also predictors of technology use, thus a relationship existed between these variables (Ssekibaamu, 2015; Šumak et al., 2017; Venkatesh et al., 2003). Strong positive correlations between PE, EE, FC were consistent with Moore (2012) and Ssekibaamu (2015) and strong correlations between PE, EE, SI, and FC were consistent with Ssekibaamu (2015).

There were also strong correlations between EE and SI and FC and SI were consistent with Ssekibaamu (2015). Based on the literature, the findings suggest that a correlation may exist between principals' belief that G Suite will help them perform their job, their belief that G Suite is easy to use, their belief that their superiors expect them to use G Suite, and their belief that there is adequate support in the organization to use G Suite.

Venkatesh et al. (2003) argued that experience and the other moderators were essential parts of the UTAUT and were shown to moderate the relationship of EE, SI and FC. Although experience is considered a moderating variable, it was present across all of the four constructs except SI. There was a moderate positive correlation between PE and experience (r = .44, p = .001), a strong positive correlation between EE and the moderating variable of experience (r = .57, p = .001), and a small positive correlation between FC and experience (r = .39, p = .05). Experience was also shown to interact with EE and FC in Workman (2014).

Although interaction does not necessarily mean correlation, Thompson et al. (1994) argued that experience had a direct as well as a moderating effect on technology use. Taylor and Todd (1995a) suggested less experience users relied on the ease of use of the technology because they lacked experience to fully understand the technology. Ease of use is part of the TAM that developed into EE in the UTAUT. There was a moderate negative correlation between age and experience (r = -.40, p = .001). The mean value for experience level was 2.73 (Table 3) which was coded as *basic* which suggest that as age increased the experience level decreased. Based on the arguments of Thompson et al. (1994) and Taylor and Todd (1995a), these findings suggest that a possible correlation exist between age and experience in using G Suite. In other words, older principals' belief that G Suite is easier to use and that they may compensate for their lack of experience with the technology.

PRO SDLS Correlations

The factors of the PRO SDLS are initiative, control, self-efficacy, and motivation (Stockdale & Brockett, 2011):

1. Initiative- The proactive steps taken by principals to make decisions or plans to learn or use G Suite (Holt & Brockett, 2012; Knowles, 1979).
2. Control- The readiness and facility for principals to manger their learning of G Suite (Holt & Brockett, 2012) .
3. Self- Efficacy- Grounded in Bandura's (1977) Social Learning Theory concept, the faculty for principals to believe in their power to create an expected outcome for using G Suite (Holt & Brockett, 2012).
4. Motivation- The internal and external desire for action towards a decision to use G Suite (Deci & Ryan, 1975; Deci et al., 1991; Holt & Brockett, 2012)

There were strong positive correlations between initiative and control ($r = .61$, $p = .001$), control and motivation ($r = .61$, $p = .001$), control and self-efficacy ($r = .57$, $p = .001$), and self-efficacy and motivation ($r = .64$, $p = .001$). There was a moderate positive correlation between initiative and self- efficacy ($r = .39$, $p = .05$). These were not consistent with Beard (2016) where there were moderate positive correlations between initiative and control ($r = .48$, $p = .001$) and control and motivation ($r = .47$, $p = .001$), but were consistent with the strong positive correlations in Beard (2016). The results from Beard's findings revealed correlations between control and self-efficacy ($r = .76$, $p < .01$), self-efficacy and motivation ($r = .59$, $p < .01$) and a moderate positive correlation between initiative and self-efficacy ($r = .46$, $p < .01$). A strong positive correlation between self-efficacy and control was also seen in the study conducted by Holt and Brockett (2012).

The variable of initiative was the one variable that was present across all of the UTAUT constructs. PE and initiative ($r = .59$, $p = .001$), EE and initiative ($r = .73$, $p = .001$), SI and initiative ($r = .37$, $p = .05$) and FC and initiative ($r = .44$, $p = .001$). The variable initiative is posited at the foundation of adult learning and SDL (Knowles, 1979; Knowles et al., 2005a) and is the catalyst for self-directed learning. Initiative is a necessary phenomenon that leads users to take control of their learning and suggest that a relationship between self-directed learning and technology adoption may exist.

Hiemstra (1994) argued that the personal responsibility aspect of adult learning focusses on the learning taking ownership of all of the learning including the consequences for the choices made for the learning. Based on the literature, these findings suggest that a correlation may exist between principals taking proactive steps to use or learn G Suite, their belief that G Suite will assist them in their job performance, and their belief that G Suite is easy to use. There is also a possible correlation between principals' proactive steps to use or learn G Suite, principals' belief that their superiors expect them to use G Suite, and their belief that there is adequate support to use G Suite in the organization.

The variables of control and motivation exist as factors in both the PRO SDLS and the UTAUT. TPB (Ajzen, 1991b; Venkatesh et al., 2003) introduced the concept of user perceived control to extend the TRA and in the creation of the combined TAM and TPB model (Ajzen, 1991a; Madden et al., 1992; Taylor & Todd, 1995b; Venkatesh et al., 2003). The concept of control was also a significant factor in SDL and adult learning theory as well as management of the learning by the user. (Garrison, 1997; Merriam & Bierema, 2013, 2014; Tough, 1978; Tough & Knowles, 1985). There was a strong

positive correlation between control and EE (r = .55, p = .001) and control and SI (r = .53, p = .001). The intersection of control, social support, and attitude was supported by Raemdonck et al. (2014) where job control and social support were significant in explaining high levels of positive attitudes towards the behavior of workplace learning. Based on the literature, these findings suggest that a possible correlation exist between the readiness and facility for principals to manger their learning of G Suite through the variable of control, their belief that G Suite is easy to use, and their belief that their superiors have an expectation for them to use G Suite. It also suggested that there is possible correlation between principals' readiness and facility to manage their learning, and their belief that G Suite will assist them in performing their job duties.

Garrison (1997) and Hiemstra and Brockett (2012) argued that social interaction between the learner and instructor or the learner and peers was a necessary part of self-directed learning for knowledge development. Motivation was addressed by Vallerand (1997), Deci and Ryan (1975), and Ryan and Deci (2000a) as part of motivational model and as part of the SDT (Deci & Ryan, 2008; Deci et al., 1991) which was included in the UTAUT (Venkatesh et al., 2003). Deci and Ryan addressed both the internal and external aspects of motivation as well as the positive and negative aspects in relationship to technology adoption including the internalization of motivation within a mandated use system.

There was a moderate positive correlation between motivation and EE (r = .42, p = .05), motivation and gender (r = .41, p = .001), and a small positive correlation between motivation and experience (r = .38, p = .05). Motivation is a central part of adult learning theory that drives adults to learn from their experiences (Knowles, 1980; Knowles et al.,

2005a) and a key factor in the PRO SDL model and scale (Hiemstra & Brockett, 2012; Holt & Brockett, 2012; Stockdale & Brockett, 2011). Venkatesh et al. (2003) argued that the effort expectancy's relationship with behavioral intent was moderated by age and gender and that the results were more significant for women. These findings suggest that there is a possible correlation between the motivation to use G Suite by principals, and their belief that G Suite is easy to use. It also suggests that there may be a correlation between the motivation to use G Suite and female principals.

Similar to the findings with the variable of initiative, the moderating variable from the UTAUT of experience, is the one variable that was present in all of the correlations with the PRO SDLS factors. Positive moderate correlations were revealed between experience and initiative (r = .48, p = .001), experience and self-efficacy (r = .48, p =.001), experience and control (r = .42, p = .05), and small positive correlation between experience and motivation (r = .38, p = .05). Experience like control and motivation comprise elements of both self-directed learning and the UTAUT. Although the separate factors of the PRO SDLS were not analyzed in Fogerson (2005), there was small positive correlation between self-directed learning and computer-related experiences among the younger members of the participant samples. Initiative and experience are both posited in self-directed learning with initiative being the drive for self-directed learning and experience guiding the process (Knowles, 1979, 1980; Knowles et al., 2005a). These findings suggest that correlation may exist between the proactive steps taken by principals to make decisions or plans to learn or use G Suite and their experience level with G Suite. It also suggests that a correlation may exist between the amount of control to learn or use G Suite and the level of experience with using G

Suite, and a correlation between principals' motivation to use and learn G Suite and their level of experience with G Suite.

Limitations of the Study

A limitation of the study was the low number of participants to power the study and measure the various relations of the variables. Small sample sizes reduce the power of the analysis to find significance where it may exist, and it also increases the likeliness of a Type I error (Tabachnick & Fidell, 2013; Warner, 2013). The results of the Pearson correlation analysis of the UTAUT variables were consistent with Moore (2012) and Ssekibaamu (2015), but were not consistent with Beard (2016) Pearson correlation analysis of the PRO SDLS factors which also identified multicollinearity between self-efficacy and control. The small sample prevented deeper analysis of the relationships between the variables to not only detect multicollinearity, but moderation and any mediation effects between the variables. The small sample size of the study also created issues of spurious correlations between the values of the UTAUT and the PRO SDLS due to evidence in the literature that suggest that small sample sizes in correlational studies often reveal Type I and Type II errors when analyzing multiple variable from the same sample (Bonett & Wright, 2000; Haig, 2003; Knudson & Lindsey, 2014).

Recommendations

Based on the literature, SDL and technology adoptions share many of the same factors and constructs which suggest that some type of relationship exist, but many studies have not fully examined this relationship. Venkatesh et al. (2016) suggested that many studies that use the UTAUT did not address all of the moderators and Dwivedi et al. (2011) questioned whether redundancy was a factor in many studies which used

variables of the TAM and other models that make up the UTAUT in the analysis using the UTAUT. A study that uses all of the components of the UTAUT as conducted by Venkatesh et al. (2003) and thoroughly examining all of the relationships between the PRO SDLS and the UTAUT should be conducted.

I focused on G Suite for Education as the technology used by principals. methodology could be expanded to investigate the relationship between SDL and technology adoption of G Suite, Apple, and Microsoft platforms as these are the dominate platforms in education. Levin and Schrum (2013) and McLeod et al. (2015) described the various topics that leaders address which included technology purchases. The UTAUT2 (Venkatesh et al., 2012) addressed the role of cost in relation to user choice of technology. G Suite for Education may be the only choice for school leaders because of low cost devices and management. The role of hedonic motivation and cost should be examined in relation to technology adoption in education as well.

I used a quantitative methodology to examine relationships, but a mixed methods or qualitative study could be used as well to understand the emerging themes of why principals adopt these technology apart from the known behavioral foundations. Because of the sparse amount of research on this topic, a grounded theory study would be appropriate as well to develop additional theories on the phenomenon.

Social Change

Principals must balance their work between the management of education in their buildings and their role as an educational leader which, at times, can seem to be in opposite directions. The advancement of web-based and mobile technologies, self-directed learning, and the support of student achievement does not negate the need for

leaders to be mindful of nullifying effects of the digital divide, equitable access to educational resources, or the need for long-term planning for sustainability. Exploring how leaders adopt technology for leadership may provide insight on how leaders can effectively become the managers and educational leaders that plan, provide and assess the needs of all learners while maintaining a comprehensive relationship with all stakeholders. Continued study of the phenomenon from a qualitative perspective will allow leaders to connect with social relationships and dynamics that drive the expectations of the community. The role of the leader in the new environment of educational technology is now positioned as a model for eLeadership, as a responsive educational leader, and a steward of public finances.

Conclusion

In this study, I examined the relationship between technology adoption and self-directed learning of K-12 principals in the state of Arkansas. I also examined the relationship between the constructs of the UTAUT and the PRO SDLS. Survey data collected from principals in the state of Arkansas was used to measure the adoption of Google's G Suite for Education platform by principals. I attempted to address the gap in the research on how K-12 principals develop the skills to lead with technology in spite of the challenges of a lack of educational technology research and demands for more student-centered, SDL with technology.

A quantitative methodology was used to examine the relationship between technology adoption and self-directed learning using the UTAUT as the theoretical framework. This framework was developed from eight existing models of technology adoption and use along with theories of behavioral intent. K-12 principals within the state

of Arkansas were surveyed using the validated instruments of the UTAUT survey instrument and the PRO SDLS. A regression analysis and Spearman correlation was performed on the data collected from 40 participants to measure the relationship between self -directed learning and technology adoption. There was not a statistically significant relationship between self-directed learning and technology adoption. A Pearson correlation was also performed to measure the relationship between the four constructs of the UTAUT and moderators and the four factors of the PRO SDLS.

As a result, strong, moderate, positive and negative correlations were present between the constructs and the factors which suggested that a relationship may exist between the variables in alignment with the literature. The small sample size prevented a more thorough examination of the size, relationships, and variance between the variables. Although the results of the correlations were more than likely to be spurious in nature due to sample size, evidence from the literature suggest that the relationship between self-directed learning and technology has not been thoroughly examined and that more research is needed to fully understand the phenomenon. This has implications for affecting positive social change within the K-12 environment due to increasing amounts of technology that exist in schools and the constant evolution of the technology. School leaders are now addressing new forms of leadership to engage faculty, students, and other stakeholders as well as lead and evaluate technology implementations. Positive social change should drive vision and goal setting as well as be the lens to see the fine line between empowerment and subjugation when adopting and using technology.

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Appendix A: Permission Request to Dr. Venkatesh

November 2017

Dear Dr., Venkatesh,

I am a doctoral student from Walden University writing my dissertation tentatively titled Self-Directed Learning and Technology Adoption by Principals under the direction of my dissertation committee chaired by Dr. Donna Gee. I would like your permission to reproduce and use your survey instrument in my research study. I would like to use and print your survey under the following conditions:

I will use this survey only for my research study and will not sell or use it with any compensated or curriculum development activities.

I will include the copyright statement on all copies of the instrument.

I will send my research study and one copy of reports, articles, and the like that make use of these survey data promptly to your attention.

If these are acceptable terms and conditions, please indicate so by signing one copy of this letter and returning it to me either through postal mail or e-mail:

Travis Taylor

Sincerely,
Travis Taylor
Doctoral Candidate

_____

Signature
Expected date of completion 8/1 / 2018

Appendix B: Permission Request to Dr. Stockdale

November 2017

Dear Dr. Stockdale,

I am a doctoral student from Walden University writing my dissertation tentatively titled Self-Directed Learning and Technology Adoption by Principals under the direction of my dissertation committee chaired by Dr. Donna Gee. I would like your permission to reproduce and use your survey instrument in my research study. I would like to use and print your survey under the following conditions:

- I will use this survey only for my research study and will not sell or use it with any compensated or curriculum development activities.
- I will include the copyright statement on all copies of the instrument.
- I will send my research study and one copy of reports, articles, and the like that make use of these survey data promptly to your attention.

If these are acceptable terms and conditions, please indicate so by signing one copy of this letter and returning it to me either through postal mail or e-mail:

Travis Taylor

Sincerely,
Travis Taylor
Doctoral Candidate

_____

Signature
Expected date of completion 8/1 / 2018

Appendix C: Permission Request to Dr. Brockett

November 2017

Dear Dr. Brockett,

I am a doctoral student from Walden University writing my dissertation tentatively titled Self-Directed Learning and Technology Adoption by Principals under the direction of my dissertation committee chaired by Dr. Donna Gee. I would like your permission to reproduce and use your survey instrument in my research study. I would like to use and print your survey under the following conditions:

- I will use this survey only for my research study and will not sell or use it with any compensated or curriculum development activities.
- I will include the copyright statement on all copies of the instrument.
- I will send my research study and one copy of reports, articles, and the like that make use of these survey data promptly to your attention.

If these are acceptable terms and conditions, please indicate so by signing one copy of this letter and returning it to me either through postal mail or e-mail:

Travis Taylor

Sincerely,
Travis Taylor
Doctoral Candidate

_____

Signature
Expected date of completion 8/1 / 2018

Appendix D: Informing School Superintendents- First Contact

March 2018

Dear Superintendent Name;

My name is Travis Taylor; I am a Ph.D. candidate at Walden University, and I am informing you of a study on self-directed learning and technology adoption by K-12 principals in which I will ask principals to participate. Principal are expected to be technology leaders as part of their overall educational leadership abilities, but how they are adopting technology for leadership varies.

The purpose of this study is to look at the effect self-directed learning has on principals' adoption of Google Suite of Education. The outcomes of this study may help in the design of better professional development for principals adopting technology for leadership.

A principal or principals in your district were randomly selected from a list from the ADE Datacenter website and will be sent a link to a survey on Survey Monkey. The survey will not require their email address, nor will it track their IP address.

- Individuals' participation will be voluntary and at their own discretion.
- Principals reserve the right to withdraw from the survey at any time prior to submission.
- I will not be naming your organization in the doctoral project report that is published in ProQuest.
- The data collected will remain entirely confidential and may not be provided to anyone outside of the student's supervising faculty/staff without permission from the Walden University IRB.

Sincerely,
Travis Taylor
Doctoral Candidate

Appendix E: Informing School Superintendents- Second Contact

March 2018

Dear Superintendent Name;

My name is Travis Taylor; I am a Ph.D. candidate at Walden University, this is a follow-up reminder, informing you of a study on self-directed learning and technology adoption by K-12 principals in which I will ask principals to participate. Principal are expected to be technology leaders as part of their overall educational leadership abilities, but how they are adopting technology for leadership varies.

The purpose of this study is to look at the effect self-directed learning has on principals' adoption of Google Suite of Education. The outcomes of this study may help in the design of better professional development for principals adopting technology for leadership.

A principal or principals in your district were randomly selected from a list from the ADE Datacenter website and will be sent a link to a survey on Survey Monkey. The survey will not require their email address, nor will it track their IP address.

- Individuals' participation will be voluntary and at their own discretion.
- Principals reserve the right to withdraw from the survey at any time prior to submission.
- I will not be naming your organization in the doctoral project report that is published in ProQuest.
- The data collected will remain entirely confidential and may not be provided to anyone outside of the student's supervising faculty/staff without permission from the Walden University IRB.

Sincerely,
Travis Taylor
Doctoral Candidate

Appendix F: Principal Request for Participation- First Contact

March 2018

Dear Principal's Name;

My name is Travis Taylor; I am a Ph.D. candidate at Walden University, and I am conducting research on self-directed learning and technology adoption by K-12 principals. Your superintendent has been informed that you will be invited to participate in my dissertation study. As you may know, principals are expected to be technology leaders as part of their overall educational leadership abilities, but how they are adopting technology for leadership varies.

The purpose of this study is to look at the effect self-directed learning has on principals' adoption of Google Suite of Education (G-Suite). The outcomes of this study may help in the design of better professional development for principals adopting technology for leadership.

A consent form is included in this email. Below is a link to Survey Monkey for the survey questions. If you consent to participating in this research, you will be taken to the survey questions. The survey should take about 15-20 minutes to complete. Your participation in this study is strictly voluntary, and you have the right to decline participation at any point before or during or after taking the survey prior to submitting their survey results.

The survey will be administered by Survey Monkey. The information will be kept confidential and secure through SSL (https) encryption during transmission across the Internet and stored on a secured drive. IP and email information will remain anonymous and not be tracked. Thank you for time and your consideration of this study. If you have any questions before participating, feel free to reply to me. If you chose to participate, the link to the survey is listed below and you can print a copy of the consent form for your records:

Survey Link
https://www.surveymonkey.com/r/68TMF6B

Travis Taylor

Appendix G: Principal Request for Participation- Second Contact

March 2018

Dear Principal's Name;

My name is Travis Taylor; I am a Ph.D. candidate at Walden University, and I am conducting research on self-directed learning and technology adoption by K-12 principals. As you may know, principals are expected to be technology leaders as part of their overall educational leadership abilities, but how they are adopting technology for leadership varies. I recently sent you an invitation to complete a survey about self-directed learning and technology adoption. I would like to again ask for you participation in this study.

The purpose of this study is to look at the effect self-directed learning has on principals' adoption of Google Suite of Education (G-Suite). The outcomes of this study may help in the design of better professional development for principals adopting technology for leadership.

A consent form is included in this email. Below is a link to Survey Monkey for the survey questions. If you consent to participating in this research, you will be taken to the survey questions. The survey should take about 15-20 minutes to complete. Your participation in this study is strictly voluntary, and you have the right to decline participation at any point before or during or after taking the survey prior to submitting their survey results.

The survey will be administered by Survey Monkey. The information will be kept confidential and secure through SSL (https) encryption during transmission across the Internet and stored on a secured drive. IP and email information will remain anonymous and not be tracked. Thank you for time and your consideration of this study. If you have any questions before participating, feel free to reply to me. If you chose to participate, the link to the survey is listed below and you can print a copy of the consent form for your records:

Survey Link
https://www.surveymonkey.com/r/68TMF6B

Travis Taylor

Appendix H: Principal Request for Participation- Third Contact

March 2018

Dear Principal's Name;

My name is Travis Taylor; I am a Ph.D. candidate at Walden University, and I am conducting research on self-directed learning and technology adoption by K-12 principals. As you may know, principals are expected to be technology leaders as part of their overall educational leadership abilities, but how they are adopting technology for leadership varies. I recently sent you an invitation to complete a survey about self-directed learning and technology adoption. I would like to again ask for you participation in this study.

The purpose of this study is to look at the effect self-directed learning has on principals' adoption of Google Suite of Education (G-Suite). The outcomes of this study may help in the design of better professional development for principals adopting technology for leadership.

A consent form is included in this email. Below is a link to Survey Monkey for the survey questions. If you consent to participating in this research, you will be taken to the survey questions. The survey should take about 15-20 minutes to complete. Your participation in this study is strictly voluntary, and you have the right to decline participation at any point before or during or after taking the survey prior to submitting their survey results.

The survey will be administered by Survey Monkey. The information will be kept confidential and secure through SSL (https) encryption during transmission across the Internet and stored on a secured drive. IP and email information will remain anonymous and not be tracked. Thank you for time and your consideration of this study. If you have any questions before participating, feel free to reply to me. If you chose to participate, the link to the survey is listed below and you can print a copy of the consent form for your records:

Survey Link
https://www.surveymonkey.com/r/68TMF6B

Travis Taylor

Appendix I: Permission to Publish UTAUT Information

MIS Quarterly
Carlson School of Management
University of Minnesota
Suite 4-339 CSOM
321 19th Avenue South
Minneapolis, MN 55455

February 20, 2018

Travis Taylor

Permission to use material from
MIS Quarterly in doctoral dissertation

Permission is hereby granted to Travis Taylor to use material from the following articles in his proposal and dissertation at Walden University:

"User Acceptance of Information Technology: Toward a Unified View," V. Venkatesh, M. Morris, G.B. Davis, and F. D. Davis, MIS Quarterly (27:3), September 2003, pp. 425-478

In addition to the citation information for the work, the legend should include

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where 2003 is the year of publication.

Permission is granted for Proquest through UMI® Dissertation Publishing to sell or provide online the original dissertation, should you choose to list the dissertation with them, but does not extend to future revisions or editions of the dissertation, or publication of the dissertation in any other format. The permission does extend to academic articles resulting from the dissertation.

Janice I. DeGross
Manager

Appendix J: Informed Consent

Informed Consent

You are invited to participate in a research study exploring the relationship between self-directed learning and technology adoption. The purpose of this study is to investigate how principals adopt technology for their duties as principal. This may aid in the creation of better technology professional development for principals in the future. The study is titled Self-Directed Learning and Technology Adoption by Principals. This is a research project being conducted by Travis Taylor, a student at Walden University. As a school principal, you were randomly selected from a group of school districts that were divided into categories of small, medium and large-sized districts based on Average Daily Attendance as defined by the Arkansas Department of Education. The survey should take approximately15-20 minutes to complete.

PARTICIPATION
Your participation in this survey is voluntary and is not part of any work requirements. You may refuse to take part in the research or exit the survey at any time without penalty. You are free to decline to answer any particular question you do not wish to answer for any reason.

BENEFITS
You will receive no gifts, money or compensation of any kind nor any other direct benefits from participating in this research study. However, your responses may help in creating quality professional development for principals using technology for leadership.

RISKS
There are no foreseeable risks involved in participating in this study other than those encountered in day-to-day life.

CONFIDENTIALITY
Your survey answers will be collected through SurveyMonkey.com where data will be transmitted over a secured Internet connection and stored in a password protected electronic format. The survey questions nor Survey Monkey will collect identifying information such as your name, email address, or IP address. Therefore, your responses will remain anonymous. No one will be able to identify you or your answers, and no one will know whether or not you participated in the study. No names or identifying information would be included in any publications or presentations based on these data, and your responses to this survey will remain confidential. You may print a copy of this consent form from the attachment in the email for your records.

CONTACT
If you have any questions concerning the study, you may contact my at travis.taylor@waldenu.edu. If you feel you have not been treated according to the

descriptions in this form, or that your rights as a participant in research have not been honored during the course of this project, or you have any questions, concerns, or complaints that you wish to address, you may contact the Research Participant Advocate (1-800-925-3368 ext. 312-1210) from within the USA, 001-612-312-1210 from outside the USA, or email address irb@waldenu.edu.

Email: irb@mail.waldenu.edu
Phone: (612) 312-1283
Fax: (626) 605-0472

Information about the Walden University Institutional Review Board, including instructions for application, may be found at this link: http://academicguides.waldenu.edu/researchcenter/or

Appendix K: Figures

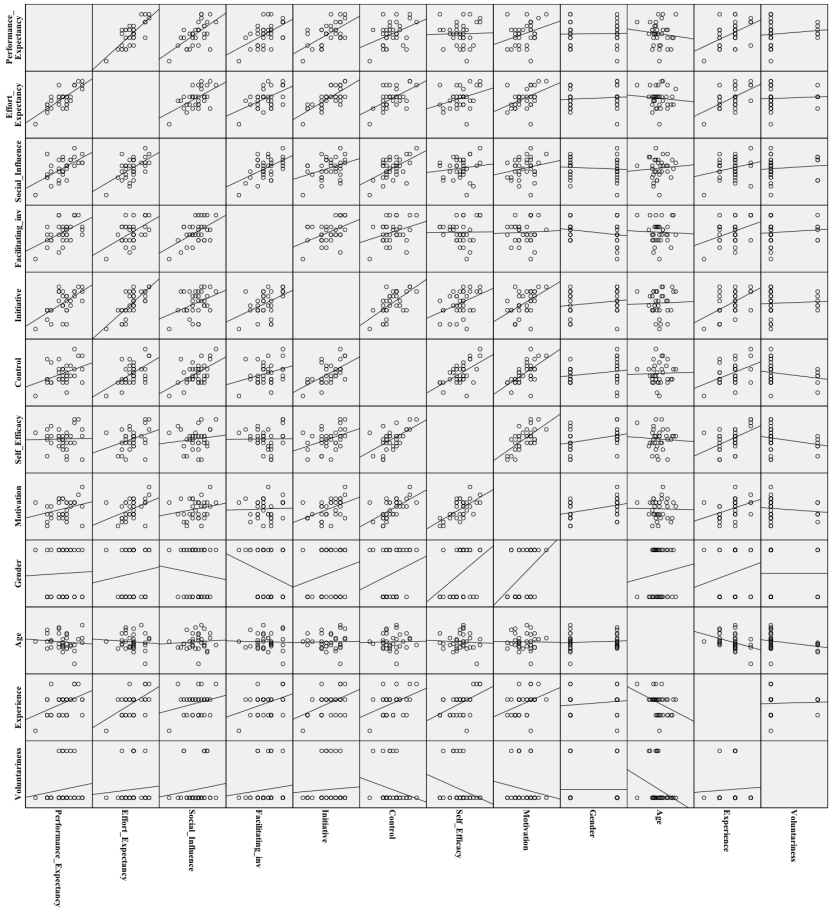

Figure 1. Scatter plot matrix.

Appendix L: Tables

Table 1

Correlation Descriptives

Variable	*n*	*M*	*SD*
Performance Expectancy	40	3.73	.70
Effort expectancy	40	3.89	.62
Social influence	40	3.30	.83
Facilitating	40	.71	.20
Gender	40	1.53	.51
Age	40	48.75	7.25
Experience	40	2.73	.72
Voluntariness	40	1.18	.39
Initiative	34	19.53	2.53
Control	34	20.74	3.11
Self-Efficacy	34	23.15	3.06
Motivation	34	25.38	2.41

Table 2

Correlation of UTAUT and PRO-SDLS Variables

	Variables	1	2	3	4	5	6	7	8	9	10	11	12
1	Performance Expectancy	--											
2	Effort expectancy	.77**	--										
3	Social influence	.62**	.58**	--									
4	Facilitating conditions	.50**	.48**	.48**	--								
5	Gender					--							
6	Age						--						
7	Experience	.44**	.57**		.39*		-.40**	--					
8	Voluntariness								--				
9	Initiative	.59**	.73**	.37*	.44**			.48**		--			
10	Control	.39*	.55**	.53**				.42*		.61**	--		
11	Self-Efficacy					.36*		.48**		.39*	.57**	--	
12	Motivation		.42*			.41*		.38*		.48**	.61**	.64**	--

Note. ** $p = .001$, *$p = .05$.